IPCC WGI SR15 Final Government Draft Review Comments And Responses - Summary for Policymakers

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430					Consequences of warming can be negative and positive (or even neutral!) for a system. All SPM statements are oriented to the negative ones, since 'risk' has been defined through negative consequences only. This makes the report heavily one-sided. [Russian	
432					Negative interactions (trade-offs) of 1.5°C with SDGs - Energy supply and SDG6 are too heavily weighted in negative direction - emphasis is on replacing coal with CCS, nuclear and even renewable sources impacting negatively access to clean water and sanitation [Chad]	
3894					The current version of the SPM and the report is very much appreciated. We especially welcome that the key messages became in general much clearer and a major improvement in the readability of the graphics. All important topics in relation to the subject are fully covered. The fact that the bold statements in each section can be grouped to form the key messages of the report is also an important aspect of the current draft. [Luxembourg]	
3896					The findings of the report on sustainable development in section D are quite general and the headline statements are quite generic. The SPM would greatly profit from more details from the underlying chapters and from minimizing the use of purely generic statements. [Luxembourg]	
4264					In general, the storyline of SPM is not that convincing to demonstrate the importance of keeping global warming 1.5? and show more clear pathway to reah the goal. Policy makers find difficulties in utilizing the SPM for their policy making related to 1.5? target. Overall, (1) This report is difficult to understand. (2) The reason to limit global warming to 1.5? is not clear. (3) The elements of contents are not equal level. Most are global but some are very local. [Republic of Korea]	
4266					There are no levels of confidence in some sentances. (C3, D2.2, D2.4, D2.5) [Republic of Korea]	
4268					The main purpose of SPM is to deliver the message to the public as well as the policy makers that limiting global warming to 1.5? is much beneficial in many ways compared to 2? and higher temperature. The configuration and wording of SPM should be designed to emphasis on the difference between 1.5? and 2? +, but the current version is Not sufficient enough to stress on the difference. [Republic of Korea]	
4270					Overall, the main messages of this SPM is vague and weak. It is hard to find new and additional information. People know that the risk of 1.5 ? world is lower than 2? world. The urgency of GHGs reduction and adaptation should be emphasized more than ever. [Republic of Korea]	
5340					ALL: There is mention of renewables in the document but there seems to be a lack of information on the impact of sustainable transport or electric vehicles with the use of renewables on global temperatures [Saint Lucia]	
7306					KEY ISSUE 1: While the statements in the SPM are, as a rule, drawn from the content of the underlying chapters, the draft SPM often fails to highlight important considerations, context, and straightforward language from the chapters. This is reflected, for example, in the SPM's treatment of scientific uncertainty, as well as in the SPM's presentation of issues associated with challenges to the emissions and development pathways identified in the underlying report. [United States of America]	
7308					KEY ISSUE 2: While authors' efforts to improve the text is appreciated, the treatment of uncertainty in the SPM remains inadequate. There are significant uncertainties in the report's projections regarding subjects such as biome loss, species loss, projected global mean surface temperature averages, and remaining carbon budgets, which are not appropriately reflected within the SPM. Many of these are identified in the submitted comments. Generally, the SPM should supply quantitative estimates (including ranges that account for uncertainty) for each finding identified within it. If such quantitative analysis is not present in the underlying report, the topic may not warrant inclusion in the SPM. Every instance where a finding is based on the expert judgement of the authors should be clearly marked and include an accompanying reference to a clear justification for the finding in the underlying report. Moreover, the SPM does not adequately address the cumulative uncertainties that result from the coupling of climate and socio-economic models used to estimate impacts. The validity and credibility of the modeling cited by this report will be crucial to the acceptance of its findings. Therefore, the SPM should present the total uncertainty and its sources. Furthermore, where possible, model predictions should be compared against observed changes to provide clearer context. [United States of America]	

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7310					KEY ISSUE 3: The SPM narrative fails to communicate the scale of the global technological and economic challenge to meet a 1.5°C objective. The report chapters indicate that meeting 1.5°C warming targets and successfully implementing deep decarbonization of the global economy would require immediate, rapid, and far-reaching transitions across multiple dimensions in every sector. Many of the report's ""1.5°C-consistent"" pathways are predicated upon a massive increase in the pace of decarbonization starting in 2020 to reduce global emissions in half by 2030. Without such reductions, the report further indicates that only a very narrow path remains to achieve 1.5°C, which would involve great costs if it is feasible at all. This message does not come across strongly enough in the SPM. The SPM downplays the challenges that these drastic socio-technical transformations would face. These transformations would require an unprecedented global focus on reducing carbon emissions, involving significant trade-offs. The SPM implies that these challenges will be minor and any trade-offs easily resolved, whereas the underlying report and the published literature clearly demonstrate the scope and depth of these barriers to limiting emissions consistent with 1.5°C. For example, the Chapter 2 Executive Summary (page 2-5) notes that: ""Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5°C consistent pathways (high confidence). Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5°C being about three to four times higher compared to 2°C. (See also chapter 2, page 2-79, section 2.5.2.1.)"" The report finds that the feasibility of limiting warming to 1.5°C will depend heavily on the acceptability, scalability, and implementation of carbon dioxide removal (CDR) technologies and strategies at unprecedented scales by 2050. Many CDR approaches are still on the drawing board, their implementation at scale is still largely speculative, and the potential adverse effects of these measures on ecosystem services and sustainable development remains uncertain (2.6.3). Further, the SPM fails to present key context regarding the rate and degree of decarbonization consistent with pathways of 1.5°C until late in the SPM, minimizing the visibility of this important finding. If it is to accurately convey the key findings from the underlying chapters, the SPM must include in its opening section a clearer statement about feasibility that acknowledges both the challenges posed by 1.5°C-consistent emission reduction targets and the enabling conditions that are needed to address those challenges. Statements A5, C1-3, D1-2, and Figure SPM-3 are notably weak and inadequate in this regard. [United States of America]	
7312					KEY ISSUE 4: The report places outsized focus on sustainable development that is beyond the mandate given to the authors for the report and beyond the mandate of the IPCC itself. The purpose of the IPCC is the assessment of climate change science. While the context of sustainable development is relevant to the assessment and analysis of emission pathways and adaptation responses to IPCC products, the IPCC should not take it upon itself to plot a vision for global attainment of sustainable development goals via climate policy. Furthermore, throughout the SPM and the underlying report, the United Nations Sustainable Development Goals (SDGs) are taken as synonymous with sustainable development. They are not the same. The SDGs are a set of time-limited goals adopted at the international level. Sustainable development is an ongoing process that is largely self-defined at local or regional scales. The report should focus on the latter. Throughout the SPM and the underlying report, the authors should refer to the context of "goals related to sustainable development" rather than the United Nations SDGs. The exclusive focus on the SDGs muddies the understanding of the report's findings. For example, in D4.1, the text refers to specific SDG goal numbers, and the topic of concern is relegated to a parenthetical clause. This backwards framing implies that the attainment of the nominal SDG is more important than addressing the underlying development concerns. The text should be redrafted to focus on the sustainable development implications of climate mitigation and adaptation, not the SDG. As drafted, the report is deviating from the mandate of the IPCC in analyzing efforts through a lens of the SDGs, which are a negotiated product of a different body and subject to an ongoing process for their review. As a general matter, the U.S. Government recognizes the 2030 Agenda as a global framework for sustainable development that can help countries work toward global peace and prosperity. At this time, the U.S. Government cannot express support for specific goals or targets of the SDGs. Each country has its own development priorities, and the U.S. Government continues to consider these in its policies. [United States of America]	
7314					KEY ISSUE 5: SPM Section A - The report does a much better job than the previous draft at distinguishing mitigation from adaptation, but there are still some places where they are inappropriately lumped together, e.g., in A5: limiting warming to 1.5°C does not require adaptation actions. Rather, adaptation actions are a response to the temperature increase, and may interact with the mitigation actions needed to keep warming to 1.5°C. [United States of America]	
7316					KEY ISSUE 6: SPM Section B - SPM findings which are applicable to both 1.5°C and 2°C of warming are presented as if they only apply to one and not the other. This draft is improved in this respect but still contains such statements, e.g., key findings B6.2, B6.4, D3, D3.1, D3.2, and D2.5. [United States of America]	

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7318					KEY ISSUE 7: SPM Section B - The use of the word "substantial" is undefined when describing the difference in impacts at 1.5°C versus 2°C of warming. For example, the statement that losses at 2°C are more "substantial" in paragraph B2 could be interpreted as 10% more species loss in the minds of some readers and 75% in others. Other examples include where the words "substantial" or "substantially" are also problematic when applied to energy demand (C3.2), risks (B3), and adaptation opportunities (B4.2). When the word "substantial" appears before phrases like "reduce risks" or "reduction in energy demand," it can simply be removed with no loss in accuracy or specificity. In a few cases, however, the word "substantial" renders a whole sentence meaningless. Paragraph C2.3 is a good example: "Bioenergy can still be substantial without BECCS due to its cross-sectoral potential for replacing fossil fuels (high confidence)." [United States of America]	
7320					KEY ISSUE 8: SPM Section C - First, the SPM should be clearer about just how much larger these remaining carbon budget numbers are compared to AR5 estimates, and why. Second, the estimates described in C1.2 need to clarify if they are with or without overshoot. Third, given all the uncertainty factors (climate sensitivity, role of non-CO2 forcers, overshoot/no overshoot, permafrost feedbacks, and uncertainties about warming estimated to date), the SPM text should be revised to clearly communicate the total ranges of the remaining carbon budget estimates. [United States of America]	
7322					KEY ISSUE 9: SPM Section C - The role of nuclear energy is completely ignored in the text of the SPM and does not accurately reflect the degree to which scenarios rely on it. For example, nuclear energy supply is projected to increase through at least mid-century (Figure 2.15). [United States of America]	
7324					KEY ISSUE 10: SPM Section D - The statement regarding costs in D2.1 needs to be brought into line with the supporting information from the underlying chapter. The price of emissions discussed in Chapter 2 is the marginal cost of abatement, which is not equivalent to the abatement costs referred to in D2.1. Furthermore, the SPM does not reflect the main thrust of the point in Chapter 2, namely that all modeled 1.5°C-consistent pathways include policies reflecting a high price on emissions. [United States of America]	
7326					KEY ISSUE 11: SPM Section D - The central claim in D2.3 that 1.5°C scenarios would entail "an additional 1.7% to 2.5% of annual economy-wide investment required from the present to 2035" rests almost entirely on the new discussion in 4.4.5 and Box 4.8, which have been significantly revised since the second-order draft. These numbers appear to derive from Box 4.8 Table 1, which is very poorly explained. This is a major issue for the SPM, as it is very important to represent the cost of 1.5°C scenarios, but the underlying material needs clarification and has not benefited from government review. [United States of America]	
7328					KEY ISSUE 12: SPM Section D - This section contains several instances of policy-prescriptive language that does not hew to IPCC principles. For instance, the structure of the Section D headline reads as an imperative and should be revised to be factual. Finding D6.4 presents broad policy-prescriptive commentary which is inappropriate for an IPCC document. [United States of America]	
7330					KEY ISSUE 13: SPM Figures - Figures should tie more closely to the SPM findings. For example, the scenarios presented in the figures are not discussed in the SPM text and are not the basis for any of findings therein. This limits the understanding of the basis for the information in the figures and SPM as a whole. [United States of America]	
7332					KEY ISSUE 14: SPM Figures - The fact that the results shown in Figure SPM-2 are based on the judgement of the authors should be highlighted within the figure itself, not just in the caption. In the results presented, the broad descriptions of impacts, such as "global aggregate impacts" and "distribution of impacts," provide little to no useful information to the reader. Similarly, the inclusion of "Ability to achieve SDGs" in the lower panel stands out as a contradictory finding to the underlying report where the multiple dimensionality of the interactions between warming and sustainable development is highlighted. The other impacts listed are fairly specific and amenable to quantification and offer some tangible information, though more information should be provided linking the basis for these findings to the underlying report. [United States of America]	
7334					KEY ISSUE 15: SPM Figures - Figure SPM-4 is too complicated to understand easily, and once studied carefully, presents little to no helpful information to the reader. The reader is unsure how to interpret a difference between something that has been given a value of +3 versus +2, etc. Many interactions are presented with both trade-offs and synergies, leaving the reader unable to interpret the underlying message. Moreover, all sectors and aspects of sustainable development are presented as equal, when clearly some clusters may have more weight than others. There is little, if any, merit to this figure's inclusion within the SPM. It should be removed. [United States of America]	
7336					KEY ISSUE 16: SPM Figures - The draft SPM does not provide policymakers with an understanding of the projected regional differences in temperature and precipitation change (or changes in extremes) at 1.5°C and 2°C of global warming. This important oversight can be easily addressed with the addition of Figure 3.3 or 3.4 to the SPM, either of which depict regional changes in the physical climate system and provide important context for comparing impacts of 1.5°C versus 2°C. [United States of America]	

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7338					KEY ISSUE 17: in light of references to the Paris Agreement in the SPM, it is worth reiterating that the United States intends to withdraw from the Paris Agreement at the earliest opportunity absent the identification of terms that are more favorable to the American people. The comments provided on this report are expert comments on scientific and technical issues. They do not reflect any statement on or change in the U.S. position with respect to the Paris Agreement or climate change policy or represent any implied commitment. [United States of America]	
7340					KEY ISSUE 18: These comments reflect the input of individual U.S. Government expert reviewers and, as such, do not necessarily reflect official statements of U.S. climate policy [United States of America]	
7342					This version of thd SPM is greatly improved over the first-order draft. The figures have been substantially improved. They are much clearer and in general make cleaner points than was the case in the previous version of the SPM which tried to make multiple points within a single panel and in so doing failed to make any point. The overall flow of the document is to provide a short rationale for the report, which traces to the Paris Agreement of 2015, and then proceeds to discuss these topics in the following order: Introduction A.Understanding global warming of 1.5°C B.Projecting climate changes, their potential impacts, and associated risks at 1.5°C global warming C.Emissions pathways and system transitions consistent with 1.5°C global warming D.Strengthening the global response in the context of sustainable development and efforts to eradicate poverty This is different from the order in which topics are addressed in the main body of the report: Chapter 1: Framing and context Chapter 2: Mitigation pathways compatible with 1.5°C in the context of sustainable development Chapter 3: Impacts of 1.5°C global warming on natural and human systems Chapter 4: Strengthening and implementing the global response Chapter 5: Sustainable development, poverty eradication, and reducing inequalities The order in the main document puts emissions mitigation issues ahead of impacts. For the SPM, this would be the better order as well. The largest, and most difficult, question that limiting climate change to 1.5°C creates is emissions mitigation. That comes in two parts, technical and institutional. Both are touched on in Section A. The former is covered well in Section C, but Section D does less well in handling the institutional challenges of creating and sustaining policies and measures capable of delivering 1.5°C. The SPM would be better served by switching the positions of Sections B and C in the document. At the very least, some explanation for the order of topics and flow of the document should be offered in the Introduction. At present the introduction simply says that the SPM will proceed by providing highlights bundled into sections A, B, C, and D. That's a little thin. The full SPM would benefit from a comprehensive table of contents, which will presumably be compiled for the final draft. • Section A: In the present draft, Section A is an overview of key findings. The narrative unfolds in such a technical way that some of the most important findings are buried. This leaves some pretty important observations from the open literature implied but never stated. For example, from the technical perspective, current nationally determined contributions (NDCs) -- if implemented successfully and maintained throughout the remainder of the 21st century -- have more than a 95% chance of ending the century with more than 2°C temperature change, open the door to much higher temperature change in this century, and establish a commitment to still higher temperature change thereafter. Furthermore, the present set of actions in place to implement NDCs will fall short and, if maintained throughout the century, virtually guarantee greater than 2°C change in average surface temperature. The latter point tends to be buried in statements such as A2.2, ""If emissions continue at their present rate over the coming decades, the present rate of human induced warming of 0.2±0.1°C per decade will continue (very high confidence)."" Here the implication is implied, but never stated plainly. It is also found in Section D, finding D.1. But, while more clearly stated in Section D, it is far to the back of the SPM. A sense of urgency if countries wish to achieve the 1.5 or even 2°C limit goals is not conveyed in the report. The closest to a sense of urgency that gets conveyed in Section A is in finding A.2, where the lead is a reassuring statement that ""Past emissions alone are unlikely to raise GMST to 1.5°C above pre-industrial levels, but do commit to further changes such as sea-level rise and associated impacts (high confidence)."" The more important point is made secondary -- that is, ""If emissions continue at their present rate, human-induced warming will exceed 1.5°C by around 2040 (high confidence)."" The fact that, if all emissions were to	

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7344					The SPM needs to have a summary of key points right at the front so readers do not have to dig for the most important findings, which tend to be at the end and in some cases not even presented in bold type. The key points meriting inclusion in such a summary of the summary would seem to be that: a.Occurrences of extreme heat and extreme precipitation and flooding that are very disruptive to society are already evident with the 1°C increase in global average temperature compared to preindustrial. What were 1-in-1000 likelihood Northern Hemisphere summertime terrestrial warm extremes when global warming was about 0.5°C are now occurring with more than 1-in-10 likelihood. Among the most important impacts are record-breaking heat waves and nighttime temperatures, severe stresses on coral and other ecosystems and landscapes, faster soil drying leading to increased intensity and extent of wildfires, melting back of Arctic sea ice and thawing of permafrost, accelerating loss of ice from mountain glaciers and the Greenland and Antarctic ice sheets that are accelerating the rate of sea level rise (indicating that cryospheric melting and sea-level rise are far from equilibrium to even this limited warming), and increasing island and coastal inundation in low-lying areas around the world. b.Based on present commitments to emissions reductions over coming decades, the global average temperature is projected to increase to over 3°C over the preindustrial baseline by the end of this century, which would have far worse consequences with respect to changes in extreme weather, ecosystem impacts, disruption of societal activities, and loss of land-based ice with large commitments to future sea-level rise (when the Earth was last so warm, the reconstructed masses of the Greenland and Antarctic ice sheets suggest sea level was tens of meters higher). c.Limiting global warming to 1.5°C by emissions reduction and efficiency measures alone would require going to zero net global CO2 emissions within 2-3 decades and could only be achieved by an unprecedented technological, economic, and political mobilization in that fossil fuels are presently used to meet ~80% of global energy demand. Phasing up Carbon Dioxide Removal (CDR) to significant levels would also be required to stay below 1.5°C through the century. Impacts of prolonged global warming of this amount would be associated with even greater warming over land areas and especially in high latitudes, leading to substantially greater consequences than occurring at present. d.Absent the few-decade global phase out of fossil fuels, the global average temperature increase will, quite possibly substantially, overshoot 1.5 and even 2°C. While phasing out of CO2 emissions during the second half of the 21st century accompanied by significant phasing up of CDR has the potential to limit peak warming to less than 2.5-3°C before pulling the increase down toward 1.5°C during the late 21st or 22nd centuries, environmental consequences such as biodiversity loss, landscape transformation, disruption of the marine food chain caused by heating and ocean acidification, and the rate and amount of future sea level rise will likely be primarily determined by the peak warming and not subject to being reversed by the slow pulling back of the temperature increase. e.Aggressive near-term reductions in the emissions of methane, black carbon, HFCs, and the precursors of tropospheric ozone have the potential collectively to moderate the onset of global warming and its impacts by a decade or two if there is no offsetting slowing in the emissions of CO2. There are substantial co-benefits from such emissions reductions, including improvement of public health and of air and water quality, making the undertaking of such emissions reductions particularly cost-effective actions to be taken in support of both slowing climate change and addressing key sustainability goals. f.Initiating Solar Radiation Management (SRM) research and iteratively advancing understanding through early deployment offers the only potential alternative approach for keeping global warming below 1.5°C and perhaps eventually even pulling global warming back to less than 0.5°C, the level above which serious impacts and commitments to such impacts might fulfill the UNFCCC objective. Due to limited understanding on technical, governance, and ethical considerations, this assessment, despite there being a wide range of expert views, does not consider SRM a viable option nor even recommend a comparative analysis of the benefits and risks of overshooting 1.5°C (perhaps by a degree or more) versus augmenting	
7346					The SPM should more explicitly state the research gaps and more clearly state when conclusions are being drawn from modeled pathways, which are not exhaustive. Many statements throughout the SPM are policy prescriptive. These should be revised to reflect that they are options with accompanying risks and trade-offs. [United States of America]	

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7348					While the statements in the SPM are all supported by the underlying chapters, choices made in the organization of the SPM and what messages from the underlying chapters to highlight result in a narrative that fails to communicate the scale of the challenge compared to the messages in the underlying chapters. Global emissions need to reach net-zero by mid-century in all 1.5°C-consistent pathways; this is a finding of utmost importance that is not mentioned until over halfway through the SPM (page 13, lines 16-20). 1.5°C-consistent pathways require 2030 emissions lower than levels that are in line with current NDCs; this point is not made until near the end of the SPM (page 19, lines 13-18) and it is not made nearly strongly enough. From the Chapter 2 executive summary, ""Under emissions in line with current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs), global warming is expected to surpass 1.5°C, even if they are supplemented with very challenging increases in the scale and ambition of mitigation after 2030."" Even this does not fully convey the scale of the challenge. Of the four scenarios highlighted in the SPM (LED, S1, S2, and S5 from the figure on page 16) three of them involve cutting global emissions roughly in half by 2030, and the fourth requires even more rapid decarbonization than the others starting in 2030 to reach net zero before the other highlighted scenario and achieves far greater net-negative emissions in the second half of the century. Much of the variation and flexibility in different ways that 1.5°C can be achieved that are discussed in this report are predicated upon this massive increase in the pace of decarbonization starting in 2020 to reduce global emissions in half by 2030. Outside of this herculean increase in ambition in the next few years, only a very narrow path remains to achieve 1.5°C. This message does not come across strongly enough in this report. When the SPM does address feasibility at the front of the document in headline statement A5 (page 6, lines 20-22), the statement is watered down, only saying that there are no simple answers because multiple unstated dimensions to the question need to be considered simultaneously. As discussed in Cross-Chapter Box 3, there are geophysical, environmental-ecological, technological, economic, socio-cultural, and institutional dimensions to feasibility. Section A5 of the SPM needs to acknowledge that meeting 1.5°C warming targets and successfully implementing deep decarbonization and climate resilient development requires rapid and far-reaching systems transitions (e.g. energy, land, urban, and industrial systems) in the next one to two decades, and drastic socio-technical transformations (e.g., policies, governance, markets, and behavior) which all face significant challenges. These are the challenges that the enabling conditions discussed in A5.1 (page 6, lines 24-28) help address. A clearer statement in Section A about feasibility that acknowledges both the challenges posed by 1.5°C warming targets and the enabling conditions that are needed to address those challenges is needed for the SPM to accurately convey the key findings from the underlying chapters. [United States of America]	
7350					"substantially" is a subjective, meaningless term in the SPM and should be removed. It's a major problem to use the term when discussing the difference in impacts at 1.5 versus 2.0°C of warming. What is the difference in species losses at 1.5 versus 2.0°C? Saying losses are "substantial" could be interpreted as a 10% loss in the minds of some readers and 75% in others. The projected biome shifts described in Section 3.4.3.1 are much more specific and would be a good alternative in this particular case. [United States of America]	
7352					The SPM contains findings that apply to both 1.5 and 2.0°C of warming, but many are presented as if they only apply to one and not the other. Here are a few examples: key findings B6.2, B6.4, D3. , D3.1, D3.2, D2.5. [United States of America]	
7354					The acronym LED is never defined. [United States of America]	
7356					Overall, this version of the SPM is much improved compared to the previous version. As one overarching comment, the urgency for deep decarbonization, and the extent of the systems and social transformations required for limiting global warming to 1.5°C discussed in the various chapters, does not seem to have been adequately reflected in the SPM. The language should be reviewed to reflect the underlying chapters. [United States of America]	
7358					The figures in the SPM have been dramatically improved compared to the last draft. They are simpler and far more accessible, and the authors should be applauded for this work. However, the figures in the underlying chapters have not received the same attention. Many figures in the underlying chapters are rendered illegible by small fonts that cannot be read at the current resolution of the figures, even when magnified. This needs to be rectified. [United States of America]	
7360					While the statements in the SPM are all supported by the underlying chapters, choices made in the organization of the SPM and what messages from the underlying chapters to highlight result in a narrative that fails to communicate the scale of the challenge. Global emissions need to reach net-zero by mid-century in all 1.5°C-consistent pathways. This is a finding of utmost importance that is not even mentioned until page 13. Three of the four archetype pathways explored in the document involve this immediate dramatic increase in ambition with rapid decarbonization beginning in 2020, yet the point that fulfilling the NDCs in 2030 are not enough is not made until page 19. Furthermore, the document explores many of the different ways that we can reach 1.5°C (e.g., limited reliance on CDR, BECCS is not needed in some scenarios, only Afforestation for CO2 removal, limited use of CCS); however, it is not clear that this flexibility is predicated upon a dramatic increase in ambition starting in 2020 to reduce global emissions in 2030 by roughly half, far beyond what nations have proposed in their NDCs. [United States of America]	

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7362					The report and SPM do not present a balanced assessment of the economic, social, and development costs associated with the tradeoffs of pursuing actions consistent with limiting global warming to 1.5°C. Too often, particularly in Chapter 5, authors dismiss tradeoffs as being solvable by using redistributive policies or by pursuing actions that are deemed consistent with sustainable development. [United States of America]	
7364					The Paris Agreement was ADOPTED under the UNFCCC; it is not directly under the UNFCCC. This should be updated throughout the report, including in the glossary. [United States of America]	
7366					There is no recognized definition of what elements of current NDCs are conditional or unconditional. Therefore the IPCC should refrain from using such terms throughout the report. [United States of America]	
7368					There seems to be a lack of discussion on the importance of information and specifically climate information for adaptation. Science and technology are mentioned, but not information specifically or the importance of access to information. [United States of America]	
7370					This is a highly technical report and, as a result, the SPM is very technical and data-heavy at times. However, the translation to language that would be accessible to readers without deep technical expertise in this area could be stronger. Phrases like "In 1.5°C consistent pathways" require considerable interpretation by the reader and could be expressed in more plain-speak language. As a second example, consider: "BECCS deployment ranges from 0–9 GtCO2/yr in 2050, and 0–16 GtCO2/yr in 2100, while agriculture, forestry and land-use (AFOLU) related CDR measures remove 0–11 GtCO2/yr in 2050 and 1–5 GtCO2/yr in 2100"). At other times, the language is too generic about development data (e.g., "impacts on health, livelihoods, food and water supply, human security, infrastructure, and the underlying potential for economic growth will increase with 1.5°C of warming compared to today, and even more with 2°C compared to 1.5°C" (SPM-9))." Making climate data and projections and the policy impacts data more specific and understandable for policymakers would improve the chapter. [United States of America]	

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7372					The SPM does not explicitly address the social, environmental, and economic costs of restricting global warming to 1.5°C instead of 2°C, and how that compares with the benefits. The SPM also implicitly assumes that the costs of restricting global warming to 2°C would exceed the costs, compared to a realistic business-as-usual case, which is an assumption that should be checked. Second, by its very nature, a report such as this has to estimate or otherwise project impacts that could/might/should occur if the globe warms by 2°C or 1.5°C. However, there is no discussion – or a summary thereof – in the SPM regarding the credibility of models (or methodologies) used in the report to project future impacts. Third, to compound matters, the IPCC AR5 WG1 report has noted that most climate models, which are generally one model in a chain of models used to estimate impacts, have been overestimating the rate of global warming since the 1990s (Flato et al. 2013, pages 768--770, Fig 9.8(a) and Box 9.2) despite the fact that historical anthropogenic forcing was about 20% greater than what the CMIP5 models assume (Flato et al. 2013, p. 1435). Since then, several papers have confirmed that many, if not most, models have been substantially overstating the rate of warming since the 1990s, although they disagree on the degree of overestimation (Fyfe et al. 2013; Karl et al. 2015; Fyfe et al. 2016; Medhaug et al. 2017; Santer et al. 2017; Christy et al. 2018; Lewis and Curry 2018; Remote Sensing Systems 2018). At the very least, this puts into question the validity of models that indicate high sensitivity of global temperatures to CO2 concentrations (Lewis and Curry 2018; Lewis and Grunwald 2018). If true, this indicates that models that project the higher rates of warming should be discounted in developing estimates of future impacts. Fourth, the community knows even less about the validity and credibility of other (non-climate) models that are coupled to climate models to estimate the various impacts of climate change. The document should include a discussion of the cumulative uncertainties resulting from the daisy chain of models used to estimate impacts. Fifth, the SPM fails to note that recent decades have seen the fastest declines in global poverty in both numbers and proportion of population even as fossil fuel use has exploded (Goklany 2017, and references therein) and the world has warmed. The fastest and greatest declines in poverty have occurred in China and India even as they have ramped up their use of fossil fuels (Our World in Data 2018, at https://ourworldindata.org/extreme-poverty; World Bank Development Indicators 2018, at http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators). This real world experience is at odds with the notion that poverty would necessarily be reduced more rapidly in a 1.5°C world than in a 2°C world. In light of past history and present trends with regards to poverty worldwide, this report should explicitly show that the policies needed to effectuate a 1.5°C world (or, for that matter, a 2°C world) would not compromise the present rate of poverty reduction. Sixth, if efforts to limit climate change to 1.5°C instead of 2°C reduces the rate at which poverty rates have been declining this could, in turn, reduce the adaptive capacity of societies to not only cope with any negative effects of climate change but any other source of adversity (Goklany 2007). These sources of adversity include climate- and non-climate sensitive diseases, hunger, the ability to cope with natural disasters, etc. The possibility and probability of the occurrence of this undesirable state of affairs should be addressed. It should also be noted that the resources needed to effect a transition to a 1.5°C world would divert scarce fiscal and human resources from other tasks that may improve human and environmental well-being more effectively and economically. The SPM should also discuss whether effecting a 1.5°C world is the most effective and economic method of improving human and environmental well-being. This is a threshold question that should be discussed. Seventh, considering that we are currently 1 ± 0.2°C above pre-industrial, means that we are two-thirds of the way to a 1.5°C world, and half way to a 2°C world. Yet humanity has never been more prosperous, less poverty-stricken, less hungry, longer-lived and healthier than today; death and disease rates from extreme events and climate sensitive diseases have never	
7374					On the whole, authors were very responsive to comments submitted on the second-order draft chapters, as part of the Government and Expert Review; however, some of the rewrites were so sweeping that the revised text (sometimes entirely new sections) introduced new problems and/or technical inaccuracies. The more important concerns -- primarily for Chapters 3-5 -- have been elevated to the formal Government submission. Detailed clarifications associated with these points have been provided to the lead Technical Support Unit to share with authors as final drafts are edited. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7376					Cross-Chapter Box 8 (1.5°C Warmer Worlds), which appears at the end of Chapter 3, deserves further scrutiny since it was added since the Government Review of the second-order draft. Because the table aims for synthesis across the chapters of the report, its relationship to the SPM and its added value relative to the SPM are unclear; in fact, it seems to confuse matters regarding scenarios. The four scenarios in Box 8 Table 1 are difficult to reconcile with the four 1.5°C-consistent pathways highlighted in Figure SPM-3. If they are different and have no relationship, then that should be clarified. It further confuses matters by having three scenario storyline discussions in Box 8, Table 2, where one of those scenarios is about reaching 3°C by 2100, raising the question about its relevance in this Special Report. Also, two of those storylines seem to imply that the Paris Agreement would be re-negotiated in 2020. There are a number of statements made throughout Box 8 that should be re-worded or deleted because they are policy-prescriptive. These include: "These alternative outcomes need to be factored into the decision-making process." "Adaptive scenarios could be facilitated by the Global Stocktake mechanism established in the Paris Agreement…." And so on. Finally, the following bullet is poorly worded: "What is the impact of different climate models for projected changes in climate of 1.5°C global warming?" It should instead read: "What is the impact of different climate model projections for scenarios reaching 1.5°C global warming?" Given the flaws in this box, which has not been formally reviewed, authors should consider deleting it. [United States of America]	
7378					4.4.5.4 and 4.4.5.5 have been substantially revised and contain a number of prescriptive statements that are inappropriate for an IPCC report. 4.4.5.4 makes a number of lightly veiled policy recommendations (p. 4-95), including the use of IMF Special Drawing Rights to fund the Green Climate Fund, the creation of carbon remediation assets at a predetermined face value per avoided tonne of emissions, and the use of Central Banks or financial regulators as a facilitator of last resort for low-emission financing instruments. These statements should be reframed in a neutral way or deleted. 4.4.5.4 also contains an unusual reference to "Measurement, Reporting and Verifying" (MRV), suggesting it can be used to mitigate default risks. This is not the typical role of an MRV system. [United States of America]	
7380					4.4.5.5 is newly rewritten and articulates a questionable perspective on adaptation finance that is biased toward public and international public provision of adaptation services. Although the section begins by noting that "adaptation finance is difficult to quantify," in part because "it is very difficult to isolate specific investment needs to enhance climate resilience from the provision of basic infrastructure," it goes on to suggest that adaptation would "typically have to be supported by ... government budgets with support from overseas development assistance and multilateral development banks, and a slow increase of dedicated NGO and private climate funds." Notwithstanding the opening point, this discussion neglects the important role of undeclared private adaptation investment that does not get measured in standard efforts to track climate finance. [United States of America]	
7382					4.5.2.2 contains several prescriptive statements that should be revised or deleted: (1) "governance would have to be multi-level" (p. 4-103, line 11); (2) International cooperation on technology, including technology transfer where this does not happen autonomously, is needed (lines 17-19); (3) a suggestion that financial markets should be organized by regulatory institutions if they do not acknowledge climate risk (lines 36-38). The statement that "pricing alone is insufficient" should be modified by adding "to achieve mitigation objectives associated with 1.5 degree pathways" (line 33). [United States of America]	
7384					5.4.1.2 should also note that restrictions on the use of fossil fuels may have adverse effects for industrialization (SDG 8). This should be reflected in figure SPM.4 and the associated figures within Chapters 2 and 5. [United States of America]	
7386					A significant weakness of the SPM Final Government Draft is that it does not provide a concrete comparison of the state of advancement of various mitigation strategies to the levels that would be needed in order to achieve emissions consistent with limiting warming to 1.5°C. This could be addressed more robustly in A5, C3, D2 and D4. This reflects an underlying weakness in Sections 4.3.1 and 4.3.3 of Chapter 4, which, while improved from the Second Order Draft, still do not provide much concrete detail on the pace and scale of sectoral transformation/advancement relative to the pathways discussed in Chapter 2. [United States of America]	
7388					Chapter 5 contains several instances of policy-prescriptive text that should be deleted or reframed in a neutral way: (1) In 5.4.2.2, the references to food price support (or "food support price [sic]") are prescriptive and should be deleted. (2) In 5.5.3.2, the sentences -- "Emerging literature on justice-centred pathways to 1.5°C points toward ambitious emission reductions domestically and committed cooperation internationally whereby wealthier countries support poorer ones, technologically, financially, and otherwise to enhance capacities" -- and -- "Recent work demonstrates the contributions of 90 industrial carbon producers to global temperature and sea level rise, and their responsibilities to contribute to investments in and support for mitigation and adaptation (Heede, 2014; Ekwurzel et al., 2017; Shue, 2017) (Sections 5.6.1 and 5.6.2) -- are prescriptive and should be deleted. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7390					Chapter 5 contains several points of discussion related to power imbalances. These discussions are handled relatively well, given the sensitivity of the topic, however, some points of imbalance remain: (1) In 5.3.3 (p. 5-19), the first sentence in the third paragraph suggests that past development trajectories inevitably lead to maladaptive pathways; this assertion should be softened. (2) In 5.5.3.1, the discussion of "transformation" is aspirational yet vague - what does it mean? Why is more equitable effort-sharing essential? (3) Also in 5.5.3.1, the statement that "Consideration for what is equitable and fair suggests the need for stringent decarbonisation and up-scaled adaptation that ... overcome vested interests" has too strong of a prescriptive lean and should be revised or deleted. (4) Similarly, the sentence in the following paragraph -- "The social conditions to enable well-being for all are to reduce entrenched inequalities within and between countries (Klinsky and Winkler, 2018), rethink prevailing values, ethics and behaviours (Holden et al., 2017), allow people to live a life in dignity while avoiding actions that undermine capabilities (Klinsky and Golub, 2016), transform economies (Popescu and Ciurlau, 2016; Tbara et al., 2018), overcome uneven consumption and production patterns (Dearing et al., 2014; __ et al., 2016; Raworth, 2017) and conceptualise development as well-being rather than mere economic growth (Gupta and Pouw, 2017) (medium evidence, high agreement)" -- is aspirational but arguably does not belong in this document. (5) In 5.6.4 (p. 5-43), the reference to "addressing the uneven distribution of power" should be revised to "addressing the distribution of power" - the word "uneven" is not necessary and suggests that a key focus of limiting warming to 1.5°C should be the redistribution of power. [United States of America]	
7392					Cross-chapter Box 4 contains numerous misrepresentations. For example: It refers to indicator 12.8.1 as a "goal target" for education, rather than an indicator of a target for sustainable consumption and production patterns; it refers to the UNFCCC as though it were agreed following the establishment of the SDGs; it refers to text in the Paris Agreement as though it were part of the UN Framework Convention on Climate Change. [United States of America]	
7394					Cross-chapter Box 7 is well-written, but its placement in Chapter 3 of the report is odd. It should ideally be placed in Chapter 4, with which it has greater synergies. That would enable the Chapter 4 summary to incorporate some of the points from the cross-chapter box, for example regarding tradeoffs in land use. [United States of America]	
7396					Figure 5.4 offers a useful analysis, and some elements deserve greater explanation and mention in the SPM. For example, the reduction in energy access associated with 1.5°C is a striking result that is not clear in Figure SPM.4. This should also be discussed in Chapters 2 and 4. At the same time, some elements in Figure 5.4 are unclear or inappropriate: (1) What is the "base" scenario, specifically? This should be explained in the legend. (2) The element referring to "fossil resource" does not bear a direct relation to SDG12 (which refers to "natural resources", not fossil resources) and should be deleted. (3) Note that forest area, while relevant to SDG15.1, does not tell us how sustainable that forest is; this may merit a footnote. (E.g., it could show an increase in cases where biodiverse natural grasslands are replaced by unsustainably managed plantation forest.) (4) the food price index should be explained. (5) "Water energy" is not a familiar concept, and the units are in cubic km/year -- this should be explained. How does this relate to SDG 6? [United States of America]	
7398					In 5.6.1, the statement that "Care needs to be taken when international donors or partnership arrangements influence project financing structures" is imbalanced. Care needs to be taken in any project financing structure, and project financing structures without international donor engagement can also fail to address local needs, for example, if they are designed corruptly. Please revise accordingly. [United States of America]	
7400					In Box 4.3, the unfavorable reference to "westernisation" should be deleted and replaced with a reference to "modernization"; the current statement reflects a negative bias against certain countries and cultures. [United States of America]	
7402					Much of the discussion in Section 4.4.1 of the underlying report is general and not unique to 1.5°C pathways. The United States recommended deletion or significant curtailment of this section in previous comments. In particular, much of the language on international governance (4.4.1.2) is unnecessary to the report, and in key sections, it includes unbalanced or prescriptive statements, e.g., referring to "industry group lobbying," or recommending the "Common But Differentiated Responsibilities and Respective Capabilities" principle as a tool for promoting alternative development pathways. Similarly, the assessments of the Paris Agreement are likely inappropriate to this report, given that negotiators may not agree on them. The third through seventh paragraphs of 4.4.1.2 should be deleted to address other errors or unbalanced language. 4.4.1.4 is very difficult to follow in places, and includes the misstated claim that "governance includes adaptation" (perhaps what is meant is that it facilitates adaptation). [United States of America]	
7404					In general, the SPM and the underlying report provide a less than satisfactory treatment of energy efficiency (outside of the industrial sector) and largely neglect the role of demand response in energy systems. Although energy efficiency apparently plays a large role in the SSP1 and LED scenarios discussed in Figure SPM-3 and as cited in D2.3, and reduction in energy demand is cited as an important element in 1.5°C pathways in several sections of the SPM, there is relatively little discussion of energy efficiency and demand response in Section 4.3.1. Similarly, the discussion of energy efficiency in urban energy systems and the prospect of (and barriers to) wide-scale electric vehicle adoption could be bolstered in Section 4.3.3; these discussions don't satisfactorily address the question of what it would mean to align with a 1.5°C pathway and the feasibility of that. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7406					Section 4.2.1.1.2 should acknowledge the importance of cross-regional and sub-national impacts from climate mitigation strategies consistent with 1.5°C of warming. For example, the modeled reductions in fossil fuel production and consumption would have significant economic impacts on regions that produce or consume large quantities of coal. [United States of America]	
7408					C1.3 and Figure SPM-1 should link more closely to Section 4.3.6 of the report, which in turn should provide more discussion of those short-lived climate forcers (SLCFs) that cause cooling, e.g., sulfur dioxide and organic carbon. [United States of America]	
7410					The discussion in Section 4.2.2.1 has been substantially revised from the Second Order Draft, but is confusing and overly general in its discussion of Integrated Assessment Models (IAMs). In addition, the term "decoupling" should be clearly defined to avoid confusion, including the meaning of the phrase "decoupled absolutely." (This issue was raised in comments on SOD 4.2.2.) [United States of America]	
7412					The discussion of adaptation in the Paris Agreement in Cross-Chapter Box 11 continues to include inaccuracies and should be deleted (e.g., it states that the Agreement's transparency framework is applicable to all countries, rather than all Parties). [United States of America]	
7414					The discussion of forest conservation is improved from the SOD. However, it is not clear why the section on forest management has been deleted. Sustainable forest management is capable of making important contributions to mitigation and adaptation. It is also unclear why the remaining discussion of forests is now headlined "Ecosystem restoration." That omits the important role of forest conservation. Section 4.3.2.2 also omits consideration of peatland conservation, which is potentially important for land use emissions. The section does note that there are potential tradeoffs between forest conservation and agriculture and (implicitly) food security, which is an important point. [United States of America]	
7416					The discussion of human migration as an adaptation strategy (in 4.3.5.6) is not sufficiently nuanced. It should distinguish between internal migration strategies (for example on a seasonal or temporary basis), which can be an effective adaptation approach, and more permanent or trans-boundary migration, which has the issues cited in the text. [See previous US comments for literature recommendations.] [United States of America]	
7418					The reference to "colonisation" of Arctic communities in Cross-Chapter Box 9 (p. 4-39) should be deleted. [United States of America]	
7420					The reference to "inappropriate human consumption" in 4.3.2.2 (p. 4-24) is not appropriate for an IPCC report, as it betrays a value judgment. Suggest replacing with "inefficient." [United States of America]	
7422					The reference to the SDGs in Cross-Chapter Box 9 (p. 4-40) is too sweeping; it's not clear that all of the SDGs would contribute to addressing the risks related to extreme events. [United States of America]	
7424					The report takes a relatively negative view of disaster risk reduction and disaster risk management, arguing in Chapter 4 Exec Summary (p. 4-7) that "Disaster risk management and education-based adaptation have lower prospects of scalability and cost-effectiveness." What is the basis for this claim? It does not appear consistent with experience that DRM can lower the long-term cost of managing disasters, or with the underlying text in 4.3.5. The discussion of this potentially important adaptation strategy in 4.3.4.1 is limited to two sentences. Note also that one of the references (Kita, 2017) is missing from the reference list. [United States of America]	
7426					The report's discussion of behavioral change (in Chapter 4, including especially in 4.4.3.1) focuses excessively on individual beliefs, many of which are likely intrinsic to individuals and not likely to be changed. It appears to be written from a viewpoint that holds a negative view of many classes of individuals, and is inappropriate for an IPCC document. It largely ignores the demonstrated success of social marketing techniques in the fields of public health and environment as means of opening a dialogue that can lead to long-term behavior change. Moreover, the discussion in 4.4.3 has no specific concrete connection to 1.5°C pathways. The discussion in 4.4.3.1.1 and 4.4.3.1.2 should be deleted. The dated reference in 4.4.3.3 to a 16-year-old study (Poorting et al., 2002) as evidence of current preferences should also be deleted. [United States of America]	
7428					The report's discussion of feasibility is often vague and overly generalized. For example, on p 4-7, the Chapter 4 Executive Summary states "Reductions of several warming SLCFs are constrained by economic and social feasibility." This statement is too general to be useful to readers or policymakers; it is also difficult to evaluate the credibility of such general statements. [United States of America]	
7430					The revised discussion of adaptation options in 4.3.5 is only weakly linked to 1.5°C pathways. [United States of America]	
7432					The role of nuclear energy receives inappropriately limited attention in the SPM and the underlying document, appearing in the SPM only in one of the figures but not in the text. Section 4.3.1.3 discusses the current state of deployment of nuclear energy, but does not address the consequences of the issues raised for limiting warming to 1.5°C. Moreover, the discussion in 4.3.1.3 does not align with the material presented in Chapter 2, which shows an increase in nuclear energy supply through at least mid-century (Figure 2.15). [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7434					The SPM should highlight that integrated assessment modeling (IAMs) suggest that a major share of emissions reductions in 1.5°C overshoot scenarios would need to come from industry. This is an important point that should be reflected in the SPM. See Chapter 2 and 4.3.4. [United States of America]	
7436					The statement in 4.4.5.1 (in new text) that there are three categories of policy tools to meet distributional challenges is unduly narrow and should be broadened. There are other fiscal and social policies, which need not be specifically enumerated, that could address these issues. [United States of America]	
7438					The use of "Necessity" in the new title of the new section 4.4.5.2 -- "Carbon Pricing: Necessity and Constraints" -- is policy prescriptive. It should be deleted. The section could be retitled, "Carbon Pricing: Role and Constraints" or simply "Carbon Pricing." The opening sentence to this section makes an odd and unsupported claim, and should be deleted. The discussion of carbon prices in the third paragraph should clarify whether it pertains to national carbon prices or to the obstacles associated with a "world carbon prices." The reference to "switching carbon prices" is unclear and the statement about mobility in the same paragraph is a non sequitur and should be deleted. The final paragraph in this section is policy prescriptive and should be deleted. [United States of America]	
7440					There are several issues with Table 5.3 that should be addressed, including the following. These feed into Figure SPM-4 and should be addressed there also: (1) The assessment that non-biomass renewables have a synergy with SDG1 is conditioned entirely on their climate mitigation benefits, which would apply equally to other mitigation strategies; (2) The cell on REDD+ and food security includes a discussion of bioenergy production that does not belong there; (3) The cell on REDD+ and SDG5 relates past experience that is a function of implementation approach; it does not mean that future REDD+ activities would necessitate a tradeoff with gender equality and women's empowerment; (4) the benefits of nuclear energy for biodiversity conservation should be highlighted in the appropriate cell. See, e.g., Brook and Bradshaw (2015), Key Role for nuclear energy in global biodiversity conservation, Conserv Biol. 2015 Jun;29(3):702-12. doi: 10.1111/cobi.12433. [United States of America]	
8762					An increase of 1.5 degrees of Earth's temperature, which can be based on the changes in the nature of the earth, taking into account the process of the occurrence of the entire life of the earth, and a percentage which, of course, can not be accurately calculated, is the effect of human behavior and activities on the ecosystem. , Has had some effects in some parts of the world that has been irreparable due to lack of sufficient and accessible information due to the limited amount available. Information constraints are possible with the participation of specialized and executive teams between countries in the form of regional and international projects supported by international organizations and institutions such as the World Bank, UNESCO, UNEP, UNDP and others. [Iran]	
8834					Suggest including an Executive Summary due to the length of the report (22 pages). [Australia]	
8836					To be more practical for policy makers the Summary for Policy Makers should focus more clearly on the key objective (to detail the projected impacts of global warming of 1.5 compared to 2°C). For example, the SPM could use a headline point summarising the higher costs of 2°C compared to 1.5°C (as addressed in Chapter 3.5.3 in particular). [Australia]	
8838					The SPM could more clearly articulate the opportunities and benefits of keeping temperature rise below 2°C even if 1.5°C is not achievable. The thresholds of 1.5°C and 2°C above pre-industrial global mean surface temperature do not have meaning in and of themselves, they are milestones along a continum. There is a lot of detail on the challenges, trade-offs and options for pathways towards 1.5°C. The SPM could balance these with the benefits of moving towards 1.5°C. For example, headline statements D4 and D5 (and sub-statements) note the synergies for achieving sustainable development goals (SDGs), but do not expand on the positive prospects of such synergies. In this way, the SPM would benefit from clearer articulation of the opportunities and benefits for which policy makers can focus on. [Australia]	
8840					Strengthening the headline statements on the difficulty of keeping GMST increase to 1.5°C would reinforce the key message that achieving GMST at 1.5°C requires "rapid and far-reaching systems transitions", as noted in statement C3. Messaging throughout the SPM is not always consistent with statement C3, which notes the substantial efforts and transitions required to limit global warming to 1.5°C. Statement C1 could more explicitly express the degree of change required for 1.5°C trajectories, compared to a continuation of the current level of emissions (as illustrated by the figure on page SPM7). [Australia]	
8842					Suggest greater linkages between elements of the SPM and the relevant chapters of the Special Report. For instance, in later chapters of the Special Report there is content on historical issues and decisions within the United Nations Framework Convention on Climate Change (UNFCCC) negotiations. Much of this content does not connect to the SPM and dilutes the focus of the report. [Australia]	
206					This version of SPM is generally greatly impoved and that positive feedback can be given for improved readability and clarity. Also the figures have developed and they are more easily understandable than in theprevious draft. Figures are very informative but some are still a bit laborious to interpret (especially figure SPM 4). The information (text) supporting the interpretation of the figures is generally sufficient, however, we suggest some clarifications. [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
208					While the SPM includes references to equity (and ethics), it would be recommendable to more explicitly include the equity, ethics, fairness, justice and human rights aspects, since some of the decision-makers reading the SPM may not be familiar with the previous reports and discussions on the topic. [Finland]	
310					Consequences of warming can be negative and positive (or even neutral!) for a system. All SPM statements are oriented to the negative ones, since 'risk' has been defined through negative consequences only. This makes the report heavily one-sided. [Russian Federation]	
312					The use of burning embers for the purpose of this report can be misleading. Yes, additional risk can be detectable and attributable, but SMALL! [Russian Federation]	
1710					One would expect a one general statement summarizing the state of knoweldge on 1.5 °C warming, i.e how much do we know and whether there are knowledge gaps and in what areas. This is crucial to put the special assessment of 1.5 °C in perspective and provide a guide to AR6 contributions. [Saudi Arabia]	
1712					How large the uncertainties surrounding the 1.5 °C impacts comapred to the 2 °C impacts and whether and to what extent all the impacts under 1.5 °C are statistically distinguishable from those under 2 °C warming. A general statement summarizing these uncertainty aspects will be very informative to policy makers. [Saudi Arabia]	
1714					Policy making is made in most cases by assessing the benefits and costs at the margin, i.e. looking at the incremental benefits and incremental costs in whatever form they are available. The report in general and the SPM in particular strives in great detail to assess the benefits/avoided impacts of 1.5 °C comapred to 2 °C (section B). In contrast assessment of mitigation costs in terms of GDP/welfare and distributional implications of these costs is largely absent from both the report and the SPM other than the mentioning of the marginal abatement costs. Provided that economic resources are scarce, policy makers would like to have some understanding of how much the resource costs to limit warming to 1.5 °C, how these costs compare to limiting warming to 2 °C, and who pay and how much. The SPM and the report seems to ignore the mitigation cost side and focus only on the impacts and that failure limits its usefulness for decison making. [Saudi Arabia]	
1788			22		General comment: Language is very technical/scentific [Denmark]	
1790					A high level statement from the report should be developed and inserted after the introduction (as in SOD). The following key points are found particularly policy relevant and should be reflected in the high level statement: Since the end of the 18th century average global warming has been approximately 1oC (A1); if current GHG emission rates continue 1,50oC warming will be reached by 2040 (A2, A2.1, A2.2), current global reduction commitments are not sufficient to limit warming to 1,5oC and track towards a 3-4oC warming (technical report 1.1.3 and D1); holding warming below 1,5oC requires net-zero CO2 emissions by midcentury, reduction of non-CO2 greenhouse gasses and carbon-dioxide removal from the atmosphere (A2.3, C1, C2); the sooner net-zero emissions are reached the less is the risk of surpassing 1,5oC in this century and the less is the quantity of needed carbon dioxide removal from the atmosphere (C2,figure page 16 lower panel comparing different pathways); Negative impact from 1,5oC warming are larger than today, but less than those of a 2oC world (section B synthesis); Impacts on health, livelihoods, food and waqter supply, human security, infrastructure and the underlying potential for economic growth will increase with 1,5oC warming compared to today, and even more with 2oC warming (B5); the frequency and magnitude of extreme weather events will increase and will be much larger at 2oC than at 1,5oC (B1); impacts on natural ecosystems and biodiversity are much lower at 1,5oC than at 2oC but temporary overshoot of 1,5oC could have irreversible effects on ecosystems and biodiversity (B2, B3); Adaptation needs will be lower at 1,5oC compared to 2oC (B5); limiting global warming to 1,5oC would require rapid and far reaching systems transition occurring during the coming one to two decades, in energy, land, urban and industrial systems (C3); mitigation consistent with 1,5oC warming pathways is associated with multiple synergies and tradeoffs across a wide range of the UN sustainable development goals (D4), positive synergies are most pronounced for emission pathways with immediate action and rapid emission reductions, trade-offs are most pronounced for pathways with later action and heavy dependence on removal of carbon dioxide from the atmosphere (D4.2, figure page 18 lower panel). [Denmark]	
1816					Given the overlap between graphics in figure 1 (page 7) and figure 3 (page 16) consideration needs to be given to the possibilities to merge firgures, for instance by showing global temperature response to the emission pathways LED, S1, S2 and S5. This would possibly make panel a, c, d and e in figure 1 redundant. [Denmark]	
1818					The structure of the report makes repetition and overlap unavoidable making the storyline difficult to follow. In particular there is overlap between section A and section C. [Denmark]	
1826					Statements are not consistent in terms of describing impacts in a 1.5o and 2.0o C worlds as compared to current conditions. The overarching key message seems to be that impacts in a 1.5o world would be larger than today but not as large as those that would be expected in a 2o world. Where possible consistency should be sought. [Denmark]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3238					We suggest for the authors to consider including an improved version of Figure 2.10, a subset of Figure 2.10 or at least some of the key messages that Figure 2.10 conveys into the SPM; if a separate Figure is not amenable, this could be done as an inset/addition to Figure SPM.3 (part 2); or as part of a newly conceived figure in section D (see also our comment II on Figure SPM.4 p 18). It is of utmost importance that policymakers understand the "NETS-commitment" they make when choosing certain mitigation pathways. Figure 2.10 is helpful in this concern, as it shows both gross and net CO2 emissions, and therefore the total dimension of CDR assumed in 1.5C scenarios. It is our understanding that NETs are also necessary to compensate for residual non-CO2 emissions, however that is at the moment not clear from the figure description, and would have to be amended/pointed out in the caption if the figure is displayed in the SPM. Currently only compensation for residual CO2 emissions are being shown. [Germany]	
3240					We miss a reference to peak&decline and a clear time-reference for peaking emission in the entire SPM. Even though "peaking as soon as possible" is part of the PA, and all available analysis supports the importance of an early peak date, the term is currently absent from the SPM. Is this accidental or on purpose? Peak year can also be derived from Figure SPM.3, where clearly emissions must peak by 2030 or earlier (for the more sustainable pathways). We would suggest to include language either in section C or in section D on this. You may wish to use the following text from Chapter 2: "Transition challenges, overshoot, and CDR requirements can be significantly reduced if global emissions peak before 2030 and fall below levels in line with current NDCs by 2030". (2-49) "It is unclear whether following NDCs until 2030 would still allow global mean temperature to return to 1.5°C by 2100 after a temporary overshoot, due to the uncertainty associated with the Earth system response to net negative emissions after a peak (Section 2.2)." (p.2-48) ; [Germany]	
3242					The SPM has a strong focus on mitigation of CO2 and the remaining carbon dioxide budget. Please add some more context and explanation why CO2 is so vital for 1.5C mitigation pathways and the relative role of SLCF, aerosols and NOx early on, e.g. in section A and in context of Figure SPM.1. It should be pointed out that despite increasing uncertainty for absolute numbers of the remaining carbon dioxide budget for lower T targets such as 1.5C and 2C (se also our comment on C1.2 and C1.3 (p 13 ln 31 and ln 40), the underlying relationship between cumulative carbon dioxide and T is robust, similar to what is currently expressed in footnote 6. It would also be helpful to repeat that a) cumulative carbon dioxide emission are what determines the long-term temperature commitment, b) non_CO2 forcing is already reduced to the maximum extent in most 2°C pathways and therefore similar in 1.5C pathways (see Chapter 2 ES) in section C to enable the reader to understand the strong focus on residual CO2 emissions. It is important to note that the Paris Agreement goal is to achieve a balance of GHG sinks and sources (not only Carbon Dioxide Neutrality), and we suggest to carefully revise the language of the SPM to avoid any impression of bias or one-sided interpretation here. [Germany]	
3244					We are very concerned that the analysis of the sustainable development implications of mitigation pathways in line with 1.5°/2°C provided mainly in section D/figure SPM.4 does not adequately account for the sustainable development benefits of lower levels of climate change, lesser and fewer risks, lower adaptation challenges and avoided impacts at 1.5° C compared to 2°C or a baseline case of substantially higher warming. Also, the risk entailed by relying on large-scale carbon dioxide removal technologies, i.e. implications of choosing pathways that emphasize near-term ambitious emission reduction should be highlighted more. As stated in our comments on the Second Order Draft of the whole report, we do understand the limitations of the literature here, and commend the authors and the scientific community for their efforts to enhance our understanding of the SD implications of different mitigation pathways. However we call upon the SPM drafting team to find ways to highlight this caveat and frame their findings in a way that precludes isolating perceived sustainable development risk and trade-offs of 1.5/2C pathways and options from both co-benefits of mitigation and the benefits of reduced climate risk (and the risk of BAU-scenarios). This applies first and foremost to the suggested graphics (e.g. current SPM.4) but also to some parts of the SPM, e.g. statement on abatements costs (D.2.1) or development risks (D.4.3, D.4.4). In this context, we would find it useful to consider a different graphical representation in section D (see our "alternative figure" to p.18 - Figure SPM.4) [Germany]	
3246					All figures in the SPM currently contain substantial additional text, such as a headline and a subsection to that headline, while some in addition feature substantial explaining text on different panels. We find that both confusing and redundant with what is supposed to be explained in the caption, noting also that captions should be improved for all figures. We would encourage the authors to reconsider the use of subheader paragraphs, and limit additional text on the figure panels to a minimum. Currently, the headline plus subheading paragraphs could easily be perceived as a additional headline statement, raising questions about the "status" of that text - and whether it would need a confidence qualifier. See also our comments on individual figures. [Germany]	
3248					Please check throughout the report if the expression "global warming" is used consistently with the definition in the same SPM-box, where "global warming" refers to periods of 30 years. Otherwise, replace "global warming" by "global temperature increase". [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3250					Some of the references provided at the end of the SPM sections are not relevant for the statements they should support. It is however crucial for the integrity of the IPCC and the credibility of its reports that the information provided in the SPM can be traced back to the assessment of the underlying chapters. Please check carefully if the references provided are relevant and pointing to the right part of the text. [Germany]	
3252					Reference to milestone years such as 2030 or 2050 is very useful for policymakers, cf. C1, C1.4, C3.2, C3.5, Figure SPM.3, D1., D1.2. However please make clear in the SPM language that reaching a certain goal by 2030 or 2050 needs strong and relentless action starting now. You could use formulations such as "starting now and over the next 12 years up to 2030" or "from now on ... in order to reach neutrality by 2050" [Germany]	
3254					We strongly encourage authors to include a comparison between current NDCs and cost-effective 1.5 and 2°C pathways. It would be extremely helpful if authors could provide guidance on the upscaling that would be necessary in the short term in order to match the NDCs with cost-effective 1.5 and 2°C pathways, drawing on material from Cross Chapter Box 4.1, and also include information on short-term policies that may help to bridge the gap between current NDCs and 1.5°C pathways to the extent that the 1.5°C target remains within reach without assuming disruptive policies post-2030. It may be useful for some of the information to framed conditional on the availability of large scale NETs. [Germany]	
3256					We would still very much prefer if the authors could include and highlight robust information about common features of 1.5°C-pathways with some more detail. Apart from the 2040-2060 timeframe for net-zero carbon, is there anything else that could be said about key indicators, such as e.g. phase out of unabated coal use, peak years, when are net-zero GHG emissions reached. We understand that - despite the large range of scenarios going into the assessment - some of these key indicators show very narrow windows, e.g. the timing of net-zero emissions close to 2050, which is a defining feature of 1.5C compared to 2C pathways. We encourage the authors to identify and report such additional robust indicators that can be helpful in guiding decisions makers. Ch 2 provides ranges for such values, e.g. in 2.3.5 and table 2.5, and could explore further. It would also be helpful to differentiate between high OS and low OS pathways [Germany]	
3258					Halting deforestation is currently only implicitly included in the SPM (grouped with AFOLU, but never spelled out explicitly, apart from a subcategory in Figure SPM.4). While we support the notion on protecting natural ecosystems (C.2.4) and integrated land management (C.3.3), we would strongly suggest to address deforestation and protecting and enhancing natural carbon sinks explicitly. This provides a stronger link to relevant aspects of the Paris Agreement and impacts the effectiveness of CDR measures in general and should be mentioned. [Germany]	
3260					The definition of GMST on page 3, line 26-28 is not applied consistently in this report. The acronym is only used in section A, and many sections and figures use average instead of mean which adds confusion to the readers. Please harmonize throughout the SPM. [Germany]	
3262					We complement the writing team on a greatly improved SPM draft. However we still encourage the authors to improve the readability of the SPM for a broader audience by using less technical terms, avoiding acronyms, shortening sentences. This is particularly important for the headline statements. Please see also our suggestions on specific text below. [Germany]	
3264					The full report clearly shows that many mitigation pathways for both 1.5C and 2C rely on the assumption that CDR technologies will be available at large scale in the second part of the century or earlier. Raising near-term ambition (such as the NDCs) and rates of decarbonisation would not only correspond to the efforts to limit warming to 1.5C laid out in the Paris agreement but also function as a hedging strategy against both climate risk and the risk of large scale CO2 removal not being feasible and/or climatologically not effective, given that pathways to 1.5C have similar characteristics to pathways to 2C with limited or no CDR. The authors may wish to consider this in their framing or conclusions of sections C or D. [Germany]	

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3266					As said during the SOD (SPM-FOD) review, we were hoping for the SPM to include concrete measure and suggestions concerning short-term entry points for ambitious climate policy that would help to get closer to a 1.5C - compatible emissions trajectory and avoid the challenges of extremely rapid decarbonisation rates towards 2050 and the additional risk of large scale CDR. In particular, we feel that the issue of carbon pricing is underrepresented if not misrepresented in the SPM. CH2 ES is very clear about high carbon prices being necessary in modelling experiments to trigger the necessary transition. 2.5.2.1 clearly states that carbon pricing is an important element of any policy mix. ES Ch4 reads: "Evidence and theory suggest that carbon pricing alone, in the absence of sufficient transfers to compensate their unintended distributional cross-sector, cross-nation effects, cannot reach the levels needed to trigger system transitions (robust evidence, medium agreement). But, embedded in consistent policy-packages, they can help mobilise incremental resources and provide flexible mechanisms that help reduce the social and economic costs of the triggering phase of the transition (robust evidence, medium agreement)." While we share the authors' conclusion that carbon pricing is not a stand-alone measure and needs to be complemented by other measures and policies, we find that the current cursory treatment in the SPM is not representative of the scientific literature on the topic. We would strongly encourage the authors to include a more substantial statement on pricing policies that reflects the notion of chapter 4 that carbon pricing may not be a sufficient but in many cases still is a necessary condition for change across the economy, along with fiscal reform that addresses subsidies to fossil fuels, GHG-intensive modes of transport, etc. [Germany]	
3268					The information on the different consequences of global warming of 1.5 °C in comparison to 2°C, in particular in Section B, is highly appreciated. However, in many instances the SPM only addresses relative implications, but does not provide quantitative information on the absolute values, e.g. in the paragraphs under B.3. Therefore many statements remain vague and sometimes seem even trivial. We strongly urge authors to add more important specific information whenever available in the underlying report. [Germany]	
3270					The SPM provides different ranges (percentiles of 5-95%, 10-90%, 25-75%, 33-67%) and different likelihoods according to footnote 2. In addition, sometimes ranges and likelihoods seem to be used together when a range is associated with a certain likelihood, e.g. when a "likely range" is mentioned without specifying numbers, see for example our comment on SPM-5-32. The mixture of ranges, percentiles and likelihoods will be very confusing for the audience of the SPM, please improve. [Germany]	
3272					We appreciate the discussion provided on financial aspects of a transition in line with 1.5C warming. In the light of Article 2.1c of the Paris Agreement, we would encourage the authors to further strengthen those aspects in the SPM that refer to shifting investment flows to be consistent with 1.5C pathways, as captured in chapter 4-8 "The rapid and far-reaching response required to keep warming below 1.5°C and enhance the adaptive capacity to climate risks needs large investments in low-emission infrastructure and buildings that are currently underinvested, along with a redirection of financial flows towards low-emission investments (robust evidence, high agreement)." [Germany]	
3274					In the current draft, paragraphs on adaptation can be found in section A, B and D. It will therefore be difficult for the readers to get the full picture on adaption. In addition, when reading the section titles, one would expect to find adaptation be addressed under section D. In order to enhance readability of the SPM, we suggest to move the paragraphs B6 and its relevant subparagraphs and to join them with the relevant paragraphs in section D "global response", e.g. D3 and its subparagraphs, or at least improve consistency and reduce redundancies. This also could save some lines of text. [Germany]	
3276					A large share of the most robust assessment in the current SPM draft relies on analysis from integrated assessment models (IAMs). Chapter 1, 2 and CC box 2.1 offer some background on the strength and weaknesses of this particular tool. In the light of their current weight within the SPM, it may be appropriate to reflected some of the key challenges and main advantages of IAMs in either section A (background) or section C of the SPM. Issues we would think of include the ability of IAM to represent technological change, the (lack of) differentiation between proven and unproven technologies, the (lack of) integration of climate change impacts on the economy, the role of carbon pricing and the instant diffusion of policies. This would be very helpful for policymakers to better understand the unique contributions of IAMs to the debate as well as their limitations, and might strengthen the debate around transformation pathways and ensure a more informed interpretation of results. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3278					We thank the writing team for the provision of headline statements in response to request by the Panel in Decision IPCC/XLIV-4. However, the SPM could greatly profit from another thorough revision of those headline statements. In our view, the current version doesn't always highlight the findings most relevant to policymakers. This is particularly true for sections C and D, where we miss clear language highlighting the urgency of short term action, and the challenges in reaching 1.5C, as well as a clear reference to the conditionality on (large scale) carbon dioxide removal for most 1.5C pathways and the imperative of international collaboration and non-climate policy environments being geared towards sustainability. We would also recommend to lift one of the main findings of Section B, that new knowledge and analysis since AR5 has found higher levels of risk at global warming levels well below 2C, to the level of headline statement. This finding is currently mainly conveyed through the update of the reasons for concern figure, but should be stated in plain text. Relevant information can mostly be found in the underlying paragraphs, but selection has missed some of the points most relevant to policymakers. We would also very much appreciate if the key role of sustainable land management and the AFOLU sector for mitigation, adaptation and sustainable development could be included. [Germany]	
3280					We find the concept of climate-resilient development pathways useful and support its central position in this report. Highlighting the interaction and mutual interdependency between the global response to climate change and sustainable development is vital, as pointed out by the amendment of the title of the SR1.5. However, in its current presentation, it is sometimes not clear whether it should be considered a key finding of the report that CRDP exist that lead to 1.5C, or whether such CRDPs are more of a conceptual framework that provides guidance when designing truly sustainable pathways to 1.5C. We would strongly encourage the authors to refine their messaging here, in order to avoid tautologies (between section A and D in particular). We feel that CRDP could be a useful tool to strengthen the message that pathways do exist that can yield multiple SD benefits and hold the world on a 1.5C trajectory, and that many policies supporting sustainable development, i.e. those leading to more sustainable and equitable societies, are enabling factors for limiting warming to 1.5C. See also our comments on Figure SPM.4 and suggestion for alternative Figure (comments on p 18), SPM 0 on archetype pathways, and on re-organizing D along the CRDPs (p 19 ln 10 comment on whole section D). [Germany]	
3282					We strongly support the introduction of the archetype pathways that help differentiate between different mitigation pathways, their associated risks, trade-offs and potential co-benefits. We would like to encourage the authors to emphasize the interactions between the different archetypes and the SDGs even more, and make more clear how these archetypes relate to the concept of climate resilient development pathways (CRDP). The assessment concerning the relationship between the archetype pathways and the SDGs is currently mainly anchored in Figures SPM.3 and SPM.4 and could be anchored better in the text of Section C and foremost section D. cf. our comment on p 19 ln 10 section D. [Germany]	
3284					Current conclusions on mitigation options and pathways show a strong focus on decarbonisation and reaching net-zero CO2 emissions. While we understand and support that due to CO2 cumulating in the atmosphere, its role is vital in any transition, we would strongly encourage the authors to expand the current treatment of non-GHG-mitigation options and measures in order to provide a more balanced and comprehensive analysis, drawing e.g. from CH4 ES p 4-7, para 3 or Ch2 ES 2-5, last para). See our comment on p13 ln 14 for details. [Germany]	
3286					We would encourage the authors to highlight the central role of sustainable and integrated land management and the AFOLU sector for the integration of mitigation, adaptation and the SDGs/in climate resilient development pathways beyond its current treatment in the report. Specifically, an additional headline statement in section C or D would be much appreciated. See our comment on p19 ln 10 for details. [Germany]	
3288					We want to express our sincere gratitude to the SPM drafting team and all authors that have contributed to the underlying report for their hard work on this Special Report, and for producing this greatly improved FGD-draft of the Summary for Policymakers. We have utmost respect for the massive undertaking to produce a special report on this very comprehensive topic in such a short time, and with such an outstanding result. We are pleased to note that many of our comments have been considered, and the SPM is a lot more concise, clear and accessible to the reader than the last version we saw. Please accept our review comments as a constructive effort to further improve an already very good product, and be assured of our unwavering support for the scientific community and the integrity of the IPCC. [Germany]	
3290					The SPM mentions in several places "peak warming" or "peak temperature". However, there is no definition of "peak warming" nor of "peak temperature" in the SR1.5. For which time interval would this peak apply, e.g. to an average over 30 years according to the definition of global warming (which does not seem reasonable) or to the single year with the highest temperature (which is difficult to identify due to natural variability)? Please add this highly policy relevant information to the SPM. [Germany]	

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3292					This report updates the information from AR5 and previous Special Reports, and the findings presented here will in turn be updated by new science available for the upcoming Special Reports and the AR6. The continuity and comparability of the information provided by the IPCC in these subsequent assessment reports is key for policy makers. We therefore urge the author team to use consistent reference levels and reference periods, times horizons, regions and ranges etc. across the reports and in the SR1.5. [Germany]	
3294					The definitions of global mean surface temperature change and 1.5°C global warming provided in Box SPM 1 of the FGD are extremely helpful for readers, in particular politicians. However, it still remains unclear how the temperature levels, “global warming” and “warmer worlds” have been dealt with across topics, i.e. in impact and mitigation studies and climate resilient development pathways, given the pathway and timing conditionality (transient, equilibrium, overshoot, peak, 2100) of the findings, and across regions. In order to provide transparency on the findings of the SR1.5, and we strongly urge to add this information to the SPM. Please provide also information on the implications of the changed reference periods compared to AR5 including a reference to the effect of including the relatively cooler climate of the last two decades would be useful, at least in a footnote (1.2.1.2, see also our comments on the carbon dioxide budget estimate on p 13 ln 31–– 44 "General". [Germany]	
3296					Chapter 1 discusses the consequences of the reference period used in this report for the findings provided compared to those of the AR5. Chapter 2 discusses the discrepancy in the temperature responses to emissions between the CMIP5 models and observational data products. These discussions are not lifted to the SPM-level but still contained in many of the central findings. We therefore encourage the authors to provide information on these important issues in Section A. [Germany]	
3926					In this report it seems that carbon neutrality is used only for CO2-emissions and removals (same as net-zero CO2) while in other studies carbon neutrality also includes other GHGs with carbon, eg. methane (CH4), and sometimes it also includes all green-house gases. We feel that this may confuse the reader since the report then refers to net-zero in a different way than the Paris Agreement, where the emission target (Art. 4) refer to all green house gases: "balance between anthropogenic emission by sources and removal by sinks of green-house gases in the second half of this century". Hence it will be important that the SPM explains why the authors have chosen a different concept, and what this means for at what time the balance is achieved, e.g. net zero GHG may be reached later than net-zero CO2. It would therefore be beneficial that when the SPM describe the timing of net - zero CO2, that it also explains at what time net-zero GHG are achieved. [Norway]	
4168					The SPM currently lacks a good coverage of the interactions between climate change impacts at 1.5dC and higher and the SDGs. The interactions between mitigation for 1.5 and the SDGs have been made clear, but it is important to also show how limiting temperature rise to 1.5 could affect the SDGs (both in terms of the impacts that will occur at 1.5dC and the impacts that would be avoided by limiting warming to 1.5dC). There is copious information in chapter 3 on climate change impacts that can be connected to the SDGs, and an analysis of this was started in chapter 5 (table 5.1), but much these interactions should be made much clearer in the SPM. For SIDS climate change impacts will have a much greater impact on the SDGs than mitigation, so this is an important that this is shown in the SPM. [Saint Kitts and Nevis]	
4210					The Chinese government appreciates the efforts of the Working Groups of the Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report (AR6) cycle on the preparation of the Special Report on Global Warming of 1.5? (SR1.5). The national government, which attaches great importance to the report, has brought together relevant authorities and experts to carefully review its Summary for Policy Makers (SPM). The comments arising therefrom are given as follows: 1. On the balanced representation of the SPM. As found in the underlying report for SR1.5, there are many practical difficulties and challenges in limiting warming to 1.5? above pre-industrial levels, to which the current SPM fails to pay enough attention, lacking a description of barriers, costs and prices associated with 1.5?-consistent emission reduction pathways. In order to provide policymakers with more balanced and comprehensive information, the SPM should review the findings of the underlying report in an objective and balanced manner by supplementing the information on risks that can be reduced from and additional efforts that must be made for limiting warming to 1.5? relative to 2?. In addition, the climate change risks and socio-economic constraints faced by developed and developing countries at 1.5? are different. So the SPM should clearly indicate that 1.5? relative to 2? is more restrictive to the economic growth of developing countries, due to which more funding and technical support should go to the latter at the international level. 2. On the representation of the confidence on the core findings. The current SPM is inconsistent with the underlying report in representing the confidence on and uncertainty with some of the findings. So it is suggested to check them carefully. At the same time, there are some findings in the underlying report that are supported with limited literature but are given a high confidence. In order to avoid misleading policymakers, it is suggested to further check the confidence assigned to a finding in the SPM. [China]	

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5422					The SPM currently lacks a good coverage of the interactions between climate change impacts at 1.5dC and higher and the SDGs. The interactions between mitigation for 1.5 and the SDGs have been made clear, but it is important to also show how limiting temperature rise to 1.5 could affect the SDGs (both in terms of the impacts that will occur at 1.5dC and the impacts that would be avoided by limiting warming to 1.5dC). There is copious information in chapter 3 on climate change impacts that can be connected to the SDGs, and an analysis of this was started in chapter 5 (table 5.1), but much these interactions should be made much clearer in the SPM. For SIDS climate change impacts will have a much greater impact on the SDGs than mitigation, so this is an important that this is shown in the SPM. [Saint Lucia]	
5508					Include figures with a better resolution [Mexico]	
5510					Check the format of citations in the text [Mexico]	
5512					The use of parentheses should be reviewed in all the text, some are inconclusive. [Mexico]	
5514					Homogenenize the numbers, for example 1.5 to 2 ° C or 1.5 ° C to 2 ° C [Mexico]	
5516					Change font size of the symbol of ° [Mexico]	
5682					Readablity and clarity could be further enhanced by ensuring lucid comparability in expressions with AR5. This applies for, inter alia, carbon budgets, observed changes, quantification/characterisation of uncertainty. [Sweden]	
5684					It would be valuable in the SPM (especially related to Section C) to be even clearer on the fact that imagined emission pathways are always dependent on underlying assumptions (on i.e. mitigation options available, cost developments, etc). Some more explicit reasoning on this would complement the expressed levels of confidence attached to statements throughout the SPM. Policymakers are sometimes not aware of the degree to which modeller's varying assumptions impact on portfolios of measures deployed and other characteristics of the described scenario pathways (see e.g. C.1.1). [Sweden]	
5686					The overall SPM would appear to be rather long. Shortening would be excellent for enhanced readability. The headline (bold) statements are also in some cases overly long, which reduces their impact. Shortening would be preferred, leaving detail for the following paragraphs. [Sweden]	
5842					The Ggovernment of Belgium would like to express its appreciation for the very large amount of work that went into the preparation of the Special Report on a global warming of 1.5°C. The comments made below are meant to further improve the text the SPM, in order to make it more policy-relevant while fully respecting the scientific assessment made in the underlying report. We would also like to draw your attention to our comment #3, in which we express concerns regarding potential errors or lack of clarity in the text of the underlying chapter which may influence the SPM. [Belgium]	
5844					The SPM should reflect on the limits of BECCS and the tradeoffs between BECCS and sustainable development and in particular food production. Relevant content can be found in the ES of chapter 5, in particular : [ES:] If poorly implemented, CDR options such as bioenergy, BECCS and AFOLU would lead to trade-offs. Appropriate design and implementation requires considering local people ?s needs, biodiversity, and other sustainable development dimensions (very high confidence) Perhaps more importantly, the chapter makes several references to the risks of BECCS, and indicates that it is possible to reduce them by following pathways that require less CDR : [ES:] Low demand pathways, which would reduce or completely avoid the reliance on Bioenergy with Carbon Capture and Storage (BECCS) in 1.5°C pathways, would result in significantly reduced pressure on food security, lower food prices, and fewer people at risk of hunger [page 5-31:] Fundamental transformation of demand, including efficiency and behavioural changes, can help to significantly reduce the reliance on risky technologies, such as BECCS, and thus reduce the risk of potential trade-offs between mitigation and other sustainable development dimensions [Belgium]	

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5846					We found some references to mitigation and abatement costs in the report that our experts consdered as unclear and thus misleading and/or erroneous. Considerations for mitigation costs are very important for policymakers; providing accurate information in the SPM (see in particular our comment on D2.1) requires accurate information in the underlying report. Our concerns are that : - the term "mitigation cost" should not be used without a clear definition which clarifies the context (does it relate to investment or to investment and energy production cost, does it include co-benefits or not...). - marginal mitigation costs can be regarded as equal to carbon prices, but mitigation costs in general cannot be assumed marginal mitigation costs (carbon prices). Total (or mean) mitigations costs and marginal mitigation costs are different concepts, as total mitigation costs encompass a wide range of actions and technologies at different cost, while marginal mitigation costs only reflects the cost of the emission reduction unit which is the most difficult to achieve (hence the most costly). [a common understanding found in textbooks such as Perman, Ma, Common, Madison and Mcgilvray 2017, Natural resource and environmental economics, Pearson, chapter 6.]. In addition, the marginal abatement technologies in very stringent scenarios are generally new technologies which come with considerable gains of learning by doing and/or technology development. Instead of costs, these payments for new technologies can be considered as investments in assets for the future (resulting in future gains in the form of cheaper future energy). This is an important driver behind the fact that marginal abatement costs are 3 to 4 times larger in a 1.5 °C compared to a 2°C scenario, while total abatement costs are less than 2 times larger. For learning-adjusted marginal abatement costs, see Bramouillé Olson 2005 Allocation of Pollution abatement under learning by doing, Journal of Public Economics 89, 1935-1960. The sentences that we do not consider as accurate in this regard are in particular: - The parenthesis in Ch. 2, section 2.5.2.1 (p79) : "Under a cost-effective analysis (CEA) modelling framework, prices for carbon (mitigation costs) reflect the stringency of mitigation requirements at the margin (i.e., cost of mitigating one extra unit of emission)." It would be ok with the addition of the word "marginal" "(marginal mitigation cost"). - The end of this sentence, after the words "and is often used...:"Ch.2 Annex p.12 in 2.A.2.2.: "The emissions price reflects marginal abatement costs and is often used as a proxy of climate policy costs" . Marginal abatement cost is a bad proxy for climate policy cost, which is more related to the mean abatement cost. We regret that the report does not provide more information on mean abatement costs. - The end of the Glossary entry for "Carbon price" : "In many models that are used to assess the economic costs of mitigation, carbon prices are used as a proxy to represent the level of effort in mitigation policies". Same remark as before, because readers might read "effort" as "cost". [Belgium]	
5848					Belgium asked for a short SPM when the outline was approved. We also asked for a technical summary and a very short SPM. Our view is that although this version of the SPM is an improvement over the previous one, it is still too long and key messages are not yet visible enough. In addition, the wording is sometimes too complicated. We encourage the authors to further synthesize the information and to ensure that key messages are easy to read. The present document could then become the technical summary. [Belgium]	
5850					N2O is only mentioned once in the SPM (paragraph C.13), and it is to indicate that emissions are increasing in some scenarios. Unlike methane, N2O is a relatively long-lived greenhouse gas. Some F-gases are also in the same situation. We would thus have the impression that the emissions of all long-lived greenhouse gases need to decline, as stable emissions would mean that concentrations and associated radiative forcing would increase during a few centuries or more. Please clarify this potentially important issue in the SPM. [Belgium]	
6772					The SPM currently lacks a good coverage of the interactions between climate change impacts at 1.5dC and higher and the SDGs. The interactions between mitigation for 1.5 and the SDGs have been made clear, but it is important to also show how limiting temperature rise to 1.5 could affect the SDGs (both in terms of the impacts that will occur at 1.5dC and the impacts that would be avoided by limiting warming to 1.5dC). There is copious information in chapter 3 on climate change impacts that can be connected to the SDGs, and an analysis of this was started in chapter 5 (table 5.1), but much these interactions should be made much clearer in the SPM. For SIDS climate change impacts will have a much greater impact on the SDGs than mitigation, so this is an important that this is shown in the SPM. [Marshall Islands]	
8664					The SPM currently lacks a good coverage of the interactions between climate change impacts at 1.5dC and higher and the SDGs. The interactions between mitigation for 1.5 and the SDGs have been made clear, but it is important to also show how limiting temperature rise to 1.5 could affect the SDGs (both in terms of the impacts that will occur at 1.5dC and the impacts that would be avoided by limiting warming to 1.5dC). There is copious information in chapter 3 on climate change impacts that can be connected to the SDGs, and an analysis of this was started in chapter 5 (table 5.1), but much these interactions should be made much clearer in the SPM. For SIDS climate change impacts will have a much greater impact on the SDGs than mitigation, so this is an important that this is shown in the SPM. [Grenada]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8760					In general, we feel that the SPM have improved a lot since the first draft both the text and the graphics. However, we feel that it would be useful if issues related to the third of the three questions in the Talanoa dialogue, "how do we get there" (Paris Agreement) could be addressed a bit more in the SPM specially in relation to mitigation. In addition, we feel that the report illustrates the need for rapid and additional emission reductions and this could be addressed more clearly in the SPM. [Norway]	
9180					The SPM currently lacks a good coverage of the interactions between climate change impacts at 1.5dC and higher and the SDGs. The interactions between mitigation for 1.5 and the SDGs have been made clear, but it is important to also show how limiting temperature rise to 1.5 could affect the SDGs (both in terms of the impacts that will occur at 1.5dC and the impacts that would be avoided by limiting warming to 1.5dC). There is copious information in chapter 3 on climate change impacts that can be connected to the SDGs, and an analysis of this was started in chapter 5 (table 5.1), but much these interactions should be made much clearer in the SPM. For SIDS climate change impacts will have a much greater impact on the SDGs than mitigation, so this is an important that this is shown in the SPM. [Nauru]	
9232					Overall great work, undertaken under considerable time pressure. Pertinent results, with key information for policy action in section C, but also the efforts for section B are applaudable given the limited literature available (on 1.5°C impacts). [Switzerland]	
9234					For the target audience concepts such as CDR, BECCS and CCS may not be sufficiently clear. Althogh these concepts are explaned in the Glossary, all who read the SPM do not read also the Glossary. The same may also apply to terms like Global aggregate impacts or large scale singular events (RFC4 and 5). [Switzerland]	
9236					The current headlines statements are sufficient and there is no need to have separated additional headlines statements. [Switzerland]	
9238					The figures are important but need additional work. [Switzerland]	
9240					Regional aspects are unfortunately not much mentionned in the SPM. At that stage it may prove difficult to change this situation. [Switzerland]	
9372					The IPCC decision on the outline of the SR1.5 was for an SPM of up to 10 pages in length, including headline statements, tables and figures. The current draft SPM is significantly longer than this and and we strongly encourage the authors to shorten the SPM. We have made recommendations in our detailed comments to suggest where this might be done, noting that in some sections there is information presented that is repeated elsewhere in the SPM. A general recommendation is also to limit the number of sub-bullets per headline statement. [Canada]	
9374					Throughout the SPM as a whole, the terms "ethics", "equity" and "inequalities" are used somewhat interchangeably. Recommend clarifying how the terms are defined in the report, and then adjusting language in the SPM to ensure clarity and consistency. [Canada]	
9376					The SPM would benefit from including content on sex and gender considerations. There are many opportunities for discussion on gender roles, gender equity and equality in sections on vulnerable populations, adaptation and mitigation. Currently, "gender" is referred to only once in the entire SPM document. [Canada]	
9378					Overall, the SPM is text heavy and technical. As the target audience for the SPM is policy makers, having the key messages (headline statements) written in as plain language as possible, would be helpful. [Canada]	
9598					Congratulation to the writing team for producing the SR and its SPM. The invitation from the UNFCCC was to prepare a SR on the impacts of global warming of 1.5°C but the report provides mostly a comparison between the impacts at 1.5°C and 2°C.Therefore we suggest to modify the title of the SR by adding compared to 2°C. The SPM needs some more illustrations such as maps. Summarizing tables should be favoured instead of texts.Unfortunatly this reports shows the keys findings most relevant for developping countries are still at medium or low confidence.Therefore decision making for these countries is not easy [Madagascar]	
714					General comment : We congratulate the IPCC and the SR1.5 authors for this new version of the SPM which is a real improvement in terms of clarity and presentation compared to the last version. [France]	
716					General comment : messages of the SPM : Our overall impression on the SPM is positive : it underlines the benefits of limiting warming at 1.5°C compared to 2°C and it shows the scale of transformations needed. Important cross-cutting matters are mentioned: indigenous knowledge, just transition and the synergies with SDGs, the analysis of which is particularly interesting. However, some messages seem less clear and direct than in the previous version, especially those highlighting the need for a strong and urgent action to limit global warming. We think that the SPM should strengthen the global message by reporting some additional main findings of the chapters, without extending the report that much. Our specific comments suggest some modifications relevant for this purpose. We note that there are no explicit mention of the costs of the avoided impacts between 1.5 and 2°C. It is a very important point since it justifies making additional efforts to combat GHG emissions and to accelerate the low-carbon transition of the societies. [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
718					General comment : carbon budget : We have appreciated the clarification of the statements on the remaining carbon budget. However, the difference with AR5, though explained, and the large uncertainties might be disturbing for policy-makers. Therefore, we suggest to emphasize the most important message, which is that the new numbers represent very few years of emissions at current level and that deep and rapid decarbonization is the only way to avoid both +1.5 and +2°C. [France]	
720					General comment : structure and figures : The general structure of the SPM is clear and coherent with the report. It is relevant to have one figure for each section, although they are still quite difficult to understand for non-expert without spending time on it, especially the Figure 4. [France]	
722					General comment : CDR : We find the paragraph on the CDR very interesting, especially concerning the BECCS and the nature-based CDR methods. However, this paragraph doesn't insist that much on the multiple feasibility constraints of the CDR methods, compared with the 3.5 of the previous version of the SPM. We think that the few sentences mentioning the difficulties faced by the CDR methods should be strengthened and that the C2 paragraph should insist much more on the large amount of CDR necessary to limit the global warming to 1.5°C. Our specific comments suggest some modifications relevant for this purpose. [France]	
724					General comment : soils : The SPM and the chapters don't reflect the importance of soils in climate change. Soils are fundamental to life on Earth. They are central to sustainable development and the future we want (see "FAO and ITPS. 2015. Status of the World's Soil Resources (SWSR) - Main Report" or IPBES March Report on Land Degradation and Restoration). The SR1.5 insists several times on the ability of soils to store carbon {3.4.3.4, 3.5.5.3}, but it doesn't mention that much the impact of climate change on their degradation (organic matter loss, biodiversity loss, salinisation, desertification...) and the way soils will evolve with climate change (repartition of different kinds of soil, fertility, aptitude to regulate water flows...) (see {3.4.3.6} : the desertification is mentioned very quickly). We recommand to put some emphasis on these elements, though we are aware that it will be further developed in the next SRCCL. We added some comments to the SPM to insist on the content of the report related to soils. [France]	
726					General comment : agro-ecology : We propose to take into account agro-ecology, among others, as an example of agriculture practices with benefits on mitigation, adaptation, biodiversity, water quality, etc. [France]	
728					General comment : gender issues, behaviour : Some important subjects of the chapters are absents of the SPM, like gender issues. Some others are present but should be highlighted far more, like behaviour changes. We suggest some addings considering these lacks in our specific comments. [France]	
730					General comment : impacts at 2°C : We note that impacts of climate change of 1.5°C are often described in comparison to impacts of 2°C. Most policy-makers will not have in mind what are exactly the impacts of a 2°C warming (in terms of precipitation, droughts, floods, cyclones etc.) so the comparison might not be helpful enough for them. Improvements have been made in that direction since the previous version of the SPM, but the SPM would be more relevant by adding some information on the consequence of a 2°C global warming. [France]	
732					General comment : non-CO2 drivers : The role of « non-CO2 drivers » is better described than in the previous version of the SPM, but some additional explanations could help to understand their importance better. [France]	
4450					The length of the report vastly exceeds the proposed length mentioned in the outline of the SR1.5 as annexed to the Decision IPCC/XLIV-4, in which the total number of pages is stipulated as up to 225. Although it is greatly appreciated that the number of pages for the Summary for Policy Makers (SPM) (originally stipulated as up to 10 pages, including headline statements, tables, figures) is now edited to a more legible and reviewable volume (from 31 pages in the First Order Draft to 22 pages in the Final Government Draft), the current volume of the final draft of the entire report (1,140 pages) tends to place a heavy burden on the policy makers, in the endeavor to fully understand the SPM and submit the best quality of government review comment within the allocated review period. Thus, Japan would appreciate further consideration to the adherence to the length of the report as per the consensus reached in the upcoming SRs. [Japan]	
4650					GENERAL COMMENT - We would to thank the authors for their continued hard work in preparing the SPM and underlying chapters. The SPM is a significant improvement on the previous iteration, and the figures look much better. We have some general and then specific comments below which will hopefully help further improve the SPM and make it impactful and helpful to policy makers. [United Kingdom (of Great Britain and Northern Ireland)]	
4652					GENERAL COMMENT - there is currently a lack of clarity regarding the adequacy of existing effort. The text of the SPM could be strengthened to make clear exactly what the ambition gap currently is, what temperature the NDCs place us on a pathway towards and what the implications of delayed/weak near term action are. Broadly speaking the SOD was stronger on this issue and it feels like the text has become somewhat weaker in this draft and ultimately does not help to sufficiently inform efforts to understand what strengthening the global response looks like. [United Kingdom (of Great Britain and Northern Ireland)]	
4654					GENERAL COMMENT - the discussion on feasibility is very cursory in the SPM. There is a bland reference to the dimensions of feasibility but very little other critical assessment of the options and pathways to 1.5 is presented. This is particularly concerning with regards to BECCS where, for example, the ranges presented seem to contradict the upper limits of feasibility laid out in the underlying chapter. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5034					Structure. Contrary to the full report, the sequence of Sections B and C of the SPM corresponds to request from the UNFCCC's Conference of the Parties that asked for a special report on the impacts .. and related global greenhouse gas emission pathways; there is a good reason: why the negotiators followed that order. The consideration of those impacts is also important for the SDGs, however, this aspect is only mentioned on page 12 (Fig. SPM 2): Ability to achieve Sustainable Development Goals (SDGs) .., whilst such interrelations are extensively mentioned in Section C for mitigation. Therefore, at least some text on the impacts-SDGs link would be essential in Section B (see e.g.: Chapter 3, Cross-Chapter Box 6: Food Security, 2nd paragraph)) [Hungary]	
5036					Authors. It is very unfortunate that there are no authors from Central-Eastern-Europe (RA-VI or EEG in UN terms) likewise the Chapters of the SR1.5. Practically it contradicts to the rules of the IPCC and it is unclear, if there was a problem with identification, invitation of the authors or there are not enough active experts in this field in that large region [Hungary]	
5038					According to the SPM, the observed average global surface temperature rise between 2006 and 2015 was 0.87°C (±0.12°C). In Hungary - based on the data of the Hungarian Meteorological Service - the average temperature rise has been 1,3°C for the same period since 1901. Referring to that, in our opinion, a more detailed clarification of the feasibility of the 1,5°C-consistent pathways would be necessary, particularly because the NDCs aren't enough to limit global warming to 2°C. [Hungary]	
6136					We thank all authors and TSU for the significantly improved SPM. There is still some repetition in the SPM that can be removed and the SPM shortened. [Estonia]	
6138					It is not clear how do the main Bold messages (e.g. X1) relate to the follow-up messages (e.g. X 1.1). We think they should be the most important messages/summaries of the following sub-messages (they occasionally fulfil this criteria, but in most cases not) and should present a full and comprehensive narrative if read on their own (i.e. A1, A2,..) [Estonia]	
6144					There is very little on adaptation (except in section D in relation to SDGs) in the SMP and on the costs and feasibility of adapting to a 2C warmer world and in comparison with adapting to a 1,5C warmer world [Estonia]	
6170					Please add an indication of the current emision levels (cumulative abd annual) and concentrations to the SPM. How much greenhouse gases did we emit since preindustrial times and since 1990? What is the current level of sealevel rise and how much would it be in 2100 for a 2C warmer world? How much emission reductions have been achieved to date? [Estonia]	
8844					Suggest greater emphasis on the science that demonstrates the importance of sustainable land management in mitigating and adapting to climate change would benefit policy makers. The SPM could include reference to the potential benefits of counterbalancing the expected loss of prodctive land with the recovery of degraded areas (Land Degradation Neutrality) in delivering both mitigation and adaptation outcomes, as well as benefits to the SDGs. [Australia]	
2182		1		1	General Comment: ordering Consider re-ordering the headline statements and some sections of the report in order to tell a more logical and sequential story. In the current version, findings on particular themes are scattered throughout the report, with some repetition: especially in the areas of adaptation, sustainable development and economics (see also more specific comments later on). [European Union (EU)]	
8644		1			General comment - comparision of the 1.5 and 2 degree pathways, including the importance of non-CO2 emission reduction, are well elaborated in Chapter 2 of the Report but are largely absent in SPM. A simplified version of Table 2.4 could be added to the SPM to address this [Ireland]	
2184		2		2	General Comment: budgets and pathways need better explanation The budgets (discussed in section A) assume no net negative emissions and show pathways that are clearly stylised (straight-line CO2 reductions to zero accompanied by stylised non-CO2 paths whose basis is not clear). Meanwhile most of the pathways (in section C) assume substantial quantities of negative emissions. At no point is the relationship between these two explained clearly in the SPM. In addition, the SPM mentions that budgets estimated in this report are larger than those of AR5. The SPM provides no explanation for this (and the explanation in Ch2 is difficult to follow). Recommendation Simple, technical explanation of the above points is essential, but may be too complex for the SPM. Add an FAQ that explains them (in Ch2 if possible, or in some other annex document). Then refer to this explanation in the SPM. [European Union (EU)]	
8646		2			General Comment - Greater coherence between impacts and adaptation options, rather than splitting adaptation into sections B6 and D3-D6 would improve consolidated handling of adaptation and would benefit from greater cross-referencing throughout SPM [Ireland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2186		3		3	General Comment: comparison of 1.5°C & 2°C, including importance of non-CO2 and additional CDR Quantified information on the difference between 1.5°C & 2°C pathways, including the importance of reductions in non-CO2 emissions (including AFOLU measures) is fairly well explained in Ch2 but is largely absent from the SPM. Recommendation - the simplest way to restore such information without re-writing the text would be to insert a simplified version of Table 2.4 into the SPM. [European Union (EU)]	
2188		4		4	General Comment: sustainable development and social sciences Many of the report's statements on social sciences (esp sustainable development) are generalisations, not particularly linked to scientific findings. As a result, interpretations of the report are sensitive to factors such as the choice of adjective and the placement and ordering of statements regarding costs, benefits, synergies and trade-offs. For example, the report emphasises the costs and barriers to 1.5°C action in several places. In other places the report stresses that pathways with substantial behaviour change and demand reduction are most consistent with sustainable development, glossing over the fact that these scenarios will also be the most challenging in terms of requiring the most ambitious, immediate, global action - and therefore the greatest effort to overcome some of barriers the SPM alludes to. Recommendation Check the overall consistency of messaging related to sustainable development. Try to minimise the use of purely generic statements. [European Union (EU)]	
2190		5		5	General Comment: adaptation should be dealt with in a more consolidated manner The SPM deals with adaptation sections B6 and D3-6. There does not appear to be a clear rationale for splitting the issue in this way. Recommendation: ensure greater coherence between discussion of impacts and adaptation options. Considering clustering relevant insights, or at least ensure clear cross references (e.g. Section B could mention that adaptation is discussed further in Section D). [European Union (EU)]	
2192		6		6	General Comment: costs and economics The report sends seemingly contradictory messages on the cost and economic implications of climate change/ climate action. This is not helped by the fact that statements related to this are scattered across the report. Recommendations Check the overall consistency of the following statements, ideally by placing them together: B5.5, D2.1, D4.2, D4.3, D5.1. Ensure that the cost and economic implications of both climate change itself and climate action (including benefits of avoided impacts) are considered in a balanced manner. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2194		7		7	The treatment of ecosystem carbon (CO2 emissions and removals in AFOLU/LULUCF) needs much clarification, as it seems inconsistent with IPCC guidance and with the WGI report of AR5. It is further inconsistent with the presentation of what is referred to as "CDR" technologies. It would be essential to clarify the system boundaries between (i) anthropogenic versus non-anthropogenic fluxes, (ii) removals for/by "AFOLU" versus removals for/by BECCS and other "CRT"s and (iii) between "afforestation/reforestation" vs forest management (of forest remaining forest). Namely: 1) LULUCF removals are not defined explicitly. 2) Other definitions (such as "net-zero CO2 emissions") suggest strongly that "anthropogenic" removals would be considered. However, "anthropogenice removals" are not defined, and it is not explained how they would be separated from non-anthropogenic fluxes. 3) IPCC concluded earlier (2003) that "direct human-induced" removals cannot be clearly separated from indirect and natural effects. This raises the question how this separation is done (or assumed) in this report (and the underlying modelling). 4) As a result or 3 above, IPCC recommended using emissions and removals on "managed land" as a proxy for anthropogenic emissions and removals. Whilst this is practical, it is clearly not scientific, as many fluxes (and C stock changes) on "managed land" are non-anthropogenic and, arguably, many fluces and C stock changes on non-managed land are anthropogenic. 5) The carbon balance of land is most likely to be a sink (net terrestrial carbon sink). This report presents the current net land C balance as a source (see figure on p. 16). That seems to follow the approach of the WGIII report of AR5, whereas AFOLU was incorrectly indicated as a carbon source, equivalent to the "land-use change+" emissions of the WGI report of AR5. That is, WGIII incorrectly equated the LULUCF flux with land-use change (LUC) only, essentially limiting it to deforestation and peat loss, whilst ignoring the (much bigger) forest sink on forest remaining forest. If that is the aproach taken here (as the figure on p 16. suggests), then many statements in the report need to be corrected and/or clarified accordingly. 6) If the AFOLU CO2 flux is equated with LUC only, then how can it take into account soil carbon sequestration? 7) If the AFOLU CO2 flux is equated with LUC, then how can bioenergy emissions be correctly accounted, when they largely (mostly?) originate from forest remaining forest, thus not reflected in LUC. 8) if the AFOLU CO2 flux includes both LUC and forest management, then how can it be such a significant source? 9) If AFOLU CO2 represents all antropogenic emissions and removals on land, then how can BECCS be presented as a "carbon dioxide removal technology", when the technology part of BECCS does not remove carbon from the atmosphere (but uses carbon fixed by vegetation), and the fixing of the carbon is accounted under AFOLU? 10) If the AFOLU CO2 flux represents only LUC fluxes, then is it safe to say that the modelling fails to account for the CO2 impacts of forest management, including that of increased harvest for bioenergy (and therefore BECCS)? 11) If AFOLU is currently indicated as a big source, it follows that the bulk of the terrestrial carbon sink is not reflected in the AFOLU. That raises the question whether management effects reducing that sink are reflected in the scenarios and, if so, where and how? Notably, a very significant expansion of bioenergy (with or without BECCS) is expected by most scenarios, invariably presented as mitigation, despite biomass fuels having higher emission factors than fossil fuels. This is only possible if the part of the terrestrial sink responsible for the creation of the biomass used for energy is allocated to the bioenergy sector. That means that the same sink should be removed from AFOLU (not to present it twice as a removal). This would suggest a reduction of the AFOLU sink (compared to BaU). Instead, what appears to be happenning is an increase in bioenergy accompanied by a significant increase in the net sink (land turning from a source to a sink), except in s5. However, in s5 the immense amount of BECCS has a surprisingly limited impact on the AFOLU trajectory. How would that be possible? [European Union (EU)]	
2196		8		8	Several key paragraphs of the earlier version have disappeared whereas paragraphs less substantiated that have not been there before have been included in this final draft. The most substantive chapter of the report (chapter 4 on implementing the global response) is less represented than in the earlier version of the SPM. The main focus of the final draft SPM is on the 'scenarios' including the overshoot scenarios. An overshoot scenario means loss of coral reefs (see also key message B2). The high level messages have disappeared. There should be at least the following high-level messages: Impacts of 1.5°C are very serious (not compatible with the 'future we want') current section B; Staying below 1.5°C is possible; Practical solutions including technological, natural and societal solutions exist and implementation needs to be stepped up. (current sections C and D). The chapters of the SPM should be re-ordered. [European Union (EU)]	
2198		9		9	The climate resilient development pathways have been included as a key message; this would merit to become a high level message [European Union (EU)]	
5518	1		1		Change 3.4.6. Food to 3.4.6 Food [Mexico]	
3298	1	1	22	1	The summary should not exceed 10 (IPCC-) pages, including all figures etc. The document now is 22 (A4-) pages long, which is a lot better than the first version, but still too long. We encourage the authors to work towards a final version that will fit the size limitation approved by the Panel, after editing and layout. [Germany]	
6954	1	1	1	1	There are few illustrations in the SPM. It is suggested to include maps representing mean warming at 1.5 and 2 deg and its implications for diffferent regions. [India]	
8688	1	1	1	1	The New Zealand Government thanks the IPCC for the opportunity to review this draft, and thanks the authors for their work preparing it. [New Zealand]	
5520	2		5		Change the centigrade degrees symbol. [Mexico]	

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5522	2		2		Change runof to runoff [Mexico]	
5524	2		2		Change versus. 2°C to versus 2°C [Mexico]	
4272	2	5	2	8	It will be better to put section B contents after section C according to SPM list of chapters. [Republic of Korea]	
4452	3		3		While Paris Agreement decided holding the increase in the average temperature to well below 2.0°C, and also to pursue efforts to limit the temperature increase to 1.5°C, scientific knowledge accumulated to date has, as reiterated in the several chapters, significant limitations to provide definite scientific evidences to simply answer whether it is feasible to limit warming to 1.5°C contrary to the UNFCCC's expectation, or to identify how much efforts to be pursued in the future for 1.5°C target. This message is extremely important to avoid various misinterpretation of this Report. The sentences, for example, would be added in Introduction section; 1.5°C emission pathways have a wide range of uncertainty, risks related to mitigating to 1.5°C are not understood sufficiently, and it is uncertain how much socio-economic impacts are reduced in 1.5°C warmer world as compared to in 2.0°C warmer world. Therefore, this Special Report can provide 'no single answer to the question of whether it is feasible to limit warming to 1.5°C' as stated in A5. There still exist limitations on scientific knowledge in spite of great efforts that have been made by a large number of scientists. {1.6, 2.6.2, 3.7, 4.6, 5.7}. [Japan]	
4212	3	1	4	28	Objectively, the ongoing research on limiting warming to 1.5? is insufficient in terms of data, modeling, methodology and profoundness. So it is suggested to add a paragraph to the SPM to explain this. [China]	
1676	3	3	3	8	These pathways lack a reference to the Paris Agreement temperature goal and the 'well-below 2?C' element and could be misinterpreted to include not Paris compatible pathways. [Belize]	
2200	3	3	3	8	The title of the report as is on the IPCC website should be used in this introduction. The title reads: Global Warming of 1.5 °C an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty The present wording which quotes the text of the UNFCCC decision does not capture the full content of the report. Chapter 4 on 'implementing the global response ...' is the most substantiated chapter both with regards to references as well as with regards to review participation. The current wording gives the impression as if it were merely context. [European Union (EU)]	
5040	3	3	3	3	This report responds to invitation by the Conference of the Parties of the UN Framework Convention on Climate Change "... to prepare a .. " ((explanation: the COP is the institution inviting the IPCC; Decision 1/CP.21: "The Conference of the Parties, .. 21. Invites the Intergovernmental Panel on Climate Change to provide a .. ")) [Hungary]	
9380	3	3	3	3	Sentence should be adjusted to read: "This report responds to the UN Framework Convention on Climate Change Conference of the Parties" invitation (COP 21, decision 1, para.21)". The COP, via a decision, invited the IPCC to prepare the report (the UNFCCC did not invite the IPCC because it is a legal instrument). [Canada]	
9382	3	4	3	4	Sentence should be adjusted to read: "….to provide a Special Report…", which more accurately reflects the COP decision language. [Canada]	
9384	3	5	3	8	Recommend revising the last sentence to read: "The IPCC accepted this invitation in April 2016" and ending the paragraph with this. The remainder of the current sentence that outlines the IPCC decision to prepare the report "in the context of strengthening the global response to the tyhreat of climate change, sustainable development, and efforts to eradicate poverty" could be outlined in a separate paragraph, but should be clearly distinguished from the original UNFCCC request. To make this distinction more clear we reccomend a new paragraph could be established starting with the following sentence: "The IPCC also decided to prepare this report in the context..." [Canada]	
3300	3	1	3	1	"all three IPCC Working Groups": Working group names should be mentioned (e.g. in a footnote) [Germany]	
3302	3	1	3	11	We suggest to explain the characteristics of this Special Report in the suite of IPCC products replacing the shorter current text: "This Special Report assesses literature relevant to all three IPCC Working Groups building on the IPCC Fifth Assessment Report (AR5) and recent IPCC Special Reports. Its focuses on issues relevant to global warming of 1.5°C. Its findings will be complemented by the two other Special Reports to be prepared by 2019: Special Report on the Ocean and Cryosphere in a Changing Climate; Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. The full IPCC Sixth Assessment Report (AR6) will be issued in 2021/22. Special Reports follows the same IPCC procedures that also apply to the establishment of full IPCC Assessment Reports and use calibrated language for communicating certainty in key findings." (This sentence can also be used to introduce the acronym "AR5" which is not yet explained in the SPM.) [Germany]	

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3304	3	1	3	11	We strongly suggest to highlight the multiple lines of information and provide information on the knowledge-base (kind of information including peer reviewed and grey literature) and tools/approaches (observations, different models including numerical mathematical, physical, economic, integrated assessment models, expert judgement) used to establish this robust and comprehensive assessment report in a new paragraph in section A. It is also essential to provide the level of confidence/uncertainty for all statements in the SPM. Providing this transparency is essential for the credibility of the report. In addition, we suggest to mention that despite remaining uncertainties the scientific understanding of issues relevant to 1.5°C warming has increased significantly since AR5; the findings of this report will updated and complemented by the upcoming IPCC reports. [Germany]	
3306	3	11	3	11	Please replace "methodologies" by "procedures" because the first expression is commonly used to refer to the IPCC guidelines for GHG emission inventories while the latter is consistent with Appendix A to of the IPCC principles. [Germany]	
7442	3	11	3	11	There are not levels of "certainty" -- one is certain or not. There are "levels of confidence and likelihood" and that is really what IPCC's lexicon covers, so wording here needs to be changed to reflect what is actually being done. [United States of America]	
3308	3	13	3	13	The first sentence should read: The Summary for Policy Makers presents key findings of the five chapters of the special report and is structured into four sections… [Germany]	
3310	3	13	3	17	Sections A and B: It would be helpful to make clear, maybe also in the introduction, why the report relates mostly to worlds with +1°C, +1.5°C, and +2°C higher-than-pre-industrial temperatures, since RCP8.5 (AR5) is frequently used in impact assessments and adaptation discussions but would be associated with more than +4°C, and since current NDCs would lead to a warming of almost 3°C. We suggest adding the following sentence, possibly in a footnote: "This report focuses on global warming of +1°C, +1.5°C, and +2°C, higher levels or warming will be addressed in the AR6." [Germany]	
4274	3	13	3	17	Delete. It could be known from the list of contents. [Republic of Korea]	
4962	3	14	3	14	This should be "observed and projected climatic changes". See also later comment on Section B. [United Kingdom (of Great Britain and Northern Ireland)]	
3312	3	19	3	19	The term "narrative" is reserved for certain scenario definition approaches (e.g. SRES: http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=12). In addition, it would be useful to mention that the term "headline statements" refers to those paragraphs that are printed in bold letters. We suggest the following sentence: "The paragraphs that are printed in bold contain headline statements that taken together provide an overview of the key findings of this Special Report." [Germany]	
4276	3	19	3	19	provide ? providing [Republic of Korea]	
4656	3	19	3	19	There should be a comma between 'that' and 'taken together' [United Kingdom (of Great Britain and Northern Ireland)]	
7444	3	19	3	19	It is not really obvious what "Its" is referring to. It would be better to say "This report's" [United States of America]	
8510	3	19	3	2	Sentence could begin "Its narrative is underpinned by" instead of "is supported by" for greater clarity [Ireland]	
734	3	24	4	25	This glossary is very useful and should be kept in the future version of the SPM. We suggest to add two definitions to this box, in order to clarify some important concepts of the SPM. 1) Definition of non-CO2 drivers such as : "Gases or aerosols that are not CO2 and have an impact on climate change, such as N2O, methane, SO2, black carbon... They influence the climate mainly in the short-run." 2)Definition of CDR, such as the definition of the IPCC glossary : "Carbon Dioxide Removal methods refer to processes that remove CO2 from the atmosphere by either increasing biological sinks of CO2 or using chemical processes to directly bind CO2. CDR is classified as a special type of mitigation." [France]	
2202	3	24	3	25	A definition of Climate resilient development pathways should be included in Box SPM1 (see A.4.3 : Climate resilient development pathways (CRDPs) are a framework to simultaneously achieve the goals of emission reduction, climate adaptation and climate resilience in the context of sustainable development, poverty eradictaion and reducing inequalities) [European Union (EU)]	
3314	3	24	3	24	The definitions provided in this box have to be very brief due to the limited space available in the SPM. To further help the reader, it would be useful to add a footnote referring to the glossary and/or to the FAQ where further explanations are provided. [Germany]	
3316	3	24	4	25	In addition to the definitions given in Box SPM 1 we recommend to include the definition of “Carbon dioxide removal (CDR)”, similar to the glossary as follows: Carbon dioxide removal (CDR): Carbon Dioxide Removal methods refer to processes that remove CO2 from the atmosphere by either increasing biological sinks of CO2 or using chemical processes to directly bind CO2." [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3928	3	24	4	25	Please consider to define "non-CO2 radiative forcing" and how it relates to " radiative forcing from other anthropogenic forcers" used in A2.3. This should be used in a consitent manner throughout the SPM. [Norway]	
4436	3	24	4	25	May wish to include the definitions for the various confidence levels and likelihoods, as per page 1-40 of Chapter 1. The SPM makes references to the various confidence levels and likelihoods (from very high confidence to low confidence, and <50% to <66% likelihood). [Singapore]	
6386	3	24	4	25	please add references to the underlying report for all definitions in Box SPM 1 [Netherlands]	
7446	3	24	3	24	Consider defining "emissions" under "Definitions central to SR1.5" (i.e., does the word "emissions", when used alone, always refer to greenhouse gases from anthropogenic activity, aerosols, and other activities?). [United States of America]	
7448	3	24	4	25	Some definitions in this box are not unique to this special report (e.g., "global warming", "pre-industrial"). Indicate whether these more common definitions are the same as those used previously by IPCC or represent a departure from how these terms have been defined by previous IPCC assessments. [United States of America]	
7450	3	24	4	25	Add definition of sustainable development. [United States of America]	
7452	3	24	4	25	Box SPM-1 should also include definitions of carbon dioxide removal (CDR) and solar radiation management (SRM), which are key concepts that are more salient in this report than in previous assessment reports. [United States of America]	
8744	3	24	4	25	Since the report covers a broader spectrum of issues from climate change to sustainable development to eradication of poverty, definition terms used in these context shall be clearly defined as articulated in the Chapter 1 of the report. A similar appraoch is undertaken during the formulation of the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to advance climate change adaptation. [Maldives]	
9242	3	24	4	25	Is the definition of impacts appropriate? It may pose a problem in the SPM as it is not handled throughout the SPM as defined in this box. One can question if warming and sea level rise are impacts of climate change or are not per se climate change. Should not the term impacts refer to impacts of changes in climatic variables on natural and human systems? Here this type of impacts is termed outcome which is fairly unusual in scientific practice. It is well known that some differences exist in handling the term impact between climatologists and impact researchers but authors should adjust this definition here (if they decide not to do so then the terminology really needs to be applied throughout the SPM). [Switzerland]	
9386	3	24	3	24	Recommend adding "Human-induced global warming" to Box SPM 1 as per the definition in Ch. 1 Sec 1.2.1.1: "Human-induced warming refers to the component of total warming that is attributable to human activities". This term features in headline statement A1 and in Figure SPM.1. As such, it should be clearly defined in the SPM. In the definition for "human-induced global warming", please make clear whether "global warming" is defined as per the defintion for "global warming" (i.e. for a 30 year period or a 30 year period centered on a shorter period). [Canada]	
9600	3	24	4	25	We suggest to add a definition for Human induced global warming if available because the use of the words global warming/human induced global warming could be confusing for non-specialists in Climate Change [Madagascar]	
3318	3	26	3	28	Is the calculated average based on observed or modelled data? We miss this aspect in the definition. [Germany]	
3320	3	26	3	28	Can the current definition "Area-weighted global average of land surface air temperature and sea surface temperatures, unless otherwise specified, normally expressed relative to a specified reference period." should be replaced by: "Area-weighted global mean of near surface air temperatures over land and sea surface temperatures over oceans, unless otherwise specified, normally expressed relative to a specified reference period."? This could easier be related to the acronym. [Germany]	
3932	3	26	3	28	It should be noted that sea surface temperatures are likely to be warming slower than air temperatures [Norway]	
4658	3	26	3	28	This is quite a technical definition for a summary for non-specialists. In particular, 'land surface air temperature' may be confusing to a a broad readership. Could this be explained in a simpler way for non-experts? [United Kingdom (of Great Britain and Northern Ireland)]	
5688	3	26	3	26	"Area-weighted" may be unnecessary detail here. Suggest deletion. [Sweden]	
7454	3	26	3	28	Do the authors really mean that this is referring to the global mean surface temperature (so roughly 18°C) or to the change in the global mean surface temperature (so currently 1°C) in that this definition says it is "normally expressed relative to a specified reference period", which suggests that GMST is referring to a change in temperature rather than the temperature itself. [United States of America]	
2204	3	27	3	28	which reference period is chosen ? [European Union (EU)]	
9582	3	27	3	27	Note I: Land surface air temperature refers to air temperature measured in a Stevenson-type screen or the equivalent miniature screen as used by Automated Weather Stations (AWS) at a height of around 1.5m (Strangeways, 2010). Note II: Sea surface temperature refers to sea temperature measured in the top metre of the sea or so (Strangeways, 2010). Strangeways, I., 2010: Measuring global temperatures - their analysis and interpretation. Cambridge University Press, New York. 233 pp. [Croatia]	

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1678	3	3	3	33	30-year time period are the official standard used climatologically to account for natural fluctuations. Having shorter time periods as described here raises methodological issues. We suggest keeping the first sentence and delete everything after. We also suggests that you also link it to the approach that was taken in AR5. [Belize]	
2206	3	3	3	3	Increase in GMST is defined as averaged over a 30-year period relative to 1850-1900 (unless specified otherwise). It is left to interpretation what this temperature baseline means, however. It could be the average, the beginning, or the end of the 50-year period. This should be clarified. [European Union (EU)]	
3322	3	3	3	31	This paragraph mixes up three different "periods": a 51yr period from 1850 to 1900, a 30yr period, and a period shorter than 30yrs. This raises questions: Is it appropriate to relate changes in periods of different length? [Germany]	
3930	3	3	3	33	The last sentence of the definition of "Global warming" can be difficult to understand. The way the global warming is defined (centered around a 30-year period) can cause some confusion when reading about global warming up to 2017 in A1, and global averge surface temperature for the decade 2006-2015 in A1.1 and how the 30-year period relates to that warmin will exceed 1.5C around 2040 i A2. Please consider to rephrase the definition to make this easier to understand, i.e. also include how global warming in a single year (for example 2040) is calculated. [Norway]	
3934	3	3	3	33	It should be noted whether GMST cover the whole globe or only parts where long term temperature data are available [Norway]	
4454	3	3	3	33	In the BOX SPM 1: Definitions central to SR1.5, Global warming is described as, "An increase in GMST averaged over a 30-year period, relative to 1850-1900 unless otherwise specified. For periods shorter than 30 years, global warming refers to the estimated average temperature over the 30 years centered on that shorter period, accounting for the impact of any temperature fluctuations or trend within those 30 years." Since this concept may be difficult to understand for policy makers, Japan would appreciate it very much if a footnote could be added to provide specific examples. [Japan]	
5690	3	3	3	33	"averaged over a 30-year period" may be confusing for many readers. The same is true for the sentence that follows. A footnote on averaging could be an alternative, to both improve readability, while still providing the exactness. [Sweden]	
6204	3	3	3	33	Global warming: An increase in GMST averaged over a 30-year period, relative to 1850-1900 unless 30 otherwise specified. For periods shorter than 30 years, global warming refers to the estimated average 31 temperature over the 30 years centred on that shorter period, accounting for the impact of any 32 temperature fluctuations or trend within those 30 years...continued below. [Fiji]	
6206	3	3	3	33	The temperature goals of the UNFCCC refer to anthropogenic climate change. For robust trend detection of the anthropogenic signal, WMO suggests a 30 year time scale to be used for comparasion for consistency . In the AR5, 20 year period was chosen as the reference period. Having shorter periods of do not provide conssitency in comparision and opens up space for debate appropriate methodologies applied. [Fiji]	
8512	3	3	3	33	Consider rewording - begin definition with statement such as "increase in GMST relative to the average over the period 1850-1990" before going into detail on averaging period [Ireland]	
318	3	31	3	33	'For periods shorter than 30 years, global warming refers to the estimated average temperature over the 30 years centred on that shorter period, accounting for the impact of any temperature fluctuations or trend within those 30 years.' The text given in red is a bit misleading, actually redundant. Recommendation: delete. [Russian Federation]	
3324	3	31	3	31	Insert "increase in" before "estimated average" [Germany]	
3326	3	31	3	33	The sentence ("For periods… 30 years.") is hard to understand. Do you mean adding an estimate of uncertainty if a period shorter than 30 years is chosen for comparison? Please rephrase the sentence (or skip and explain later in the text where relevant). How can natural trends be separated from anthropogenically caused trends? Chapter 1 formulates it more clearly in Section 1.2.1. , should be revised in SPM. [Germany]	
4214	3	31	3	32	"estimated average temperature" should read "estimated increase in average temperature". [China]	
4446	3	31	3	33	The definition of "global warming" on its own is not clear. What is meant by "for periods shorter than 30 years, global warming refers to the estimated average temperature over the 30 years centred on that shorter period"? It is left open to interpretation what that exactly means. [Singapore]	
5474	3	31	3	33	Sentence is not understandable. Please clarify. [Austria]	
5852	3	31	3	33	"accounting for the impact of any temperature fluctuations or trend within those 30 years" : this concept is rather complicated, especially for a SPM. Wouldn't it be simpler to write that the calculation removes any impact of fluctuations over periods < 30 years? (in addition, we are wondering if temperature obtained from IAMs or other simple models that do not represent temperature fluctuations, really follow this definition) [Belgium]	
7456	3	31	3	32	Over the 30-year period, the value would be for "estimated average temperature change over the 30 years" -- not the temperature. [United States of America]	
8868	3	31	3	33	Suggest clarifying the statement by providing an example: "For periods shorter than 30 years, global warming refers to the estimated average temperature over the 30 years centred on that shorter period, accounting for the impact of any temperature fluctuations or trend within those 30 years." [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
736	3	32	3	32	We suggest to make this definition clearer, as follow : "...accounting for extrapolation in the future if needed, and for the impact…" [France]	
4074	3	33	3	33	The temperature goals of the UNFCCC refer to anthropogenic climate change. For robust trend detection of the anthropogenic signal, WMO suggests a 30 year time period adopted. In the AR5, 20 years were chosen as the reference period. Having shorter periods of 'centered' warming raises questions on the exact methodologies applied. Checking Chapter 1, it turns out that indeed only a 10-year 2006-2015 observational reference period is used. The scientific backing for the choice of this short reference period is far from being robust enough for such an important change compared to the AR5. This is in particular worrying as parts of this period have been associated with the so-called 'warming hiatus' that is not assessed in sufficient detail. [cont'd below] [Saint Kitts and Nevis]	
4076	3	33	3	33	[cont'd] Based on this reference period, Chapter 01 assesses that CMIP5 models have warmed too much in the recent past, which comes with a variety of implications including for carbon budgets. Available literature indicates that modelled and observed warming over the recent past can be almost fully reconciled when accounting for non-anthropogenic forcing differences since 2006 (solar and volcanic activity), natural variability as well as methodological differences (compare Medhaug et al. 2017). As none of these factors relates to anthropogenic activity, the assessment of Chapter 01 needs to be revisited. This is a critical element of the report as there is a risk that the adoption of a new baseline will unwillingly lead to a shift in the goalposts of the Paris Agreement – a highly policy prescriptive step. [cont'd below] [Saint Kitts and Nevis]	
4078	3	33	3	33	[cont'd] The suggestion therefore is to drop the 2006-2015 reference period and revert to the AR5 1986-2005 reference period. This would be fully consistent with the Paris Agreement. The assessment of whether or not there is a persistent mismatch between observed and modelled warming needs to be comprehensively assessed in the AR6 using fully updated forcing. [Saint Kitts and Nevis]	
5342	3	33	3	33	The temperature goals of the UNFCCC refer to anthropogenic climate change. For robust trend detection of the anthropogenic signal, WMO suggests a 30 year time period adopted. In the AR5, 20 years were chosen as the reference period. Having shorter periods of 'centered' warming raises questions on the exact methodologies applied. Checking Chapter 1, it turns out that indeed only a 10-year 2006-2015 observational reference period is used. The scientific backing for the choice of this short reference period is far from being robust enough for such an important change compared to the AR5. This is in particular worrying as parts of this period have been associated with the so-called 'warming hiatus' that is not assessed in sufficient detail. [cont'd below] [Saint Lucia]	
5344	3	33	3	33	[cont'd] Based on this reference period, Chapter 01 assesses that CMIP5 models have warmed too much in the recent past, which comes with a variety of implications including for carbon budgets. Available literature indicates that modelled and observed warming over the recent past can be almost fully reconciled when accounting for non-anthropogenic forcing differences since 2006 (solar and volcanic activity), natural variability as well as methodological differences (compare Medhaug et al. 2017). As none of these factors relates to anthropogenic activity, the assessment of Chapter 01 needs to be revisited. This is a critical element of the report as there is a risk that the adoption of a new baseline will unwillingly lead to a shift in the goalposts of the Paris Agreement – a highly policy prescriptive step. [cont'd below] [Saint Lucia]	
5346	3	33	3	33	[cont'd] The suggestion therefore is to drop the 2006-2015 reference period and revert to the AR5 1986-2005 reference period. This would be fully consistent with the Paris Agreement. The assessment of whether or not there is a persistent mismatch between observed and modelled warming needs to be comprehensively assessed in the AR6 using fully updated forcing. [Saint Lucia]	
6692	3	33	3	33	The temperature goals of the UNFCCC refer to anthropogenic climate change. For robust trend detection of the anthropogenic signal, WMO suggests a 30 year time period adopted. In the AR5, 20 years were chosen as the reference period. Having shorter periods of 'centered' warming raises questions on the exact methodologies applied. Checking Chapter 1, it turns out that indeed only a 10-year 2006-2015 observational reference period is used. The scientific backing for the choice of this short reference period is far from being robust enough for such an important change compared to the AR5. This is in particular worrying as parts of this period have been associated with the so-called 'warming hiatus' that is not assessed in sufficient detail. [cont'd below] [Marshall Islands]	
6694	3	33	3	33	[cont'd] Based on this reference period, Chapter 01 assesses that CMIP5 models have warmed too much in the recent past, which comes with a variety of implications including for carbon budgets. Available literature indicates that modelled and observed warming over the recent past can be almost fully reconciled when accounting for non-anthropogenic forcing differences since 2006 (solar and volcanic activity), natural variability as well as methodological differences (compare Medhaug et al. 2017). As none of these factors relates to anthropogenic activity, the assessment of Chapter 01 needs to be revisited. This is a critical element of the report as there is a risk that the adoption of a new baseline will unwillingly lead to a shift in the goalposts of the Paris Agreement – a highly policy prescriptive step. [cont'd below] [Marshall Islands]	

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6696	3	33	3	33	[cont'd] The suggestion therefore is to drop the 2006-2015 reference period and revert to the AR5 1986-2005 reference period. This would be fully consistent with the Paris Agreement. The assessment of whether or not there is a persistent mismatch between observed and modelled warming needs to be comprehensively assessed in the AR6 using fully updated forcing. [Marshall Islands]	
9098	3	33	3	33	The temperature goals of the UNFCCC refer to anthropogenic climate change. For robust trend detection of the anthropogenic signal, WMO suggests a 30 year time period adopted. In the AR5, 20 years were chosen as the reference period. Having shorter periods of 'centered' warming raises questions on the exact methodologies applied. Checking Chapter 1, it turns out that indeed only a 10-year 2006-2015 observational reference period is used. The scientific backing for the choice of this short reference period is far from being robust enough for such an important change compared to the AR5. This is in particular worrying as parts of this period have been associated with the so-called 'warming hiatus' that is not assessed in sufficient detail. [cont'd below] [Nauru]	
9100	3	33	3	33	[cont'd] Based on this reference period, Chapter 01 assesses that CMIP5 models have warmed too much in the recent past, which comes with a variety of implications including for carbon budgets. Available literature indicates that modelled and observed warming over the recent past can be almost fully reconciled when accounting for non-anthropogenic forcing differences since 2006 (solar and volcanic activity), natural variability as well as methodological differences (compare Medhaug et al. 2017). As none of these factors relates to anthropogenic activity, the assessment of Chapter 01 needs to be revisited. This is a critical element of the report as there is a risk that the adoption of a new baseline will unwillingly lead to a shift in the goalposts of the Paris Agreement – a highly policy prescriptive step. [cont'd below] [Nauru]	
9102	3	33	3	33	[cont'd] The suggestion therefore is to drop the 2006-2015 reference period and revert to the AR5 1986-2005 reference period. This would be fully consistent with the Paris Agreement. The assessment of whether or not there is a persistent mismatch between observed and modelled warming needs to be comprehensively assessed in the AR6 using fully updated forcing. [Nauru]	
738	3	35	3	36	We suggest to add the reference {1.2.1.2} to this definition. [France]	
2208	3	35	3	36	Pre-industrial is not clearly defined. It should be stated clearly how the 50-year period has been used to avoid varying interpretations. [European Union (EU)]	
3328	3	35	3	35	It is unclear if the reference period 1850-1900 is used for the GMST only while for all other variables, a multi-century period is used. In addition, it should be clarified that there is no clear definition of pre-industrial and that the choice of the reference period can influence the results. Chapter 1 states "Temperatures rose by 0.0–0.2°C from 1720–1800 to 1850–1900, but the anthropogenic contribution to this warming is uncertain." It also states "...expressed relative to the reference period 1850-1900 (adopted for consistency with Box SPM.1 Figure 1 of IPCC (2014e)." To include this important information, please consider to amend the definition in the SPM as follows: "In this report, the multi-century period prior to the onset of large-scale industrial activity is approximated using the reference period 1850-1900 [footnote]. This choice is consistent with the IPCC's Fifth Assessment Report." A footnote should explain the consequences of this choice for the statements on 1.5C warming. "Temperatures rose by 0.0–0.2°C from 1720–1800 to 1850–1900, but the anthropogenic contribution to this warming is uncertain." [Germany]	
3936	3	35	3	36	Here 1850-1900 is used as an approximation to pre-industrial without any discussion of the implication of this assumption. Such a key assumption should be discussed in the SPM. [Norway]	
4216	3	35	3	36	The Box defines 'pre-industrial' inconsistently with that in AR5, which defines "industrial" as: "A period of rapid industrial growth with far reaching social and economic consequences, beginning in Britain during the second half of the 18th century and spreading to Europe and later to other countries including the United States" and clearly notes that "In this report the terms pre-industrial and industrial refer, somewhat arbitrarily, to the periods before and after 1750, respectively." So it is suggested to explain the reasons for this difference in the SPM. [China]	
7458	3	35	3	35	For clarity with regard to previous IPCC assessments, consider adding: "For the well-mixed greenhouse gases, pre-industrial refers to 1750." Is 1850 a departure from how defined before? If so, elucidate. [United States of America]	
8514	3	35	3	36	Should describe definition as "Pre-industrial temperature" [Ireland]	
8764	3	36	3	36	IPCC has defined pre-industrial as the period before 1750 which is different from definition used in this document. need to be clarified. [Iran]	
7460	3	38	3	39	This definition needs to make clear that what is being envisioned is a 1.5 or 2°C world where the temperature increases are sustained at the level indefinitely, rather than that the plan is to bring the level back down to zero. So, this report is not really looking at having temperatures peak at 1.5 or 2°C and come down, but for the elevated temperatures, and it is important that the report then indicate what the equilibrium conditions (of climate, sea level, etc.) would be for these elevated levels. [United States of America]	
8458	3	38	3	39	Where is the 2 degree coming from when the UNFCCC was clear on its request for a 1.5 degree impact? [Zimbabwe]	
3330	3	39	3	39	level instead of levels; there is only one pre-industrial level [Germany]	
320	3	41	3	41	'remaining' is unnecessary in this definition [Russian Federation]	

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2210	3	41	3	42	Carbon neutrality needs to take into account CO2 emitted and captured by marine and terrestrial ecosystems. Hence it is somewhat misleading to refer to net-zero emissions as defined in the Box SPM1 as carbon neutrality. [European Union (EU)]	
2212	3	41	3	42	The net zero CO2 definition needs to be revisited for several reasons: 1) The focus on net-zero CO2 (or 'carbon neutrality') is not helpful as a non-experts often confuse this with net zero GHGs (or 'climate neutrality'); 2) The crucial point for emissions appears to be the point of "net zero GHG emissions and declining total radiative forcing" (the same as 'climate neutrality'?). This concept should be explained more clearly in the relevant part of the SPM (currently A.2.3). This should then be the concept explained in the definition box, including a clear statement that stabilising temperatures is not just a question of reaching net zero CO2. [European Union (EU)]	
2214	3	41	3	42	"Anthropogenic" needs to be defined/explained, in particular with respect to "removals". To answer a request by the UNFCCC, the IPCC conducted a high level scientific meeting that surveyed the scientific understanding of the processes affecting terrestrial carbon stocks and human influences upon them. The meeting concluded that "the scientific community cannot currently provide a practicable methodology that would factor out direct human-induced effects from indirect human-induced and natural effects for any broad range of LULUCF activities and circumstances. " (https://www.ipcc.ch/graphics/speeches/sbsta-19-statement-to-decision11.pdf). To our knowledge this situation has not changed substantially since. National GHG inventories do not reflect actual anthropogenic removals by sinks, but use the carbon stock changes on "managed land" as a proxy for anthropogenic fluxes. It is unclear whether this report would intend to take the same approach and, if so, how that could be achieved. In any event, the interpretation should be stated, not the least because what can be considered anthropogenic in the context of annual national GHG inventories may reasonably differ from the interpretation of the term in the context of long-term global reduction pathways, considering the role of various feed-back effects and time delays. [European Union (EU)]	
2216	3	41	3	43	The net zero CO2 emissions definition should also point out that global temperature can continue to raise while CO2 emissions are zero, due to radiative forcing from other greenhouse gases. [European Union (EU)]	
3332	3	41	3	43	The Paris Agreement clearly talks about GHGs, not CO2 only, in its Art. 4.1: "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." It is highly important that the IPCC does not send confusing messages on CO2 emissions on the one hand and on all GHG on the other hand. We therefore strongly urge the authors to amend the definition in the SPM and the text throughout the report as follows: "Net-zero CO2 emissions: Conditions in which any remaining anthropogenic carbon dioxide (CO2) emissions are balanced globally by anthropogenic CO2 removals. Net-zero CO2 emissions are also referred to as carbon dioxide neutrality." Please amend the glossary definitions including the one of carbon neutrality on page 9 as well: "carbon neutrality" should become "carbon dioxide neutrality". Please also add the definition of "net zero-emissions" to the box to improve balance. It would be very useful for the reader to amend FAQ2.2 which states "To stabilise global temperature at any level, 'net' CO2 emissions would need to be reduced to zero. This means the amount of CO2 entering the atmosphere must equal the amount that is removed." This would require a constant long-term non-CO2-forcing, but there are some non-CO2 greenhouse gases that accumulate in the atmosphere, e.g. CO2 resulting from CH4-oxidation or Chlorofluorocarbons? Is this effect negligible? FAQ2.2 could provide this important information on the role of non-CO2 forcers to the reader. [Germany]	
4660	3	41	3	42	"Anthropogenic" is not used consistently throughout the text of the SPM. Elsewhere, "human-induced" is used. Could this be made more consistent please [United Kingdom (of Great Britain and Northern Ireland)]	
5042	3	41	3	41	Net-zero CO2 emissions: Conditions in which any remaining global anthropogenic carbon dioxide .. ((explanation: the term "remaining" is misleading or misunderstandable; the reference to "global" means that carbon neutrality is reached globally if the global anth. emissions are balanced globally by anth. removals)) [Hungary]	
5692	3	41	3	43	It would be useful to include here some explanation about "net-zero co2" not being the same as net-zero GHG emissions. Also, it is not evident that "carbon neutrality" concept needs to be brought up here, as the term is not used in the SPM. [Sweden]	
7462	3	41	3	43	It needs to be noted that "net-zero emissions" does not mean that the CO2 concentration has returned to its preindustrial level, and it also does not mean that the CO2 concentration is stabilized because global warming has and may well continue to be affecting the global carbon cycle by, for example, thawing permafrost (leading to CO2 and CH4 emissions), faster decay of forest litter, death of trees that get oxidized by decay and widlfire, and so on. So it is really important to say this global balance that is mentioned only refers to the direct aspects and not affect on the carbon cycle caused by the induced changes in climate. [United States of America]	
7464	3	41	3	43	The words "any remaining" in the first sentence are not necessary and should be deleted for brevity. Also, is "anthropogenic" necessary or always accurate when describing CO2 removals to meet the condition of net-zero emissions? [United States of America]	
8516	3	41	3	43	The words "any remaining" don't add anything to this definition and could be removed [Ireland]	

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8888	3	41	3	42	Suggest rephrasing sentence: From "Conditions in which any remaining anthropogenic carbon dioxide (CO2) emissions are balanced globally by anthropogenic CO2 removals" To "Conditions in which anthropogenic carbon dioxide (CO2) emissions are balanced by CO2 removals " The term "any remaining" might imply we have reduced emissions to a point at which we can feasibly remove them, and we don't know that. The term "net zero" will mean anthropogenic CO2 emissions are balanced by a combination of anthropogenic and natural sinks - the natural sinks will tend to diminish as anthropogenic are reduced as these are driven by disequilibrium between the atmosphere and ocean+terrestrial biosphere. [Australia]	
5170	3	42	3	42	the definition of net-zero refers to "anthropogenic CO2 removals". Please, specify which anthropogenic removals have been considered in this report. Different fora or fields these "anthropogenic removals" can include very different aspects (i.e. natural regeneration could be included or not, managed forests, ecosystems protection,...). More clarity is needed to understand clearly what the report means when it talks about net-zero CO2 emissions. [Spain]	
8890	3	42	3	43	Suggest removing reference to: "carbon neutrality" as it is a highly ambiguous term, used differently in various contexts. [Australia]	
740	3	43	3	43	Why are other GHG excluded from the concept of "carbon neutrality" ? It might be appropriate either to delete this second sentence since "carbon neutrality" is not mentioned in the SPM, or to provide an explanation to justify the exclusion of non-CO2 gases from carbon neutrality. [France]	
1792	3	44	4		As confidence levels qualify statements throughout the report we think that a graphic (box) could be included to explain the use of qualifiers. For instance by depicting likelyhoods on a scale and evidence and confidence as a graph. [Denmark]	
5484	4		4		We suggest to add more information, the idea is not clear. [Mexico]	
322	4	1	4	2	'Cumulative global CO2 emissions from the start of 2018 to the time that CO2 emissions reach net-zero that would result in a given level of global warming.' Suggestion: replace 'emissions' with 'net-emission' and 'net-zero' with 'zero'. [Russian Federation]	
742	4	1	4	1	There is some ambiguity in this term, here and several other places (A2.3), since it could refer to gross emissions over the period or the net emissions less absorptions over the same period. Given that we are aiming for net-zero at the end of the period, the latter would make more sense, but whichever is used it needs clarification. We suggest to formulate it as "Net cumulative global CO2 emissions". [France]	
744	4	1	4	2	We suggest to add this sentence to the definition of "remaining carbon budget", in order to clarify the role of non-CO2 drivers : "The remaining carbon budget is affected by the projected emissions of non-CO2 drivers" [France]	
2218	4	1	4	2	Explain the role of non-CO2 GHGs in this. This seems to assume that the role of those is invariant with respect to scenarios. Inconsistent with definition of "1.5°C-consistent pathway", which includes all GHGs and non-GHG forcers. [European Union (EU)]	
2220	4	1	4	5	A definition of pathways (irrespective of whether 1.5°C-consistent or not) must be added to this box. In particular, it must explain the relationship between pathways and budgets. Namely that the budgets presented assume no net negative CO2 emissions, and involve no particular consideration of how emissions evolve (before and after the net-zero point) to remain within this budget. Pathways on the other hand explicitly consider the evolution of GHG emissions, including the use of CDR to enable temporary overshooting of the budget. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3334	4	1	4	2	The Definition of "remaining carbon budget" is not sufficiently clear. Please revise this definition in order to highlight that this concept of "remaining carbon budget" does only apply to non-overshoot scenarios, i.e. is not applicable in cases where temperature temporarily rises above the specified global warming level and falls back eventually, and does not inform about the amount of negative emissions for such an overshoot trajectory. Also, it is not clear from the definition whether the "remaining carbon budget" refers to a (theoretical) CO2-only world or a mulitgas-world. From the method applied, it is clear that it is the latter, but that needs to be amended here ".., considering other GHGs". We would highly recommend to revise this definition entirely, in particular given the change from AR5 and the change from the last draft of the SR1.5. At the moment, it mixes two different concepts (Net zero emissions from the mitigation/Scenario side, and threshold exceedance expressed through the TCRE from WG1) which is confusing to the reader, as e.g. for an high overshoot 1.5C scenario (S5), the cumulative carbon at net zero emissions (~peak T) would yield the budget for 1.8C, not 1.5C. It would also be helpful to either frame the definition as follows, or amend section A to include such an explanation and reference it in the definition: "The remaining carbon dioxide budget provides an estimate of the amount of CO2 that can be deposited in the Atmosphere before a specified temperature threshold is reached, considering also other GHGs. After the budget is exhausted, all additional CO2 emission (and possibly more to compensate for hysteresis and Earth system feedbacks) will have to be removed from the atmosphere in order to eventually meet the same T-threshold. Budget estimates depend on non-CO2 forcing and have several uncertainties, which are large compared to the absolute size of the budget for 1.5C. " [Germany]	
3336	4	1	4	2	The explanation is not consistent with the term to be identified: while the term refers to carbon only the explanation talks about CO2. Please amend to "Remaining CO2 budget" in order avoid confusion whether this budget also includes other carbon sources besides CO2, e.g.CH4, and further GHGs. [Germany]	
3898	4	1	4	2	This definition is not easy to understand correctly. Also because it is different from the one from AR5. We would recommend to include a clear definition in an FAQ in an annex (with examples) and refer to this definition from the SPM. Also a clearer link to negative emissions as discussed in pathways in section C, needs to be established. [Luxembourg]	
4456	4	1	4	2	The concepts of carbon budgets and the remaining carbon budgets are both central to the understanding of SR1.5. Since only the remaining carbon budget is defined in the SPM, Japan would appreciate the inclusion of the definition of the carbon budget in the SPM, with slight modifications for higher accuracy, by omitting the third definition and removing "global" before "carbon dioxide" so that it does not exclude regional connotations. Hence it should read as follows. (2) the estimated cumulative amount of carbon dioxide emissions that is estimated to limit global surface temperature to a given level above reference period, possibly taking into account global surface temperature contributions of other GHGs and climate forcers; For your perusal, the third definition of "carbon budget" mentioned in the Glossary does not seem to be an established one, and many WG1 and WG3 scientists consider that the term “carbon budget” only refers to the global scale (e.g., Gignac and Matthews, 2015, Environ. Res. Lett., 10, doi:10.1088/1748-9326/10/7/075004; Peters, 2018, Nat. Geosci., 11, 378-380). [Japan]	
5854	4	1	4	2	We think that this definition is incomplete because it needs to refer to a level of probability of achieving the stated objective. We suggest the following : "(...) in a given probability of staying below a given level of global warming". [Belgium]	
6388	4	1	4	2	definition excludes contribution of net-negative emissions after point of net-zero emissions, and cannot be linked unamboguously to global forcing level. Compare also the pathways in figure SPM3, illuistrating there is more to the issue than the cumulative positive emissions. In the present definition there is no room for negative emissions afterwards. Please add after global warming: , assuming that no net negative emissions are required. [Netherlands]	
6686	4	1	4	2	This definition may be understood in a way that it does not cover the whole remaining carbon budget, but only the budget until mid-century for senarios that include the negative emissions after mid-century (and would therefore lead to a larger number for the carbon budget since it does not take into account these negative emissions). But we are not sure that this is the right interpretation. May be the definition is not meant for all the scenarios described in the report? Therefore, please consider to specify and explain what this carbon budget is and how it differs from previous practice in IPCC assessments. Furthermore, we suggest to also clarify that this definition includes only anthropogenic emissions which will make it easier to compare with other reports, if that is what is meant in this report. Furthermore the defintion in the glossary is somewhat different. There also it should be clarifies what is meant by the carbon budget in this report. [Norway]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6960	4	1	4	2	The remaining carbon budget should not be specified without mentioning the total carbon budget as the value of the future or remaining budget is determined by carbon dioxide that has already been emitted in the past. The total carbon budget and past emissions are not mentioned even once in the SPM. The past emissions (from 1 January 1876 to 31 December 2017) are mentioned in the footnote of Table 2.2. The Fifth Assessment Report of the IPCC (AR5) clearly discusses the total carbon budget, past emissions (or the proportion of the total carbon budget already used in the past), and the remaining carbon budget for the future. Chapter 1 of this report states the following, "It is frequently asked whether limiting warming to 1.5°C is 'feasible' (Cross–Chapter Box 3 in this Chapter). There are many dimensions to this question, including the warming 'commitment' from past emissions of greenhouse gases and aerosol precursors." It is therefore acknowledged in the report itself that the total carbon budget is relevant to any discussion of the feasibility of meeting the 1.5 deg. C target. This discussion therefore cannot be complete without an upfront mention of the actual past cumulative emissions and the total carbon budget. Intergovernmental Panel on Climate Change (IPCC) (2013), Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, [Stocker, T. F., D. Qin, G. K., Plattner, M., Tignor, S. K., Allen, J., Boschung, A., Nauels, Y., Xia, V., Bex and Midgley. P. M. (eds.)], Cambridge University Press, Cambridge and New York. [India]	
6962	4	1	4	2	INSERT in the Glossary definition for "Total Carbon Budget" as in IPCC AR5, and definition for "Cumulative Emissions upto 2018". Justification same as above. [India]	
8894	4	1	4	2	Suggest re-wording: 'Remaining carbon budget: Total global CO2 emissions, from the start of 2018 to a time of net-zero CO2 emissions, with that total resulting in a targeted threshold of global warming.' [or similar wording] [Australia]	
9388	4	1	4	1	Add "anthropogenic" before "CO2 emissions" so that the definition of "Remaining carbon budget" is "Cumulative global anthropogenic CO2 emissions from the start of 2018…..etc.). [Canada]	
5044	4	3	4	3	Definition of non-CO2 radiative forcing would be essential otherwise it will not be clear for the readers of the SPM (incl. PMs) when they meet this important term later in the text (i.e. for those who read only the SPM) [Hungary]	
3338	4	4	4	4	For clarification please add „target" in front of "level". This would make the definition also more compatible with the definition in the glossary. [Germany]	
7466	4	4	4	4	Use of the word "temporary" needs to be clarified. For most readers the word might be thought of as a year or decade when in almost every case it is over a century. Also, many impacts are likely tied to the peak temperature change reached (the loss of species, the loss rate of ice sheets, and so on) rather than the long-term temperature increase to which returned a century more in the future. In that most impacts are very likely irreversible, this notion of "temporary exceedance" is very misleading when thinking about the impacts of the overshoot. What matters most is the peak temperature reached, and to hide the significance of this with the terminology here is quite misleading. [United States of America]	
8518	4	4	4	6	Should describe definition as "Temperature overshoot" [Ireland]	
8520	4	4	4	6	Temperature overshoot appears unnecessarily restricted to CO2 removals to achieve a decline in global temperature following overshoot of target. A decrease in the rate of emission of short lived climate forcers would also achieve a decline in global temperature. [Ireland]	
324	4	5	4	6	'achieved through anthropogenic removal of CO2 exceeding remaining CO2 emissions globally'. Suggestion: omit this part of the definition, because this could be also due to natural processes 'helping' us. [Russian Federation]	
746	4	5	4	5	Suggestion : add "…achieved in the context of this report through anthropogenic removal…" [France]	
2222	4	5	4	6	What is meant by "anthropogenic removals"? Do those include land activities? Ocean sinks? Why the removal of CO2 only? Clearly it is the most critical gas, but any reason to exclude other GHGs by definition? Inconsistent with definition of "1.5°C-consistent pathway", which includes all GHGs and non-GHG forcers. [European Union (EU)]	
3340	4	5	4	5	Please replace "global warming" by "global temperature increase", as there will be an absolute reduction in temperature. In addition, according to the definition in the same SPM-box, "global warming" refers to periods of 30 years. [Germany]	
3342	4	5	4	5	In this definition, overshoot is only linked to temperature. However, the glossary defines "Overshoot pathways: Pathways that exceed the stabilization level (concentration, forcing, or temperature) before the end of a time horizon of interest (e.g., before 2100) and then decline towards that level by that time. Once the target level is exceeded, removal by sinks of greenhouse gases is required." To avoid confusion, we suggest to specify the variable of interest in the SPM and to amend the text: "Temperature Overshoot: The temporary exceedance of a specified target level of global warming, such as 1.5°C. Temperature overshoot implies a... ". Please revise glossary accordingly and add a definition for "temperature overshoot" as well as "emissions overshoot"; please check double entry for overshoot pathways on pages 39 and 40 of the glossary. [Germany]	
8870	4	5	4	6	Suggest clarifying the definition: 'Overshoot implies a peak followed by a decline in global warming, achieved through anthropogenic removal of CO2 exceeding remaining CO2 emissions globally.' Does the post-peak decline in warming need to be achieved through anthropogenic removal, or could it be achieved by balancing emissions against natural CO2 removal? [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3344	4	6	4	6	The Paris Agreement clearly talks about GHGs, not CO2 only in its Art. 4.1: "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century". Please reflect on the role of GHGs other than CO2 that can also be removed and clarify the role of non-CO2 mitigation, that can alleviate peak warming, please see also our comment on the "remaining carbon budget" SPM-4-1. [Germany]	
3346	4	6	4	6	Replace "remaining CO2 emissions" by "remaining anthropogenic CO2 emissions". [Germany]	
4218	4	6	4	6	The meaning of “exceeding remaining CO2 emissions globally” is not clear. Should it be “remaining budget” or “remaining emissions”? [China]	
5046	4	6	4	6	Removal of CO2 exceeding remaining anthropogenic CO2 emissions globally ((explanation: the term "remaining" is misleading or misunderstandable; the reference to "global" means that carbon neutrality is reached globally if the global anth. emissions are balanced globally by anth. removals)) [Hungary]	
6390	4	6	4	6	unclear and intransparent formulation of mechanism to induce decline after overshoot. Should be rewritten [Netherlands]	
210	4	8			Term "Climate forcers" could be defined/explained when used for the first time - as they might not be that familiar to policymakers as greenhouse gases. [Finland]	
348	4	8	4	11	The Paris agreement clearly states "holding warming to well below 2ºC", however "well below" is not reflected here in the definition. The classification presented in Table 2.1 has a Pathway Class '1.5ºC-high-Over Shoot', which is placed under the '1.5ºC consistent' Pathway group. However this class also contains pathways with overshoot of 0.4ºC, which do not fall in the category of "well below" as mentioned in the Paris Agreement. Therefore, 'Below-1.5ºC' and '1.5ºC-low-OS' pathway class should be retained as '1.5ºC-consistent' pathway group in Table 2.1, and this should be reflected in the SPM as well. [Chad]	
2224	4	8	4	11	definiition may create confusion as it seems somewhat inconsistent with other definitions ("overshoot", "net-zero", "remaining carbon budget") that include only CO2, but not other GHGs or non-GHG forcers. [European Union (EU)]	
2226	4	8	4	12	Overshoot scenarios should not be considered as 1.5°C consistent pathways. Overshoot scenarios mean a loss of coral reefs with unprecedented consequences on societies and economies. Half a billion people depend directly or indirectly on coral reefs for their livelihoods, hence loosing coral reefs does not only mean loosing a unique ecosystems with very rich biodiversity. Overall the negative impacts of overshooting 1.5°C will likely trigger a cascade of negative effects and consequences which we cannot oversee in their entiety and therefore swift action (technological, societial, and natural solutions combined http://www.drawdown.org) to reverse global warming is the only rationale insurance strategy. To that end, 1.5°C consistent pathways must not include overshoot. [European Union (EU)]	
3348	4	8	4	11	This report uses the expressions "one-in-two chance" and "two-in-three chance" while previous IPCC reports mainly used "50% (more likely than not) chance" and "66 % (likely) chance" as defined in footnote 2 of this report. We would encourage the authors to stick to the previous language in this definition, in the SPM and throughout the report to avoid confusion. [Germany]	
3350	4	8	4	11	Please replace "global warming" by "global temperature increase", consistent with the definition in the same SPM-box, where "global warming" refers to periods of 30 years. [Germany]	
3938	4	8	4	11	Please consider to use percentage instead of fractions like previously used in assessments. (Here: use 50% instead of "one in two" and 66% instead of "two in three".) [Norway]	
4080	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including ‘holding warming to well-below 2°C’. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of ‘high overshoot’ pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Saint Kitts and Nevis]	
4082	4	8	4	11	[cont'd] The definition could read: 1.5°C consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers that complies with the long term temperature goal of the Paris Agreement. They provide…. the latter implies overshoot that does not exceed 0.1°C above 1.5°C. Follow up changes to the adjusted definition should also be made in all the underlying chapters. [Saint Kitts and Nevis]	
4278	4	8	4	11	Make the definition of "1.5?-consistence pathway" more clear. [Republic of Korea]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4458	4	8	4	8	Although the remaining carbon budget is closely connected to the CO2 emissions pathway, the methodology to relate the temperature to the carbon budget is not necessarily consistent with that to the emissions pathway in SR1.5, which we believe results in substantial increases in the carbon budget in SR1.5 compared to that in AR5. Therefore, the following notes should be given for the term "1.5-consistent pathways": "Consistency with 1.5 degree is assessed by the same method as in AR5, but it is not consistent with the method to estimate the remaining carbon budget in SR1.5. Geophysical uncertainties are being recognized such that the former presumes higher non-CO2 radiative forcing than the latter {2.1.3, 2.2.1, 2.6.1}." [Japan]	
5048	4	8	4	8	1.5°C-consistent pathway: A pathway of anthropogenic emissions of greenhouse gases [Hungary]	
5248	4	8	4	11	The Paris agreement clearly states "holding warming to well below 2ºC", however "well below" is not reflected here in the definition. The classification presented in Table 2.1 has a Pathway Class '1.5ºC-high-Over Shoot', which is placed under the '1.5ºC consistent' Pathway group. However this class also contains pathways with overshoot of 0.4ºC, which do not fall in the category of "well below" as mentioned in the Paris Agreement. Therefore, 'Below-1.5ºC' and '1.5ºC-low-OS' pathway class should be retained as '1.5ºC-consistent' pathway group in Table 2.1, and this should be reflected in the SPM as well. [Zambia]	
5348	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Saint Lucia]	
5350	4	8	4	11	[cont'd] The definition could read: 1.5°C consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers that complies with the long term temperature goal of the Paris Agreement. They provide…. the latter implies overshoot that does not exceed 0.1°C above 1.5°C. Follow up changes to the adjusted definition should also be made in all the underlying chapters. [Saint Lucia]	
5856	4	8	4	11	Specifying a level of probability would be beyond the role of a definition, and could be regarded as prescriptive. We suggest removing the reference to a level of probability here. If this is not possible, an alternative solution would be to write something like "A pathway of emissions (...) that provides a given probability, with our current knowledge of the climate response, that global warming either remains below 1.5°C or returns to 1.5°C by around 2100 following an overshoot. In this SPM, the assessed probability is approximately one-in-two (as likely as not) to two in three (likely)" [Belgium]	
6172	4	8	4	11	Holding warming to well below 2ºC should be reflected in the definition to be consistent with the Paris Agreement characterization. The classification presented in Table 2.1 has a Pathway Class '1.5ºC-high-Over Shoot', which is placed under the '1.5ºC consistent' Pathway group. However this class also contains pathways with overshoot of 0.4ºC, which do not fall in the category of "well below" as mentioned in the Paris Agreement. Therefore, 'Below-1.5ºC' and '1.5ºC-low-OS' pathway class should be retained as '1.5ºC-consistent' pathway group in Table 2.1, and this should be reflected in the SPM as well. [United Republic of Tanzania]	
6208	4	8	4	11	1.5°C-consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers 8 that provides an approximately one-in-two to two-in-three chance, given current knowledge of the 9 climate response, of global warming either remaining below 1.5°C or returning to 1.5°C by around 10 2100 following an overshoot...continued below. [Fiji]	
6210	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'...continued below. [Fiji]	
6212	4	8	4	11	As from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C and in my opinion, these are not compatible with the Paris Agreement temperature goal. Therefore, this can be misleading to be classified as 1.5°C pathways while in fact not even being 2°C compatible and thus classified as 1.5°C pathways. Those that are low overshoot are releatic and retained in Table 2.1. Apply consistency across all chapters. [Fiji]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6586	4	8	4	11	The Paris agreement clearly states "holding warming to well below 2ºC", however "well below" is not reflected here in the definition. The classification presented in Table 2.1 has a Pathway Class '1.5ºC-high-Over Shoot', which is placed under the '1.5ºC consistent' Pathway group. However this class also contains pathways with overshoot of 0.4ºC, which do not fall in the category of "well below" as mentioned in the Paris Agreement. Therefore, 'Below-1.5ºC' and '1.5ºC-low-OS' pathway class should be retained as '1.5ºC-consistent' pathway group in Table 2.1, and this should be reflected in the SPM as well. [Sudan]	
6698	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Marshall Islands]	
6700	4	8	4	11	[cont'd] The definition could read: 1.5°C consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers that complies with the long term temperature goal of the Paris Agreement. They provide…. the latter implies overshoot that does not exceed 0.1°C above 1.5°C. Follow up changes to the adjusted definition should also be made in all the underlying chapters. [Marshall Islands]	
6956	4	8	4	11	In the glossary, "1.5 deg. C-consistent pathway" should be renamed "1.5 deg.C- consistent model pathway", and changes to the entire text should be made accordingly. This is required to ensure the reader understands that the pathways are model based and the assessment of the feasibility or lack thereof of the model pathways in the real world has to come from outside the models themselves. Such a clarification is present in the FAQs of Chapter 2. As the SPM will be read more widely than the actual chapters and since the entire clarification will be too long to present in the SPM itself, it is suggested that the phrase be changed to reflect this in the glossary and in the text of the SPM accordingly. This is also in line with FAQ 2.1. [India]	
6958	4	8	4	11	Modify the sentence in the following manner: "A modeling scenario of the trajectory of emissions of greenhouse gases and other climate forcers that are estimated in the model to provide an approximately one-in-two to two in three chance, given current knowledge of the climate response, of global warming either remaining below 1.5°C or returning to 1.5°C by around 2100 following an overshoot. [India]	
7468	4	8	4	11	Calling a pathway that overshoots 1.5°C a "1.5°C-consistent pathway" is really very misleading given that most impacts will be determined by the peak temperature change and not the long term equilibrium temperature change. Are there any convincing scientific studies that there is some equivalence of pathways that peak at 2 or 2.5°C and come back to 1.5°C with what happens if the path does not go over 1.5°C? No. So lumping the different cases into one term based on the long-term temperature increase is inappropriate given lack of similar outcomes. Pathways should be named by the peak temperature they reach -- not the ultimate level they get back to. [United States of America]	
8382	4	8	4	11	The wording of temerature goal of Paris agreement is not reflected here in the definition. The classification presented in Table 2.1 has a Pathway Class '1.5ºC-high-Over Shoot', which is placed under the '1.5ºC consistent' Pathway group. However this class also contains pathways with overshoot of 0.4ºC, which do not fall in the category of "well below" as mentioned in the Paris Agreement. Therefore, 'Below-1.5ºC' and '1.5ºC-low-OS' pathway class should be retained as '1.5ºC-consistent' pathway group in Table 2.1, and this should be reflected in the SPM as well. [Nepal]	
8648	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Grenada]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9036	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Solomon Islands]	
9038	4	8	4	11	[cont'd] The definition could read: 1.5°C consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers that complies with the long term temperature goal of the Paris Agreement. They provide…. the latter implies overshoot that does not exceed 0.1°C above 1.5°C. Follow up changes to the adjusted definition should also be made in all the underlying chapters. [Solomon Islands]	
9104	4	8	4	11	The context of this special report is the Paris Agreement and its respective articles. This should be clearly stated in the definitions section. This has very concrete implications for the definition of 1.5°C pathways. Paris Agreement compatible pathways need to comply with the criteria set out in the Paris Agreement articles 2 and 4 including 'holding warming to well-below 2°C'. It is clear that this implies a more than 66% probability of limiting warming to below 2°C implying a peak median warming of around 1.7°C. As evident from Table 2.1, there is a class of 'high overshoot' pathways that include overshoots of up to 0.4°C. Such pathways are not compatible with the Paris Agreement temperature goal and it is very misleading that they are classified as 1.5°C pathways while in fact not even being 2°C compatible. This is not what policy makers have asked for. These pathways should therefore not be classified as 1.5°C pathways and only the low overshoot category and lower from Table 2.1 should be retained. [cont'd below] [Nauru]	
9106	4	8	4	11	[cont'd] The definition could read: 1.5°C consistent pathway: A pathway of emissions of greenhouse gases and other climate forcers that complies with the long term temperature goal of the Paris Agreement. They provide…. the latter implies overshoot that does not exceed 0.1°C above 1.5°C. Follow up changes to the adjusted definition should also be made in all the underlying chapters. [Nauru]	
7470	4	9	4	9	Strange odds. What if a pathway gives a 9-in-10 chance of 1.5°C? The use of 1/2 to 2/3 is odd. Are only those pathways with odds between 50% and 67%, but not above? [United States of America]	
3352	4	1	4	1	According to the glossary (please see "Transient climate response") the expression "climate response" refers to the response of GMST to a change in radiative forcing, not to the response of any other climate parameter. To avoid confusion, it might be useful to replace "climate response" by an expression that is easier to assess for non-specialists. [Germany]	
4964	4	1	4	11	What is meant "by around 2100"? Would, say, 2010 count? Also, why is 2100 chosen? There are pathways in the literature that reach 1.5C after 2100. Are they considered to be 1.5C consistent? If the authors have chosen to define 1.5C-consistent pathways as those remaining or returning to 1.5C by around 2100, perhaps better to mention that this is the case. [United Kingdom (of Great Britain and Northern Ireland)]	
5050	4	1	4	1	climate response, of global warming either limiting to 1.5°C or [Hungary]	
8522	4	11	4	11	End of definition should refer to 'temperature overshoot' rather than merely 'overshoot' [Ireland]	
5052	4	12	4	12	Definition of Reasons for Concern would be essential otherwise it will not be clear for the readers of the SPM (incl. PMs) when they meet this important term later in the text (i.e. for those who read only the SPM). [Hungary]	
748	4	13	4	14	Add other changes/disruptions in weather patterns : "...such as warming, sea level rise, precipitation changes, or changes in the frequency and intensity of heat waves…" [France]	
2228	4	13	4	16	There are a lot more negative than positive impacts. Proposed wording: "Most impacts are negative for lives …"; However, the added value of this second sentence is questioned (see next comment) [European Union (EU)]	
3354	4	13	4	16	This definition seems different from the one in the AR5 WG2 glossary that reads "The impacts of climate change on geophysical systems, including floods, droughts, and sea level rise, are a subset of impacts called physical impacts." In the definition of the SR1.5 physical impacts are properties of climate change itself, and no longer called impacts. If this assessment is correct, please include a footnote that highlights this change in a fundamental definition. [Germany]	
5054	4	13	4	14	Impacts: Effects of climate change, such as warming, sea level rise or changes in the frequency and intensity of heat waves or other extremes, .. ((explanation: it is important to refer to other extremes, which are also mentioned e.g. in Section B)) [Hungary]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2230	4	14	4	16	The second sentence should be deleted. It does not add value, and the mentioning of "positive or negative" outcomes (given equal weight) may wrongly suggest that the chances for the two kinds of outcomes are similar and/or that the gains caused by the positive outcomes would somehow balance the losses caused by the negative ones. This is unhelpful ad as it breeds complacency. Also, many outcomes can be neutral (or a matter of taste) or mixed or changing over time (positive on the short run, disastrous on the long run), so suggesting that they are either negative or positive is wrong. [European Union (EU)]	
3356	4	14	4	14	Insert "precipitation" before "heat waves", as heavy precipitation/droughts are among the most relevant impacts of climate change. [Germany]	
4414	4	14			Why only "heat waves"? I suggest to change it to "extreme weather" or add to "heat waves" heavy precipitation, droughts, …" too. [Czech Republic]	
8882	4	14	4	15	Suggest using the terms 'beneficial' and 'adverse' in regards to impact, instead of 'negative' and 'positive' since these are often used in a mathematical sense. [Australia]	
3358	4	15	4	15	What is meant with "positive of negative outcome for lives", in addition to mentioning health? [Germany]	
4662	4	18	4	18	It appears the authors have adopted the same definition of risk as in AR5, although the word seems to be used sometimes inconsistently in the document. For example: Page 8 line 48: “Risks associated with other biodiversity-related hazards” instead of “Impacts associated with other biodiversity-related risks”? Page 9 line 28: “Risks” instead of “risk” Page 9 line 44: “Hazards” instead of “risks” Also there are places where use of the word risk may be complicating things more than is necessary. For example: Page 10 lines 36-37: The indexes used for the RFCs are themselves risk levels, so stating that limiting to a specific warming level “reduces the risk of reaching a very high / high level” is then a risk of a risk! Better I suggest to say “reduces the risk to a very high / high level”. [United Kingdom (of Great Britain and Northern Ireland)]	
7472	4	18	4	21	The definition of "risk" seems inadequate, missing important concepts that risk levels (1) are dynamic; (2) reflect an estimated probablility (or likelihood) and scale that an adverse impact may actually occur; and (3) reflect a specified time frame. By explicitly adding these concepts to the definition, this report will be more consistent with IPCC's prior publications that define climate-related risks, for example, IPCC, 2012: Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 555-564. [United States of America]	
7474	4	18	4	21	Consider a disclaimer that risk as assessed here is not traceable, but the expert judgment of the current set of authors. [United States of America]	
7476	4	2	4	2	Instead of "uncertain" adverse outcomes, shouldn't this line refer to outcomes or surprises that cannot be predicted? [United States of America]	
7478	4	2	4	2	The phrasing "uncertain adverse outcomes of..." is obscure and limited. What about adverse outcomes of socio-economic development? [United States of America]	
8892	4	2	4	21	Suggest rephrasing sentence: From "Risk can also include the uncertain adverse outcomes of adaptation or mitigation responses." To "Risk can also include the possibly adverse outcomes of adaptation or mitigation measures." [Australia]	
750	4	23	4	24	Add "education" in the factors, in link with art 6 of FCCC [France]	
2232	4	23	4	25	Behaviour' is not a mere enabling condition. Behaviour changes are an essential part of a 1.5°C consistent pathway and a just transition to sustainable economy. One could consider adding an category : crucial elements for a 1.5°C consistent pathway. In addition, the framing of the "enabling conditions" is puzzling. It seems to assume that there could be "mitigation and adaptation options" in abstraction, independent of these "enabling conditions". That further assumes that these options are merely technical/technological fixes. This dehumanises the "global response". If there are just "enabling conditions", then who is in fact responding? The factors listed are not "enabling conditions" for some abstract response, but they are the response: changing human behaviour that manifests itself through changed individual priorities, changed policies, changed governance, changed finance priorities, etc. The technology or other mitigation options deployed are just tools and set limits to what can be achieved. A lot can be achived solely by changing behaviour (like consuming less and being more conscious of our actions). Many things cannot be achieved due to hard barirers like thermodynamics or resource constraints, regardless of "enabling conditions". [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3360	4	23	4	24	For making the definition complete as it is defined in the glossary, please replace “behaviour” by “changes in lifestyles and behaviour”. Also, to be attune with the Glossary which states "Conditions that affect the feasibility of adaptation and mitigation options, and can accelerate and scale-up systemic transitions" for enabling conditions, it may be appropriate to substitute the neutral "facilitate" by a stronger verb, such as "improve", "accelerate", "foster". [Germany]	
3362	4	23	4	25	"education", "knowledge transfer" or "access to knowledge" are mentioned throughout the report as substantial enabling factors to realize mitigation and adaptation options, but missing in the definition. Please include these factors, if the definition is kept. [Germany]	
3364	4	23	4	25	The definition of "enabling conditions" is not needed in Box SPM.1 because it is quite straight forward and not key to understanding this report. Please consider deletion. [Germany]	
4098	4	23	4	25	Technology access should be added to the list of enabling conditions (compare D6.1-3) [Saint Kitts and Nevis]	
4460	4	23	4	25	The definition of "Enabling conditions" in SPM is different from the one in Glossary. Please give us concrete reason why "technological innovation" and "institutional capacity" are not included in SPM, and "acknowledging synergies and trade-offs among different options" and "the global response" are included in SPM. Also, the definition of "Enabling conditions" in SPM starts from "Factors". If these are not conditions but factors, "Enabling conditions" may be revised to "Enabling factors". [Japan]	
5352	4	23	4	25	Technology access should be added to the list of enabling conditions (compare D6.1-3) [Saint Lucia]	
6214	4	23	4	25	Enabling conditions: Factors, including governance, policy, finance, behaviour, innovation and 23 capacity, that can facilitate the global response to climate change and that underpin the feasibility of 24 mitigation and adaptation options, acknowledging synergies and trade-offs among different options. Technology is one of the enabling conditions and should be included in the list. [Fiji]	
6702	4	23	4	25	Technology access should be added to the list of enabling conditions (compare D6.1-3) [Marshall Islands]	
6964	4	23	4	25	In the definition of ‘Enabling Conditions’, factors should also include economic status, level of industrialisation, and national circumstances. This is an important aspect of enabling conditions that is mentioned at various places in the report but is missing in the SPM. [India]	
8776	4	23	4	23	Delete: governance [Iran]	
9108	4	23	4	25	Technology access should be added to the list of enabling conditions (compare D6.1-3) [Nauru]	
3366	4	26	4	28	For a better distinction of “hazard”, “risk” and “impacts” we recommend to add the definition for “hazard” inline with the definition given in the glossary: "The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources." [Germany]	
7480	4	27	4	27	Terms that one would expect to be here, such as Carbon Dioxide Removal, Solar Radiation Management, etc., are missing. Without use of these approaches, there is really no practical (i.e., politically and economically likely to happen) way to keep the global average temperature increase below 1.5°C. [United States of America]	
5058	5		8		reference to the tipping points and their robustness or to the limitations due to non-linearity in responses might be useful [Hungary]	
212	5	1	6	28	Section A includes information on global warming as changes in temperatures but reader may miss relevant information on the current emissions which is not included and which is important also for understanding the carbon budgets. Reader finds more information and numbers on emissions from the figures and section D, but if possible, it would be good to include number information on emissions also to the text of section A. [Finland]	
314	5	1	8	12	On section A: The section provides the estimates of global warming against 1850-1900, even with standard deviations. However, it says nothing about uncertainty of this base level. The impacts result from temperatures, not from anomalies. [Russian Federation]	
316	5	1	8	12	On section A: It should be specified as ‘net cumulative CO2 emissions’, while speaking about total CO2 accumulated in the atmosphere before the emission becomes net-zero. Otherwise it is inconsistent. [Russian Federation]	
338	5	1	8	12	Many times the section presents examples of negative consequences which magnitude depends monotonously on warming. In those cases, all statements on more severe effects under +2.0ºC than under +1.5ºC are trivial. This makes sense if a rate of amplification is specified. [Russian Federation]	
2234	5	1	5	1	Replace 'Understanding' with Aspects of global warming of 1.5°C [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3368	5	1	6	31	We strongly welcome the careful and comprehensive assessment of the impacts of 1.5°C global warming, related adaptation options and of the comparison to a 2°C world which adds substantially to our understanding of this issue. To further even deeper understanding we encourage the authors to provide or to check confidence statements to each of these findings throughout the SPM, and to clearly explain the role of internal variability in assessing the differences between 1.5 °C and 2 °C worlds. Internal variability creates irreducible (aleatoric) uncertainty in the estimations of the geophysical futures under 1.5 °C and 2 °C warming. How is the "overlap" between the 1.5 °C and 2 °C worlds arising from internal variability, especially on the regional scale considered in the report? How is such uncertainty considered in the assessment of risk, impact, consequence, etc. that can be avoided by 1.5 °C rather than 2°C? And how is the uncertainty transferred to the assessment of adaptation options? It is essential to address these issues in section A or B in order to help the readers full comprehend the scientific robustness of the statements in section B. [Germany]	
4220	5	1	5	38	In the statement - 'Human-induced global warming reached approximately 1±0.2? (likely range)', 'likely range' is not a standard term for confidence as determined in AR5, due to which readers tend to confuse it with the expression in the footnote to P3. So it is suggested to reformulate '1±0.2 °C (likely range)' as what is usually worded in an IPCC report, ie, 1.0 [0.8 to 1.2] ?. [China]	
4444	5	1	5	1	It is not clear from the top figure which observational dataset that is used to plot the grey bars. If the grey bars are taken from fig 1.2 in chapter 1 they refer to the entire uncertainty interval for the observations. This is not clear from the caption in the SPM figure. In addition, chapter 1 discusses uncertainties in conventional climate temperature datasets but makes no mention of how reanalyses can be used to derive spatially consistent, globally averaged temperatures. [Singapore]	
7002	5	1	5	1	References on Global Warming Hiatus should be included in the Chapter 1 of Final Draft in section 1.1 Assessing the knowledge base for a 1.5°C warmer world. Global mean temperature over 1998 to 2013 increased at a slower rate (0.1?K decade?1), approximately one third of that from 1951 to 2012. This trend is referred to as a "global warming hiatus". Medhaug et al. (2017) suggested prominent cause of global warming hiatus as (i) external drivers, the Earth's climate response to CO2 and other radiative forcings, (ii) internal variability, which all affect the actual global temperature. The studies on global warming hiatus suggest that human influence is dominant in long-term warming. Since 1850, the warming hiatuses, cooling hiatuses, and typical warming have already occurred three times and the typical cooling has occurred twice. Knutson et al. (2016) estimated that the warming slowdown (<0.1?K decade?1 trend beginning in 1998) could persist, due to internal variability cooling, through 2020, 2025 or 2030 with probabilities 16%, 11% and 6%, respectively. Medhaug et al. (2017), Reconciling controversies about the 'global warming hiatus', Nature (2017). DOI: 10.1038/nature22315 Knutson, T. R., R. Zhang, and L. W. Horowitz (2016), Prospects for a prolonged slowdown in global warming in the early 21st century, Nat. Commun., 7, 13,676, doi:10.1038/ncomms13676. [India]	
7482	5	1	5	39	Section A.x main messages on the understanding of global warming at 1.5°C avoids any mention of the potential spatial variation in temperature as part of the summary messages. Such references only occur later in Sections B.x and later after a discussion of impacts and adaptation has already unfolded in Section A.x. This key concept underpins understanding of the significance, versus the perceived insignificance, of seemingly small global temperature changes and, more importantly, speaks strongly to the uneven distributional dimensions of impacts and adaptations. Main message A.3, while mentioning geographic locations, does little if anything to communicate this point as it is encumbered by many other competing concepts and issues that have little to do with any direct mention of temperature distributional insights. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7484	5	1	6	31	In the present draft, Section A is an overview of key findings. The narrative unfolds in such a technical way that some of the most important findings are buried. This leaves some pretty important observations from the open literature implied but never stated. For example, from the technical perspective, current nationally determined contributions (NDCs) -- if implemented successfully and maintained throughout the remainder of the 21st century -- have more than a 95% chance of ending the century with more than 2°C temperature change, open the door to much higher temperature change in this century, and establish a commitment to still higher temperature change thereafter. Furthermore, the present set of actions in place to implement NDCs will fall short and, if maintained throughout the century, virtually guarantee greater than 2°C change in average surface temperature. The latter point tends to be buried in statements such as A2.2, "If emissions continue at their present rate over the coming decades, the present rate of human induced warming of 0.2±0.1°C per decade will continue (very high confidence)." Here the implication is implied, but never stated plainly. It is also found in Section D, finding D.1. But, while more clearly stated in Section D, it is far to the back of the SPM. A sense of urgency if countries wish to achieve the 1.5 or even 2°C limit goals is not conveyed in the report. The closest to a sense of urgency that gets conveyed in Section A is in finding A.2, where the lead is a reassuring statement that "Past emissions alone are unlikely to raise GMST to 1.5°C above pre-industrial levels, but do commit to further changes such as sea-level rise and associated impacts (high confidence)." The more important point is made secondary -- that is, "If emissions continue at their present rate, human-induced warming will exceed 1.5°C by around 2040 (high confidence)." The fact that, if all emissions were to cease immediately, 1.5°C can be achieved seems important, but hardly the lead in the second most prominent finding. [United States of America]	
8736	5	1			The title of this section is unclear; it seems to summarise elements of the following sections - could the title be changed to reflect this? [New Zealand]	
752	5	3	5	4	This notation could be simplified to make it more accessible to decision makers, for example with a notation like '[0.8-1.2]°C' ; or '[0.1-0.3]°C'. [France]	
754	5	3	5	4	This sentence can create a misunderstanding. It's true that there are two global warmings, one due to humans, and another due to natural process and climate variability. But in fact, the difference between human-induced and total warming is very small (see {1.2.1.3}). The way the sentence is formulated can be confusing, because it could make the reader believe that the non-human-induced warming has the same order of magnitude as the human-induced warming. The sentence could be : « Human induced global warming reached approximately 1°C above pre-industrial levels in 2017, almost equal to the level of observed warming, and is currently increasing at [0.1-0.3]°C per decade (high confidence). » [France]	
2236	5	3	5	6	Increasing per decade gives the impression that the increase will be linear, which considering the postive and negative feedbacks may not be the case. [European Union (EU)]	
3370	5	3	5	5	Possible misunderstanding: What is meant here is that the globe is 1±0.2°C warmer today than in pre-industrial times and that global temperature is currently increasing by 0.2°C per decade. If global warming (rate) was to increase by 0.2°C per decade (as mentioned in the current text) that would end up with a global temperature of about 16°C above pre-industrial level in 2100. Please rephrase according to lines 12 to 14 on page 5. [Germany]	
3372	5	3	5	5	Is it appropriate to call the temperature increase between 1850-1900 and 2017 "global warming"? The definition in Box SPM.1 implies periods of 30 years which is inconsistent with referring to a single year, 2017. Please check. [Germany]	
3374	5	3	5	5	Please add the information that "present-day CO2-induced warming is irreversible on millennial timescales" from Chapter 1, page 24. [Germany]	
3950	5	3	5	5	Important assumptions are made in the definitions of GMST, global warming and pre-industrial that are not well explained. Uncertainties associated with the human induced global warming of 1C in 2017 should be much better emphasized in this statement (A1). The current warming is a key number for most of the main findings in the report. [Norway]	
3952	5	3	5	5	The uncertainties in the industrial era temperature change which is given symetrical of 0.2C around the 1C warming should be discussed more. What are the uncertainties and why is it symetrical? There are several reasons for a non-symetrical uncertainty, i.e. availablity of long term temperature data, the use of 1850-1900 as pre-industrial period, and different warming between land and sea etc. [Norway]	
4280	5	3	5	3	The level of human-induced global warming (1 +/- 0.2 degree) is different from the level of observed warming given in A1.1 (0.87 +/- 0.12 degree), which looks confusing. It seems that the former is the estimated value for the year 2017 while the latter is that for the decase of 2006-2015. Please clarify this difference to avoid confusion. [Republic of Korea]	
4664	5	3	5	5	It would be clearer to say that we have seen x amount of warming and that 100% of this is human induced or "human activities have caused global warming of approximately 1+/-0.2 C", ideally with a confidence statement, rather than initially describing it as human induced. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4672	5	3	5	1	The whole section reads a little confusingly - why are we talking about three different time periods (2017, 2006-2015, since 2000)? It may be somewhat confusing for readers to have to differentiate between 1C and 0.87C of warming. It's also not intuitively obvious why 2006-15 (e.g. as compared to 30 year average). Would perhaps be clearer for the reader if these data were harmonised/referred to the same time periods. Could just refer to 2017 for example. [United Kingdom (of Great Britain and Northern Ireland)]	
4676	5	3	5	14	The phrase "with a likely range" used throughout this section might be a bit confusing for the non-expert. Can the uncertainty range just be put in brackets as in line 7 ("0.87°C (±0.12°C)") and put in a footnote stating that all the uncertainties here are likely ranges? [United Kingdom (of Great Britain and Northern Ireland)]	
4966	5	3	5	1	These 2 bullet points together can be confusing for non-experts. Several different variables and several different time periods are being presented, and it won't be immediately obvious how they relate to each other. For example, in A1.1 it mentions observed global average surface temperature (which should also be "global mean" to be consistent with Box SPM.1) and then in the second sentence mentions observed warming and that this is equal to human-induced warming (which is over a 30-year period), which A1 then says is c.1C in 2017. Could this be simplified? Perhaps start with observed GMST followed by what current global warming is (explaining why it's necessary to average over a 30-year period) and then how much is due to human activities (all)? Not sure what the sentence about warming since 2000 adds unless it's indicating new understanding since AR5. [United Kingdom (of Great Britain and Northern Ireland)]	
5172	5	3	5	3	replace human-induced with anthropogenic. There is no definition for human-induced in the glossary and anthropogenic is the agreed term used by UNFCCC [Spain]	
5694	5	3	5	4	It is stated that “Human-induced global warming reached approximately 1±0.2°C (likely range) above preindustrial levels in 2017...” This statement should be clarified better - does it say that all of the observed global warming since preindustrial time is attributed to human influence, or that the the human-induced fraction exceeds the full observed warming? [Sweden]	
6140	5	3	5	1	The main message A1 is not fully explained by sub-messages of A1. It is not clear how A1 relates to A1.1, if last 10 year average (A1.1) is lower than past 30-year average (A1), does this mean that the temperature increase compared to the pre-industrial levels has started slowing down? [Estonia]	
6392	5	3	5	1	The ranges in A.1 for the period 2006-2015: 0.87C (+/-0.12)' and 1C (+/- 0.20) for 2017 in A1.1. can be explained by the record warm years 2015, 2016 and 2017. The longer period mentioned in A.1 is less warm since it also includes a number of cooler years. [Netherlands]	
6984	5	3	5	3	For clarity and consistency with A2, the phrase "due to past emissions" should be inserted between "...global warming" and "reached…" [India]	
6990	5	3	5	5	Raftery et al. (2017) reported their findings in Nature Climate Change showing that there is only 1 (5)% chance to limit global mean temperature below 1.5 (2.0) deg C by the end of 21st century. This information should be included with the reference. [India]	
7486	5	3	5	3	Use 1.0°C to be correct, otherwise 0.2°C per decade is not useful. Be consistent throughout the document. [United States of America]	
7488	5	3	5	3	The math here on degrees C of warming does not add up. The numbers come from different methods, but anyone trying to do the math will find inconsistencies. The headline says 1°C in 2017. There are two decades until 2040 (actually 2037), and the warming is 0.2°C per decade -- so that would be 1.4°C, NOT 1.5°C. Further, in line 7, there is the decadal average (2006-2015) that gives 0.87. Some come from multidecade differences and some from line fits, but this really must be consistent. [United States of America]	
7490	5	3	5	4	Statement A1 compares global average surface temperature over a single year to a base period of 50 years and attributes the difference to human-induced warming. The authors should take care when comparing temperatures averaged over time periods of different lengths, and any resulting differences in the contribution of natural variability to those temperature averages. For example, global average surface temperature in a single year would reflect interannual variability separate from human-induced warming, while a 50-year period would less so. Statement A1 does not specify whether the uncertainty of ±0.2°C reflects this natural variability, or something else such as measurement error. Suggest that the statement either compare pre-industrial 50-year base period to (i) temperature averaged over at least 30 years, in which case an anthropogenic driver may be appropriate, or (ii) temperature averaged over a single year, clearly stating the contribution of natural variability to year-to-year temperature differences. [United States of America]	
7492	5	3	5	5	What is the basis for indicating that the rate of warming is better understood than the amount of change? [United States of America]	
7494	5	3	5	5	Consider referencing Section 1.6 (confidence, uncertainty and risk) to facilitate readers' understanding of these classifications. [United States of America]	
7496	5	3	5	8	The use of "human-induced" here in combination with use of a single year (2017) implies that 100% of observed warming since pre-industrial has been human induced. And this appears at odds with the statement that, since 2000, observed warming is equal to estimated human-induced warming. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8524	5	3	5	5	Consider rephrasing for greater clarity. Human-induced global warming should be described as global annual temperature rise. [Ireland]	
9244	5	3	5	3	It should be mentioned for clarity, that human-induced global warming is calculated from models and not taken from measurements, because according to the definition in Box SPM1 (p.3 line 30-34), global warming is defined as the average over a 30y period centered over a shorter period (as the year 2017 is) and therefore only can be taken from models. This might not be clear to readers at first sight and might look contradictory to the definition in Box SPM1. [Switzerland]	
9246	5	3	5	5	In light of the large geographical spread of the observed warming relative to 1.5°C global mean warming, and the consequence of the impacts primarily on land, it would be most important to supplement this important headline statement with a quantification of the warming on land only. For example: "Considering only the land, surface warming was XX°C above pre-industrial levels in 2017, and is currently increasing at YY°C per decade." or just give the numbers in brackets for a shorter version. [Switzerland]	
9390	5	3	5	3	Use the same level of precision for central estimates as is used for uncertainty. Please write 1.0°C instead of 1°C. [Canada]	
3376	5	4	5	4	Is the range of +-0.1°C the likely range or the 5-95 percentile? Please add this information. [Germany]	
7498	5	4	5	4	Using the specific year "2017" sounds far too precise given the indicated uncertainty in the temperature change. Would it not be more appropriate to say "this decade" or something similar? [United States of America]	
3378	5	5	5	5	Why braces or curly brackets? Perhaps a short hint perhaps in a footnote on page 3 would be great that parentheses contain references within SPM and the content of curly brackets are linked to the original report as consistently realized in chapter C, page 13, line 20,29, 44, 49… [Germany]	
9248	5	5	5	1	It should be mentioned for clarity, that human-induced global warming is calculated from models and not taken from measurements, because according to the definition in Box SPM1 (p.3 line 30-34), global warming is defined as the average over a 30y period centered over a shorter period (as the year 2017 is) and therefore only can be taken from models. This might not be clear to readers at first sight and might look contradictory to the definition in Box SPM1. [Switzerland]	
350	5	7	5	1	The SPM only mentions the recent single decade reference period of 2006-2015, without discussing the uncertainties associated with using such a short time period (as eluded to in section 1.2.1.2). The definition of global warming used by the IPCC emphasises the need to use a 30-year reference period in order to limit the effect of interannual variability, and AR5 followed this recommendation. Remaining consistent with this previous work would be very useful in the SPM, particularly as the Paris Agreement's temperature goal was based upon AR5. It will be confusing for policy makers to see such a change with no clear explanation of what this change means (for uncertainties, changing carbon budgets etc.). This is especially true given the strong attention that the debate on the global warming hiatus received, a phenomenon that was later on largely linked to short-term variability (and that falls within this 10 year reference period). It might be more prudent to reserve a detailed analysis of new reference periods and their implications for AR6, as this SR is of a rather limited scope for such content. The SR's conclusions must be able to be used by policy makers in the Talanoa Dialogue, and bringing in a new reference period at this stage would be difficult in that regard. [Chad]	
3380	5	7	5	7	In contrast to A.1, the first sentence of A1.1. provides the difference between two periods and should therefore be called "observed global warming" instead of "observed GMST". This would also help distinguish the statement in A.1 (observed T-increase up to a certain year) and A1.1. (global warming referring to longer periods). If this is not the case, "Observed global average surface temperature" should be changed to "Observed global mean surface temperature" to be consistent with the acronym GMST and to not confuse unskilled readers. Wording should also be changed accordingly across the report and the SPM including in Chapter 1: p. 1-4 (last para), p. 1-7 (line 2) and p. 1-15 in the heading of Table 1.1. [Germany]	
3382	5	7	5	9	The observed GMST warming given in this paragraph refers to the increase between the periods 1850-1900 and 2006-2015. Chapter 1 reads "On the definition of warming used here, warming to the decade 2006–2015 comprises an estimate of the 30-year average centred on this decade, or 1996–2025, assuming the current trend continues and that any volcanic eruptions that might occur over the final seven years are corrected for." Does this mean that instead of writing GMST one could write "global warming" because the temperature increase refers to 30 year periods? Please check. [Germany]	
3384	5	7	5	1	The robust understanding of anthropogenic global warming as a fundamental fact needs to be conveyed to the broader audience of the SR1.5. To prevent the potential misunderstanding that anthropogenic warming is significant only since 2000 please add after the first sentence: “It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.” (AR5 WG I SPM p.17) [Germany]	
3386	5	7	5	1	Please add "accounting for uncertainty due to contributions from solar and volcanic activity over the historical period" after 20%, as in the original Chapter 1, page 4. In the current version the reader will wonder what the reason for the range of +/-20% is. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4282	5	7	5	7	Better use "global mean surface temperature" rather than "global average surface temperature" for better consistency in many places. [Republic of Korea]	
4416	5	7			Explanation of difference between GLOBAL AVERAGE SURFACE TEMPERATURE and GLOBAL MEAN SURFACE TEMPERATURE is missing. I understand the MEAN could be average or median or weighted average or ... Be careful in right using of MEAN and AVERAGE in all Report. [Czech Republic]	
4462	5	7	5	8	As "Observed global average surface temperature for the decade 2006-2015 was 0.87°C (±0.12°C) warmer than 1850 – 1900" may lead to misreading, rewriting may be required as follow: "Observed global average surface temperature for the decade 2006 – 2015 was warmer than 1850 – 1900 by 0.87°C (±0.12°C) ". [Japan]	
4666	5	7	5	8	The comparable figure (to 2003 to 2012) in AR5 WGI was 0.78, you could consider including this for comparison [United Kingdom (of Great Britain and Northern Ireland)]	
4674	5	7	5	1	Be consistent with how errors/ranges/uncertainty are reported - don't switch between % and °C [United Kingdom (of Great Britain and Northern Ireland)]	
5174	5	7	5	1	this paragrapgh is very confusing, the % of anthropogenic warming compared to the total needs to be somehow clarified [Spain]	
5250	5	7	5	1	The SPM only mentions the recent single decade reference period of 2006-2015, without discussing the uncertainties associated with using such a short time period (as eluded to in section 1.2.1.2). The definition of global warming used by the IPCC emphasises the need to use a 30-year reference period in order to limit the effect of interannual variability, and AR5 followed this recommendation. Remaining consistent with this previous work would be very useful in the SPM, particularly as the Paris Agreement's temperature goal was based upon AR5. It will be confusing for policy makers to see such a change with no clear explanation of what this change means (for uncertainties, changing carbon budgets etc.). This is especially true given the strong attention that the debate on the global warming hiatus received, a phenomenon that was later on largely linked to short-term variability (and that falls within this 10 year reference period). It might be more prudent to reserve a detailed analysis of new reference periods and their implications for AR6, as this SR is of a rather limited scope for such content. The SR's conclusions must be able to be used by policy makers in the Talanoa Dialogue, and bringing in a new reference period at this stage would be difficult in that regard. [Zambia]	
5696	5	7	7	7	Should use "Global mean surface temperature" (not "average") for clarity, following the definition in Box SPM.1. [Sweden]	
6174	5	7	5	1	It is not clear, why the decade 2006 - 2015 is chosen for illustration. To be consistent with approach used in AR , WE suggest that a comparison be made to the last threed decades to get a clear trend in decadal warming [United Republic of Tanzania]	
6216	5	7	5	1	A1.1: The underlying section 1.2.1.3. relates to a set of publications mainly from the same group based on very similar or even identical methodology that is the basis for this confidence statement. ‘Since 2000’ is very precise and points to the fact that this statement is based on studies that provide assessments of the ‘anthropogenic warming component’ based on appropriate methodological approaches rather than long term averages. At the same time, the period from 2000 is a period with strong natural variability imprint. An analysis of this debate and the implications of this statement is largely absent from the underlying chapter and requires more creaditable sienceto warrant a high confidence statement. [Fiji]	
6588	5	7	5	1	The SPM only mentions the recent single decade reference period of 2006-2015, without discussing the uncertainties associated with using such a short time period (as eluded to in section 1.2.1.2). The definition of global warming used by the IPCC emphasises the need to use a 30-year reference period in order to limit the effect of interannual variability, and AR5 followed this recommendation. Remaining consistent with this previous work would be very useful in the SPM, particularly as the Paris Agreement's temperature goal was based upon AR5. It will be confusing for policy makers to see such a change with no clear explanation of what this change means (for uncertainties, changing carbon budgets etc.). This is especially true given the strong attention that the debate on the global warming hiatus received, a phenomenon that was later on largely linked to short-term variability (and that falls within this 10 year reference period). It might be more prudent to reserve a detailed analysis of new reference periods and their implications for AR6, as this SR is of a rather limited scope for such content. The SR's conclusions must be able to be used by policy makers in the Talanoa Dialogue, and bringing in a new reference period at this stage would be difficult in that regard. [Sudan]	

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6868	5	7	5	1	The SPM only mentions the recent single decade reference period of 2006-2015, without discussing the uncertainties associated with using such a short time period (as eluded to in section 1.2.1.2). The definition of global warming used by the IPCC emphasises the need to use a 30-year reference period in order to limit the effect of interannual variability, and AR5 followed this recommendation. Remaining consistent with this previous work would be very useful in the SPM, particularly as the Paris Agreement's temperature goal was based upon AR5. It will be confusing for policy makers to see such a change with no clear explanation of what this change means (for uncertainties, changing carbon budgets etc.). This is especially true given the strong attention that the debate on the global warming hiatus received, a phenomenon that was later on largely linked to short-term variability (and that falls within this 10 year reference period). It might be more prudent to reserve a detailed analysis of new reference periods and their implications for AR6, as this SR is of a rather limited scope for such content. The SR's conclusions must be able to be used by policy makers in the Talanoa Dialogue, and bringing in a new reference period at this stage would be difficult in that regard. [Gambia]	
6976	5	7	5	8	The sentence mention that the temperature has risen by 0.87 degrees above pre-industrial but it does not specify the amount of carbon emitted since 1850 that caused this increase. This information should be incorporated. [India]	
7500	5	7	5	1	This isn't overly clear. The words essentially say all warming due to humans. What does ±20% mean? Does this mean 80 to 100% of warming for the 2006-15 time period is human-induced? [United States of America]	
8384	5	7	5	1	The SPM only mentions the recent single decade reference period of 2006-2015, without discussing the uncertainties associated with using such a short time period (as eluded to in section 1.2.1.2). The definition of global warming used by the IPCC emphasises the need to use a 30-year reference period in order to limit the effect of interannual variability, and AR5 followed this recommendation. Remaining consistent with this previous work would be very useful in the SPM, particularly as the Paris Agreement's temperature goal was based upon AR5. It will be confusing for policy makers to see such a change with no clear explanation of what this change means (for uncertainties, changing carbon budgets etc.). This is especially true given the strong attention that the debate on the global warming hiatus received, a phenomenon that was later on largely linked to short-term variability (and that falls within this 10 year reference period). It might be more prudent to reserve a detailed analysis of new reference periods and their implications for AR6, as this SR is of a rather limited scope for such content. The SR's conclusions must be able to be used by policy makers in the Talanoa Dialogue, and bringing in a new reference period at this stage would be difficult in that regard. [Nepal]	
8526	5	7	5	1	Analysis in A.1 and A.1.1. appears to miss the year 2016. Also lacks clarity on proportion of temperature rise as human-induced [Ireland]	
9392	5	7	5	7	Regarding line 7 and footnote 3: Should footnote 3 be revised from "warming TO the decade 2006-2015" to "warming FOR the decade 2006-2015"? The definition of global warming in Box SPM 1 for periods shorter than 30 years (e.g. the decade 2006-2015) says that the increase in GMST is estimated for a 30 year period centered on the shorter period. [Canada]	
1798	5	8	5	1	The last paragraph "Since 2000---+/- 20%" is very technical and difficult to understand, consider reformulation. [Denmark]	
4100	5	8	5	1	A1.1: The underlying section 1.2.1.3. relates to a set of publications mainly from the same group based on very similar or even identical methodology that is the basis for this confidence statement. 'Since 2000' is very precise and points to the fact that this statement is based on studies that provide assessments of the 'anthropogenic warming component' based on certain methodological approaches rather than long term averages. At the same time, the period from 2000 (until when?) comprises more than a decade of the so-called hiatus – a period with very strong natural variability imprint. An analysis of this debate and the implications of this statement is largely absent from the underlying chapter. It appears therefore questionable whether this science is established enough to warrant a high confidence statement and if it is required at all. [Saint Kitts and Nevis]	
4284	5	8	5	8	The meaning of the sencentence is unclear. [Republic of Korea]	
4286	5	8	5	1	It would be better to clarify "±20% range" in description of estimates of human-induced warming compared to observed warming. I think section 1.2.1 does not explain this range enough. [Republic of Korea]	
4668	5	8	5	9	This sentence isn't clear. Suggested rephrase:"Since 2000, observed surface temperatures have increased by XX°C, all of which is human-induced warming (with a likely range of +/- 20%) ." [United Kingdom (of Great Britain and Northern Ireland)]	
4670	5	8	5	9	This statement could also be strengthened - as currently written it could be interpreted as implying that a substantial human component has only occurred since 2000. However, as the underlying Chapter 1 makes clear, AR5 made clear that the net impact of solar and volcanic forcing is +/-0.1C - i.e. human activity had a dominant role. [United Kingdom (of Great Britain and Northern Ireland)]	
5056	5	8	5	8	warmer than that for the period 1850-1900 [Hungary]	
5176	5	8	5	8	replace human-induced with anthropogenic. [Spain]	

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5354	5	8	5	1	A1.1: The underlying section 1.2.1.3. relates to a set of publications mainly from the same group based on very similar or even identical methodology that is the basis for this confidence statement. 'Since 2000' is very precise and points to the fact that this statement is based on studies that provide assessments of the 'anthropogenic warming component' based on certain methodological approaches rather than long term averages. At the same time, the period from 2000 (until when?) comprises more than a decade of the so-called hiatus – a period with very strong natural variability imprint. An analysis of this debate and the implications of this statement is largely absent from the underlying chapter. It appears therefore questionable whether this science is established enough to warrant a high confidence statement and if it is required at all. [Saint Lucia]	
6394	5	8	5	1	implication of sentence unclear. It suggests all observed warming is human induced, if that is intended, why not just state that explicitly? [Netherlands]	
6704	5	8	5	1	A1.1: The underlying section 1.2.1.3. relates to a set of publications mainly from the same group based on very similar or even identical methodology that is the basis for this confidence statement. 'Since 2000' is very precise and points to the fact that this statement is based on studies that provide assessments of the 'anthropogenic warming component' based on certain methodological approaches rather than long term averages. At the same time, the period from 2000 (until when?) comprises more than a decade of the so-called hiatus – a period with very strong natural variability imprint. An analysis of this debate and the implications of this statement is largely absent from the underlying chapter. It appears therefore questionable whether this science is established enough to warrant a high confidence statement and if it is required at all. [Marshall Islands]	
7502	5	8	5	8	Given current understanding, why does the special report use such a recent year (2000) for this statement? THE SAME FINDING CAN BE EXTENDED BACK TO 1950 (WHICH TAKES 30-YEAR BASE PERIODS INTO ACCOUNT). The Climate Science Special Report stated: "The likely range of the human contribution to the global mean temperature increase over the period 1951-2010 is 1.1 to 1.4°F (0.6 to 0.8°C), and the central estimate of the observed warming of 1.2°F (0.65°C) lies within this range (high confidence). This translates to a likely human contribution of 92-123% of the observed 1951-2010 change." https://science2017.globalchange.gov/chapter/executive-summary/ [United States of America]	
8904	5	8	5	9	Suggest clarification: what is human-induced warming that can be observed separately from observations? How are the "Equal" and "+/-20%" related? [Australia]	
9110	5	8	5	1	A1.1: The underlying section 1.2.1.3. relates to a set of publications mainly from the same group based on very similar or even identical methodology that is the basis for this confidence statement. 'Since 2000' is very precise and points to the fact that this statement is based on studies that provide assessments of the 'anthropogenic warming component' based on certain methodological approaches rather than long term averages. At the same time, the period from 2000 (until when?) comprises more than a decade of the so-called hiatus – a period with very strong natural variability imprint. An analysis of this debate and the implications of this statement is largely absent from the underlying chapter. It appears therefore questionable whether this science is established enough to warrant a high confidence statement and if it is required at all. [Nauru]	
2238	5	9	5	9	what is meant with a range of 20 %? Uncertainty of +/- 20 %? [European Union (EU)]	
3388	5	9	9		It is confusing to provide ranges sometimes in absolute numbers and sometimes in percentages. Please provide consistently absolute numbers throughout the SPM. In this case, the level of warming since 2000 is unclear, hence the absolute number cannot be derived from the information in the text. [Germany]	
5698	5	9	5	9	The statement on the anthropogenic contribution to the observed warming is rather complicated. "with a likely range of +/-20%" is an unnecessarily complicated expression. It would be useful to stay closer to the earlier IPCC assessments' language. Also, how much of the observed warming since preindustrial is attributable to humans? (The second sentence would seem to be an attribution statement only for the warming since 2000.) [Sweden]	
7504	5	9	5	9	What does the ±20% refer to? This is not clear. Use the same range: e.g., with a likely range of 0.70 to 1.04°C. That would be less confusing. [United States of America]	
1768	5	12	5	12	Replace "Energy continues to accumulate..." with "Emissions are continuously released to the ..." as energy doesn't accumulate in the climate system. The issue of the climate change is because of emissions not energy. [Saudi Arabia]	
3390	5	12	5	14	The current paragraph A1.2. does not provide substantive new information beyond the headline statement A.1. Please add relevant information to A1 (in particular the better formulation for the warming per decade and the uncertainty range from A1.2) and remove A1.2. [Germany]	
4464	5	12	5	14	The use of word "Energy" is not clear. As we were unable to find any descriptions about energy accumulation in 1.2.1 or 1.2.4., request modifications of this paragraph to "Past and present greenhouse gas emissions and other anthropogenic climate forcers continue to accumulate in the climate system, causing continuous warning…" in accordance with the relevant paragraph of Cross-Chapter Box 2 in Chapter 1. [Japan]	
4678	5	12	5	14	A1.2 and 2.2 are very similar and could probably be merged [United Kingdom (of Great Britain and Northern Ireland)]	
5334	5	12	5	13	A1.2: Energy is used in the sentence but referring to GHG gases. Does not reflect what is mentioned in the Chapter. Would recommend changing to GHG Gases [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5700	5	12	5	14	The referring to "past and present" assumedly means "emissions until now" i.e. also in the absence of any future emissions (committed warming?). How many decades would apply in A1.2? The statement on what would happen "If all anthropogenic emissions … were reduced to zero immediately" is interesting from the viewpoint of scientific understanding, but purely hypotethical in the real world context. This should be made clear here. Overall, there is overlap between A1.2, A2.1 and A2.2, which confuses. Suggest combining A1.2 with A2.1 and A2.2, and displaying the combined finding under A2. [Sweden]	
5858	5	12	5	14	Readers might have difficulties to understand the meaning of the term "energy" here. Please replace with "heat". [Belgium]	
6396	5	12	5	12	the term 'present emissions' unclear. Should it not read: 'continued emissions at current annual rate' or similar? (compare A.2, line 22) [Netherlands]	
6980	5	12	5	12	The sentence mentions "Energy continues to accumulate" which needs to be explained as we are more familiar with CO2 accumulation. [India]	
8528	5	12	5	12	Amount of energy referred to is unstated, and could be included [Ireland]	
8778	5	12	5	12	Delete: past and present [Iran]	
8902	5	12	5	14	Suggest clarification: "Energy continues to accumulate in the climate system due to past and present greenhouse gas emissions and other anthropogenic climate forcers (very high confidence), causing continued warming at a rate of 0.2°C/decade with a likely range of ±0.1oC (high confidence)." "Energy" implies radiative forcing, whereas "continued warming" implies observed increase in surface temperature, as per the definition of global warming on page 3. [Australia]	
9250	5	12	5	14	Figures and quantification would be useful here. "Energy accumulates in the climate system" is too unspecific. Please add the amount of energy accumulated in the ocean. This is an important finding that merits quantification in the SPM. [Switzerland]	
756	5	13	5	13	Add "currently", since this rate is only valid for the current period : "anthropogenic climate forcers, currently causing continued..." [France]	
1796	5	13	5	14	consider: "causing continued warming at a rate of 0.2 +/- 0,1 oC" [Denmark]	
9252	5	13	5	13	The statement refers to energy uptake, of which over 90% is in the ocean, yet "warming" at the end of the sentence refers to GMST without saying so. "Surface warming" or GMST would be clearer. [Switzerland]	
758	5	14	5	14	The formulation of the likely range is ambiguous : it could make the reader think that the range is centered around zero. Rather say [0,1-0,3] [France]	
7506	5	14	5	14	How long does the 0.2°C/decade go? Certainly not for decades or centuries, so put a limit. [United States of America]	
760	5	16	5	18	We suggest to add this after the sentence, in order to bring quantitative information : "...even reaching +1.5°C in at least one season in regions representing 20 to 40% of the world population". (This information is given in page 7 chapter 1 : "20-40% of the global human population live in regions that, by the decade 2006-2015, had already experienced warming of more than 1.5°C above pre-industrial in at least one season.") [France]	
3392	5	16	5	16	Is the "global average" referring to the GMST? If so, please use only one expression and write "observed global mean surface temperature". If not, what "global average" is described? [Germany]	
3394	5	16	5	16	The statement "Warming greater than the global average is being experienced in many regions and seasons." is unclear: Is this referring to "global warming" of a 30-year period as defined in the second paragraph of Box SPM.1? If not, please write "temperature increase" instead of "global warming". [Germany]	
3396	5	16	5	18	The regions with the strongest above average warming should be mentioned. [Germany]	
3398	5	16	5	18	What is the temporal averaging for the global GMST here? Is it annual? From Fig.SPM.1.a large range of monthly GMST variability is evident. In order to identify regional warming greater than the global average, some temporal averaging is probably needed. In addition, how is this related to the definition of global warming (30 year period) and of a 1.5C warmer world? [Germany]	
3900	5	16	5	16	Please include here also the statement of section 1.2.2: “Northern-Hemisphere mid-latitude winters, are experiencing regional warming more than double the global average.” [Luxembourg]	
3940	5	16	5	17	Please consider if it is possible to indicate this by a factor. E.g. if warming over land on average is 1.5 times or 2 times higher than warming over ocean. Also please consider to include an example of where the regional amplification will occur, e.g. the Arctic. [Norway]	
4288	5	16	5	18	In particular, it is necessary to specify in detail which region and season. [Republic of Korea]	
4680	5	16	5	18	How much greater is the warming experienced by some regions and which regions? How much greater is warming over land v ocean? At the moment this statement isn't particularly useful as it is very vague. [United Kingdom (of Great Britain and Northern Ireland)]	

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5062	5	16	5	18	The first part of this text is too general in the SPM w/o copying here the relevant Figure; therefore, it could be omitted and retaining only the second part on warming over land vs over the ocean and adding the very concrete and important message from Chapter1 (page 4), so that: The average warming over land is higher than over the ocean (high confidence). Depending on the temperature dataset considered, 20-40% of the global human population live in regions that, by the decade 2006-2015, had already experienced warming of more than 1.5°C above pre-industrial in at least one season (medium confidence). [Hungary]	
5860	5	16	5	18	As it stands, the first part of the statement is obviously true : the warming cannot be rigorously homogenous in space, so some regions necessarily become more warm than others. It would be more interesting if the greater warming in some regions can be qualified, e.g. as "substantially larger than average". In addition, please check that the statement about greater warming over land than over ocean only has "high confidence" : is there any doubt ? [Belgium]	
6982	5	16	5	18	Can the difference between land and ocean warming be quantified and given? [India]	
7008	5	16	5	18	Underlying report: Chapter 1 page 17: Figure 1.3 may also include March-April-May (MAM) and October-November-December seasons. Though globally June-July-August and December-January-February-March represent extreme of summers and winters respectively, in countries like India, March-April-May is the time one experiences severe heat waves. [India]	
7508	5	16	5	18	Recommend specifically calling out/acknowledging the Arctic as one of these regions. [United States of America]	
7510	5	16	5	18	This statement is really inadequate, not just because there are not surprisingly also some regions warming less than the global average. It needs to be said clearly that the polar regions and mid- to high-latitude land areas are warming significantly more than the global average (so many important effects on the population and environment in those areas) -- and that while low latitudes are warming by less, this is mainly because a greater share of the trapped energy is going into evaporation, and this greater rate of evaporation has been leading to higher rates of precipitation, which carries its own dangers (flooding, etc.) that may well be of comparable or greater importance that the actual temperature increase. So, the sentence needs to provide more context and assessment. [United States of America]	
7512	5	16	5	18	The use of "many" in statement A1.3, "Warming greater than the global average is being experienced in many regions and seasons, with average warming greater over land than over the ocean (high confidence)" could be confusing. Section 1.2.1 (page 1-16) states that "Warming is not observed or expected to be spatially or seasonally uniform (IPCC, 2013b). A 1.5°C increase in GMST will be associated with warming substantially greater than 1.5°C in many land regions, and less than 1.5°C in most ocean regions." Figure 1.3 goes on to show regional differences in warming, but it does not quantify or state what proportion of regions are projected to experience greater than average warming. Based upon the area weighted averaging technique, this should be about half. However "many" could be interpreted to mean more than several, a plurality, half, a majority, or something else. Moreover, without quantifying "substantially warmer than 1.5°C" it is difficult to understand the meaning of how many places are projected to experience such temperatures. Regarding seasonal differences in warming, Figure 1.3 shows that DJF warming is greater than JJA, but does not support the statement that warming greater than the global average is being experienced in many seasons. Reviewers recognize that the difference between warming on land and over the ocean is particularly relevant for this document so suggest that Statement A1.3 be amended to read: [DELETE: Warming greater than the global average is being experienced in many regions and seasons with] Average warming IS greater over land than over the ocean. (high confidence). WARMING IS 0.XC GREATER THAN THE GLOBAL AVERAGE OVER X% OF THE LAND, AND 0.XC GREATER THAN THE ANNUAL AVERAGE IN X SEASON. [United States of America]	
7514	5	16	5	18	This opening has the same problem as the previous draft. Obviously warming will be greater than the average in probably half the places and certainly half the seasons. This is the very definition of 'average'! The clause on line 17 says something useful, as would a statement that Arctic warming is greater than the average. Give quantitative numbers for land and Arctic differences from the mean. [United States of America]	
8530	5	16	5	18	Could rephrase for greater clarity, perhaps as "Observed temperature increase over land is greater than over oceans" [Ireland]	
9254	5	16	5	18	This is a weak statement; WGI can do better here by providing numbers. For example, highlight polar amplification, or say e.g. "warming in 2050 xx% higher in interior of continents, yy% at high altitudes, zz% at high latitudes, and in 2100 for 1.5 and for 2°C respectively. [Switzerland]	
3400	5	19	5	19	The SPM lacks information on current climate change and its (attributable) impacts in section A. Although the SR1.5 does not focus on these issues it is important to provide the broader readership of the SPM with this important knowledge. Please add key information from chapter 3 to the para of the SPM, e.g. "The global climate has changed relative to the preindustrial period with multiple lines of evidence that these changes have had impacts on organisms and ecosystems, as well as human systems and wellbeing (high confidence)." or "Human-induced global warming has already caused multiple observed changes in the climate system (high confidence)." [Germany]	
5862	5	19	5	19	Please consider adding an extra para A.1.4 reflecting on impact of observed warming till now: proposed new §A1.4 "The current human induced global warming has already caused multiple observed changes in the climate system: more frequent heatwaves, increase of heavy precipitations and droughts" (based on summary of chapter 3) [Belgium]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
762	5	2	5	2	Suggestion : "Past emissions of GHG alone..." [France]	
2240	5	2	5	21	The placement of the confidence statement ('high confidence') at the end of the sentence suggests that it applies to the whole sentence. However, a combination of statements A1 and A2.1 suggests that the confidence for the first part of the sentence (before the comma) is only 'medium'. [European Union (EU)]	
3942	5	2	5	38	There may be unclarity in the message given in A.2.1. The message that an immediate cut in all emissions would constrain further global warming by less than 0.5, i.e. holding the global warming under 1.5C the next two-three decades and century, is not clearly distinguishable from the message of the effect of present emissions continuing (also 1.5 within 2040). A.2.3 points to emsission prior to time of warming to be determining the maximum of globale warming , and one might therefore expect a greater difference between the two emission scenarios in the next two decades (one with zero emission the next two decades and one with continued emissions)? The way it is formulated, one would conclude that 1.5 degrees is reached independently of emissions from now on until 2040? Can you explain better the difference between the case explained in A2.1 and the case in A2.2 when it comes to global GMST. Furthermore we recognize that in A2.2 it seems that with continued emission 1.5 will be reaced around 2040-2045 with very high confidence while in A2.1 it is said that if all emissions stop it is only high confidence related to a holding the warming below 1.5 over the next two to three decades. [Norway]	
4222	5	2	5	21	The IPCC Fifth Assessment Report (AR5) clearly states that global warming depends on cumulative emissions, ie: Cumulative emissions of CO2 largely determine global mean surface warming by the late 21st century and beyond. Such emissions not only determine the future warming trend, but also have caused the current warming of 1? above preindustrial levels. However, the statement in this paragraph may mislead policymakers. So it is suggested that this paragraph be reformulated to read: Cumulative emissions of CO2 largely determine global mean surface warming by the late 21st century and beyond. Past emissions have caused approximately 1°C global warming above pre-industrial levels and do commit to further changes such as sea-level rise and associated impacts (high confidence). [China]	
4290	5	2	5	21	It would be better to move 2 lines about past emission and commitments at the A2 to an additional bullet under A2. [Republic of Korea]	
5178	5	2	5	23	split into two separate headlines with this one first: If emissions continue at their present rate, human-induced warming will exceed 1.5°C by around 2040. This is an important message that needs to be more strongly highlighted. Also, replace human-induced with anthropogenic. [Spain]	
5820	5	2	5	23	This paragraph is confusing, presenting conflicting ideas regarding the relative contribution of past emissions to current GMST. The likely contribution of past emissions should be presented in a clear manner, making the argument flow from A1 to A2 seamlessly. The particular example that past emissions commit to further changes, such as sea-level rise and associated impacts, does not serve the propose of explaining the concept presented in the first sentence of this paragraph and can distract from the core fundamental idea. We propose the following redrafting: A2. Past emissions are responsible for current warming, although they alone are unlikely to raise GMST to 1.5°C above pre-industrial levels. Past emissions also already commit to further changes resulting from global warming, such as sea-level rise and associated impacts (high confidence). If emissions continue at their present rate, human-induced warming will exceed 1.5°C by around 2040 (high confidence). {1.2, 3.3, Figure SPM 1} [Brazil]	
5864	5	2	5	23	Please consider splitting § A2 in 2 § to improve readability. We suggest moving the 2nd sentence ('If emissions continue ...') after § A.2.1. [Belgium]	
6398	5	2	5	23	2040 is too precise given the uncertainties.It should be somewhere between 2031 and 2050. Please make use of the statement in Chapter 1, page 26: Leach et al. (2018) use a central estimate of human-induced warming of 1.02°C in 2017 increasing at 0.215°C per decade (Haustein et al., 2017), to argue that it will take 13–32 years (one-standard-error range) to reach 1.5°C if the current warming rate continues, allowing 25–64 years to stabilise temperatures at 1.5°C if the warming rate is reduced at a constant rate of deceleration starting immediately. [Netherlands]	
6966	5	2	5	23	The SPM has no mention of past emissions at all. Unlike the IPCC AR5 which provided values for the entire carbon budget as well as the future emissions, this report as also the SPM does not provide the numbers for past emissions which provide a useful context for assessing the feasibility of 1.5. deg. C. This is stated in Chapter 1 of the report itself - “It is frequently asked whether limiting warming to 1.5°C is ‘feasible’ (Cross–Chapter Box 3 in this Chapter). There are many dimensions to this question, including the warming ‘commitment’ from past emissions of greenhouse gases and aerosol precursors.” This discussion cannot be complete without an upfront mention of the actual past cumulative emissions and the entire carbon budget. This can be added before or after line 3 on page 5 of the SPM where current human induced warming is discussed. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6968	5	2	5	21	The first sentence in Section A2 should be removed. Not only past emissions but future emissions alone are also unlikely to increase temperature above 1.5 deg. C. The relevant section in Chapter 1 of the SOD which refers to Matthews and Solomon, 2013 says “Thus, although present-day CO 2 -induced warming is irreversible on millennial timescales (without human intervention such as active carbon dioxide removal or solar radiation modification (Section 1.4.1)), past CO 2 emissions do not commit to substantial further warming (Matthews and Solomon, 2013). They only speak about “further” warming and not about 1.5 deg. C as a whole of which 1+/- 0.2 deg. C warming has already happened because of past emissions. This statement also contradicts the statement in A1.2 which acknowledges the significance of past and present emissions. [India]	
6986	5	2	5	24	Refer to the underlying report: Chapter 1, “Past emissions are unlikely to raise GMST to 1.5 deg C above pre-industrial level” needs to be modified with the quantification of the rise in temperature by the end of 21st century due to past emissions. [India]	
6992	5	2	5	23	The basis of “past emissions alone are unlikely to raise GMST to 1.5deg C above pre-industrial level” needs to be discussed in SPM. From the present formulation, it is unclear as to what extent the past emissions are likely to contribute to global warming by the end of century. Therefore, it is essential to inculde past emissions contribution to GMST by the end of 21st century in absolute terms. In chapter1: “Past emissions are unlikely to raise GMST to 1.5 deg C above pre-industrial level” needs to be modified with the quantification of the rise in temperature by the end of 21st century due to past emissions. [India]	
7516	5	2	5	2	A2 seems almost in conflict with A1.2 and both discuss the warming from previous emissions. [United States of America]	
7518	5	2	5	2	1.5°C is a 'further change' than now, agreed, so what is the further change in sea level? from now? from when 1.5°C is reached? but past emissions are not going to reach 1.5°C? 0.2°C/decade from past emissions is expressed above (time de-limited). "Associated impacts" is too vague. Are they associated with SLR, with CO2, with.... [United States of America]	
7520	5	2	5	23	Change to "... human-induced warming will exceed 1.5° ± 0.5°C by around 2040...". The same error bar should be added whenever 1.5°C warming mentioned. [United States of America]	
8532	5	2	5	22	Clarify references to emissions as to GHG emissions and use consistent language in relation to human-induced global warming [Ireland]	
8738	5	2	5	23	Past emissions alone, without considering system’s tipping point and return loops, are unlikely to raise GMST to 1.5°C above pre-industrial levels, /…/ Explanation: In the section C (especially C1.2), it is clearly stated that estimates of remaining carbon budgets for 1,5 vary by more than 50% due to assessed uncertainties; while climate system's tipping points and return loops have not even been considered. It is therefore needed that the message at the beginning of the Summary does not portray an overly optimistic outlook. [Slovenia]	
8780	5	2	5	2	Delete: alone are unlikely to raise GMST to 1.5°C above pre-industrial levels, but [Iran]	
8862	5	2	5	21	Suggest including probablistic terms in the statement to be consistent with other statements: "Past emissions alone are unlikely to raise GMST to 1.5°C above pre-industrial levels, but do commit to further changes such as sea-level rise and associated impacts". Suggest clarify that 'commitment' may imply more than just sea-level rise. As such, suggest re-wording as: "Past emissions alone are unlikely to commit the earth to a GMST rise of 1.5°C above pre-industrial levels, but are likely to commit Earth to further long-term changes in the climate system, including sea-level rise and its associated impacts". [or similar wording] [Australia]	
8898	5	2	5	21	Suggest rephrasing sentence to clarify that these changes will occur even if emissions were stopped today. From: "commit to" To: "will result in" [Australia]	
9256	5	2	5	2	Emissions of what? CO2, or all greenhouse gases, or all radiatively relevant species? Probably all but this is not clear, yet it makes a big difference to whether the statement is correct or not. See for example IPCC WG1 AR5 FAQ 12.3 [Switzerland]	
9394	5	2	5	21	The phrase, "but do commit to further changes such as…" could be better clarified. Instead, it could be phrased as, "but will continue to increase sea-level rise and associated impacts" (phrasing directly from Chapter 1, page 28, line 2). [Canada]	
1794	5	21	5	21	Add statement on current trajectory and NDC's, for instance: "The current nationally determined contributions to GHG emission reduction do not limit warming to 1.5 degrees. Depending on mitigation decisions after 2030 they cumulatively track toward a warming of 3-4 degrees C above preindustrial temperatures by 2100" [1.1.3] [Denmark]	
3402	5	21	5	21	For easier understanding please write "but do commit to further changes in the Earth system such as sea-level rise." It would also be good to start a new sentence for this important statement. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4466	5	21	5	23	The sentence "If emissions continue at their present rate, human-induced warming will exceed 1.5°C by around 2040" should be modified to “If emissions continue at their present rate of inducing 0.2°C warming per decade, human-induced warming will exceed 1.5°C by around 2040 with the time range of around between 2075 and 2030 due to the uncertainties of present increase rate of between 0.1 and 0.3°C per decade, respectively.” This sentence is highlighted in boldface in the SPM, but not included in Executive Summary of Chapters 1 and 3. If it is regarded an important message, we would suggest it be added in Executive Summary of Chapter 1 or 3. [Japan]	
4968	5	21	5	22	".. Commit to further changes such as sea-level rise…" - this makes it sound like sea-level rise hasn't yet happened. Rephrase to "…commit to other changes, such as further sea-level rise…" [United Kingdom (of Great Britain and Northern Ireland)]	
7522	5	21	5	21	Should it not say "do commit the world" [United States of America]	
8896	5	21	5	21	Suggest clarification: should this phrasing be "contribute" instead of "commit"? [Australia]	
9396	5	21	5	22	This text states: "If emissions continue at their present rate, human-induced warming will exceed 1.5C by around 2040.", whereas the text in Figure SPM.1 states: "At the present rate of human-induced warming global temperatures would reach 1.5C around 2040". Chapter 1, pg 45, states: 'If the current warming rate continues, the world would reach human–induced global warming of 1.5°C around 2040.'. Thus 1) the underlying analysis is based on warming rate, not emissions continuing at its present rate. Constant CO2 emissions may correspond to approximately a constant warming rate, but this relationship doesn't hold for other forcings. 2) This sentence says 'by around 2040' whereas underlying analysis and chapter say 'around 2040'. These are different because 'by around 2040' allows that the limit could be exceeded substantially before 2040, where 'around 2040' does not [Canada]	
214	5	22			From the communication perspective starting paragraph with the second sentence "If emissions continue at their present rate…" would be better. [Finland]	
764	5	22	5	22	We suggest to write "If warming continues at its present rate..." instead of "if emissions continue at their present rate..." because there is nothing in the report that gives the future rate of human-induced warming as a function of future emissions. [France]	
3404	5	22	5	22	Please exchange "rate" by "level" if the paragraph is kept. [Germany]	
3406	5	22	5	23	The statement that with current emissions warming would reach 1.5C by 2040 does not seem supported by underlying assessment. It is based on the assumption that the temperature response would be the same as in the past decades. We suggest changing the text in A2 to " If the current warming rate of 0.2+/- 0.1°C per decade continues, the world would reach human–induced global warming of 1.5°C around 2040" and to delete paragraph A2.2. [Germany]	
4292	5	22	5	23	"around 2040" is an important message, and providing uncertainty range would be useful.It will be better to add uncertainty, express the range referring the latest papers (i.e. ±5 yesrs) or add references about that. Also, linking this with A2.2 would strengthen the conclusion. [Republic of Korea]	
4682	5	22	5	23	It should be noted here that individual years may well exceed 1.5 prior to this point. [United Kingdom (of Great Britain and Northern Ireland)]	
5064	5	22	5	22	emissions continue at their present rate, human-induced global warming [Hungary]	
6400	5	22	5	22	the term 'rate' is ambiguous and can be misunderstood (e.g. rate of change). May require attention throughout the SR, or explained in Definitions section. But from SPM 1 it seems to follow that 'the rate of human-induced warming' is meant. A reference to SPM 1 could be included here. [Netherlands]	
8460	5	22	5	23	Is it with NDCs or without. There was a need to mention the business as usual scenario and the rate after the implementation of the current level of the aggregate effect of countries' ambition through the INDCs. This will be useful to Governments so that they know the effect of their past efforts and the potential effect of further ambitions. The UNFCCC published a preliminary report in 2015 of the aggregate effect of NDCs. It could be helpful [Zimbabwe]	
9258	5	22	5	22	"emissions continue at their present rate" is not unambiguous as one could interprete it as "rate of change". Unambiguous wording would be "emissions continue at their present level". [Switzerland]	
9398	5	22	5	23	The conclusion here states that human-induced warming will exceed 1.5C by around 2040 (high confidence). The word 'around' is undefined by the IPCC. Its definition would affect the confidence level. Remove the word 'around' and if necessary include a later year so that the assessed statement can still be made at high confidence. For example, consider: "If emissions continue at their present rate, human-induced warming will exceed 1.5°C by 204x (high confidence)." [Canada]	
352	5	25	5	29	The last sentence given in Executive Summary of Chapter 1 for this particular point should come here, which is "A warming greater than 1.5°C is therefore not geophysically unavoidable: whether it will occur depends on future rates of emission reductions." [Chad]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3408	5	25	5	29	If it is intended to convey the message that limiting warming to 1.5°C is still geophysically feasible, we recommend to state this in a clearer manner, using the information given in chapter 1 ES on page 4, in particular the last sentence which is easier to understand for non-experts. “A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions.“ [Germany]	
3410	5	25	5	29	This statement is confusing because it indicates that stopping GHG and aerosol emissions immediately could still lead a further warming of up to half a degree, which is significant in the context of 1.5C global warming. Such further warming would not be consistent with the information provided in AR5, WG1, FAQ12.3 and in SR1.5 SOD, Ch1 that read on Page 5 "If all anthropogenic emissions were reduced to zero immediately, any further warming beyond that already experienced would last at most a decade and be indistinguishable from natural variability over that time." Looking at the yellow line in Figure 1.5 the temperature response seems to raise by about +0.1 C shortly after stopping the emissions and falls to about - 0.2C below the time of stopping the emissions at the end of the century. We suggest deleting paragraph A2.1, because the main message is given in the first sentence of para A.2, the relevant references including to Figure 1.5 should be added to para A.2. Additional information on the role of non-CO2-forcers is given in para A2.3. [Germany]	
3412	5	25	5	32	If A2.1 was kept we suggest to switch A2.1 and A2.2, so that statements on present rates appear first followed by the scenario that emissions were reduced to zero immediately. [Germany]	
4468	5	25	5	29	Request to include how the differences between GWP and GTP were organized when various analyses about multiple climate forcers are combined (as provided in Cross-Chapter Box 2 in Chapter 1),as this will be very helpful for the reader. [Japan]	
4470	5	25	5	32	The statements in the SPM A2.1 and A2.2 are probably based on the following text in the last paragraph in Chapter 1, Section 1.2.4 Geophysical warming commitment (p.24). In terms of clarity, Japan would appreciate it very much if a footnote could be added to provide relevant information on how this expert judgement was reached. "Expert judgement based on the available evidence (including model simulations, radiative forcing and climate sensitivity) suggests that if all anthropogenic emissions were reduced to zero immediately, any further warming beyond the 1°C already experienced would likely be less than 0.5°C over the next two to three decades, and also likely less than 0.5°C on a century timescale". Furthermore, with due respect to the intricacies of the expert judgement, it would be much appreciated if supplementary explanation could be provided regarding the differences in the confidence level from medium confidence to high confidence, corresponding to the warming scale in the next 20 to 30 years in comparison to that in the next 100 years, especially in relationship to the slightly downward tendency of the yellow/orange line (Zero GHG and aerosol emissions) in Figure 1.5 in Chapter 1.2.4. In addition. for higher clarity, it would be beneficial if supplementary explanation could also be provided regarding the confidence level (very high confidence) mentioned in SPM A2.2, specifically in relationship to the blue dotted line in the aforementioned Figure 1.5. [Japan]	
4970	5	25	5	29	This paragraph is useful but it seems to combine several important points making it difficult to understand where the last part of the para ("due to the compensating effects…") fits in. The first point would seem to be that if all anthro emissions are reduced to zero, then there would still be some warming over the next 1 or 2 decades because of the loss of cooling aerosols. Second point is that that warming would likely be less than 0.5C. Third point is that warming over the next century would also likely be less than 0.5C. Final point is (I think) that the uncertainty in the amount of warming (?) is due to the compensating effects of different climate processes (e.g. TCRE, methane release) and climate forcers. Is this correct? If so, it would be good to be clearer on this. [United Kingdom (of Great Britain and Northern Ireland)]	
5252	5	25	5	29	The last sentence given in Executive Summary of Chapter 1 for this particular point should come here, which is "A warming greater than 1.5°C is therefore not geophysically unavoidable: whether it will occur depends on future rates of emission reductions." [Zambia]	
6218	5	25	5	29	A2.1: What is the basis for this assessment of the lower confidence for the long term: ‘and likely less than 0.5°C on a century timescale (medium confidence), due to the opposing effects of different climate processes and drivers’? Examination of 1.2.4 reveals the following: ‘Some studies estimate a larger ZEC from CO2, but for cumulative emissions much higher than those up to present day (Fro?licher et al., 2014; Ehlert and Zickfeld, 2017) ‘‘past CO2 emissions do not commit to substantial further warming (Matthews and Solomon, 2013)‘ Therefore suggest merged statement without timescales and high confidence [Fiji]	
6590	5	25	5	29	The last sentence given in Executive Summary of Chapter 1 for this particular point should come here, which is "A warming greater than 1.5°C is therefore not geophysically unavoidable: whether it will occur depends on future rates of emission reductions." [Sudan]	
6870	5	25	5	29	The last sentence given in Executive Summary of Chapter 1 for this particular point should come here, which is "A warming greater than 1.5°C is therefore not geophysically unavoidable: whether it will occur depends on future rates of emission reductions." [Gambia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6970	5	25	5	29	This statement should be removed. It has no place in the SPM where it is evident that immediate cessation of all emissions is neither possible nor the subject matter of any practical discussion. The context for its use in the relevant Chapter (Chapter 2 of the report) is to isolate the continued warming effect into the future, of past emissions, including the effect of non-CO2 GHGs. It has no relevance in the SPM. [India]	
7000	5	25	5	29	This formulation makes little sense. The underlying point is the same as in A2, but written in a way that proposes a highly unlikely counterfactual: "if all anthropogenic emissions … were reduced to zero immediately." The information content is already covered in the formulation in A2. To illustrate the confusion that could arise with such formulations, one could equally write: "If all past emissions were to be immediately removed from the atmosphere through geoengineering, future emissions projected by NDCs are unlikely to ..." This could be an equally factually accurate statement but just as meaningless. THis formulation risks creating the artificial impression that past emissions are inviolate while future emissions are infintely elastic. The reality is more complex. The IPCC should avoid if-then counterfactual statements. [India]	
7524	5	25	5	29	Page 1-22 (Section 1.2.4) states that "Expert judgement based on the available evidence (including model simulations, radiative forcing and climate sensitivity) suggests that if all anthropogenic emissions were reduced to zero immediately, any further warming beyond the 1°C already experienced would likely be less than 0.5°C over the next two to three decades, and also likely less than 0.5°C on a century timescale," which is repeated in SPM A.2.1. Page 1-23 goes on: "If present-day emissions of all GHGs (short- and long-lived) and aerosols (including sulphate, nitrate and carbonaceous aerosols) are eliminated (Figure 1.5, yellow line) GMST rises over the following decade. This initial warming is followed by a gradual cooling driven by the decline in radiative forcing of short-lived greenhouse gases (Matthews and Zickfeld, 2012; Collins et al., 2013). Peak warming following elimination of all emissions was assessed at a few tenths of a degree in AR5, and century-scale warming was assessed to change only slightly relative to the time emissions are reduced to zero (Collins et al., 2013)." (1-23 and fig 1.5). However based upon the figure and the first quoted sentence, it could be misleading for the SPM statement A2.1 to simply repeat the quotes statement from page 1-22. The latter quoted text highlights a key timeframe, that of continuing rising temperatures. Suggest that statement A2.1 be amended to read "If all anthropogenic emissions (including greenhouse gases, aerosols and their precursors) were reduced to zero immediately, it is [PROBABILITY] [DELETE: likely] that WARMING WOULD CONTINUE FOR THE NEXT DECADE. Any further warming would likely be less than 0.5°C over the next two to three decades (high confidence), and LIKELY less than 0.5°C on a century time scale (medium confidence), due to the compensating effects of different climate processes and climate forcers. {1.2.4, Figure 1.6}" [United States of America]	
8386	5	25	5	29	The last sentence given in Executive Summary of Chapter 1 for this particular point should come here, which is "A warming greater than 1.5°C is therefore not geophysically unavoidable: whether it will occur depends on future rates of emission reductions." [Nepal]	
8534	5	25	5	26	Define "immediately" - refer to 2018 or 2019 (if this is what is meant), for clarity. [Ireland]	
8536	5	25	5	29	This point is counterfactual and would imply a collapse of global food production. Could benefit from rewording to refer to fossil fuel emissions, land use and non-CO2 emissions or wording to that effect [Ireland]	
9112	5	25	5	2	A2.1: What is the basis for this assessment of the lower confidence for the long term: 'and likely less than 0.5°C on a century timescale (medium confidence), due to the opposing effects of different climate processes and drivers'? Examination of 1.2.4 reveals the following: 'Some studies estimate a larger ZEC from CO2, but for cumulative emissions much higher than those up to present day (Fro?licher et al., 2014; Ehlert and Zickfeld, 2017) ' 'past CO2 emissions do not commit to substantial further warming (Matthews and Solomon, 2013) ' Therefore suggest merged statement without timescales and high confidence. [Nauru]	
1770	5	26	5	26	This is very vague statement, not scientifically sound because of uncertainties: immediate reduction of emissions to zero is not a feasible scenario and should not be used to substantiate warming levels which should be based on realistic assumptions and scenarios. This statement is not specific to the 1.5? C and is based on deduction. [Saudi Arabia]	
4684	5	26	5	27	Is it necessary to make the distinction between likely less than 0.5 in the next few decades and on a century timescale? Might just confuse the reader. If it is, then better to use the exact wording in the underlying chapter: "… and also likely…" [United Kingdom (of Great Britain and Northern Ireland)]	
3414	5	27	5	27	Replace "on a century time scale" (could be one or more centuries) by "by the end of the century". [Germany]	
1804	5	28	5	28	delete "due to the compensating..forcers". Section 1.2.4. og the underlaying science-report 4 defines geophysical warming commitment as the unavoidable future warming resulting from physical Earth system inertia. It is unclear what compensation effects of different climate processes and climate forcers are, when in-fact, the key message is that there is a geophysical warming commitment already build in the climate system. [Denmark]	
4686	5	28	5	29	The text should be clearer on what is meant by "due to the compensating effects of different climate processes and climate forcers", as this will not be clear to a non-specialist. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7526	5	28	5	28	"due to the compensating effects of..." is far too vague. Elaborate. [United States of America]	
9260	5	28	5	29	"due to the compensating effects of different climate processes and climate forcers". It is not clear. Without saying what those processes and forcers are this is more confusing than helpful. Either this should be expanded to explain, or dropped. Since the statements for both timescales are the same except for the confidence this could be merged to "less than 0.5°C (high confidence over the next two to three decades, medium confidence on a century timescale)" [Switzerland]	
3416	5	29			The reference to Figure 1.6 “Schematic of report storyline” seem not to be correct, it should be Figure 1.5. [Germany]	
4688	5	29	5	29	This reference should be to Fig 1.5 not Fig 1.6 [United Kingdom (of Great Britain and Northern Ireland)]	
6402	5	29	5	29	Reference to Fig. 1.5 instead of Fig 1.6 [Netherlands]	
216	5	31	5	32	It becomes clear in the figure SPM 1 that temperature trajectory reaches 2 degrees after 2060. This is indirectly stated in the section A2.2. but this could be said in more straightforward manner in order to highlight the fact. Add for example: “per decade will continue and warming will exceed 2°C by around 20XX” [Finland]	
766	5	31	5	32	Nothing in the chapters gives this information. We suggest to delete it. {1.2.4} states : "Leach et al. (2018) use a central estimate of human-induced warming of 1.02°C in 2017 increasing at 0.215°C per decade (Haustein et al., 2017), to argue that it will take 13–32 years (one-standard-error range) to reach 1.5°C if the current warming rate continues". A2.2 would be correct if "warming" is written instead of "emissions", but then the sentence is a tautology. [France]	
2242	5	31	5	32	duplication simitar content as A.1 [European Union (EU)]	
3418	5	31	5	31	Please add "emissions" before the parentheses to increase clarity. [Germany]	
3420	5	31	5	32	It should be pointed out, that this statement only applies to the global average value. Please add "global" to the sentence: "… human induced global warming 0.2C..." [Germany]	
3422	5	31	5	32	In A2.2 you state that there is a "very high confidence" that "the present rate of human induced warming of 0.2±0.1oC per decade will continue" for the current emission rate. Compare your sentence in A1.2 where you speak of "high confidence" in relation to the 0.2°C/decade: "causing continued warming at a rate of 0.2°C/decade with a likely range of ±0.1oC (high confidence)." Which of these uncertainty qualifiers is correct? [Germany]	
3944	5	31	5	32	A2.2, Please specify if "present rate" means "continued level of approx. 40 GTCO2 per year" or if emissions are assumed to increase with the same yearly rate as the previous decade (e.g. 2.2% per decade [AR5]). [Norway]	
4472	5	31	5	32	It is not clear where this paragraph is referred to in subsections 1.2.1 and 1.2.4. [Japan]	
4978	5	31	5	32	What is the current emissions rate? This is an important piece of information that should be included in the SPM. [United Kingdom (of Great Britain and Northern Ireland)]	
4980	5	31	5	32	It's not clear how this number has been derived. The statement in FAQ1.2 says: "if the current warming rate continues" and not "if emissions continue at their present rate". Based on current CO2 emissions only and the TCRE in Chapter 2, 1.5C would be reached around 2050, so does this SPM statement mean all anthropogenic emissions? If so, this needs to be stated, and the easily traceable in the underlying chapter. If this is incorrect, then it should stick to the wording from FAQ1.2. [United Kingdom (of Great Britain and Northern Ireland)]	
5066	5	31	5	31	A2.2. If global emissions continue [Hungary]	
6404	5	31	5	32	Not clear what is meant by 'rate'. Probably 'rate of change' or 'increase of emissions continue at their current rate' [Netherlands]	
6972	5	31	5	38	Invert the order of sections A2.2 and A2.3. [India]	
7528	5	31	5	31	Insert "global" before "emissions". [United States of America]	
7530	5	31	5	32	An addition needs to be made to this sentence indicating the total warming expected by 2050 and 2100 and comparing this to the times in the past when such warming has occurred -- while also indicating that ongoing environmental changes will continue well beyond 2100, etc. [United States of America]	
7532	5	31	5	32	This follows from A1.2 for continued emissions, but the math does not add up: 1.0°C now, + 2 decades x 0.2° does not equal 1.5°C. [United States of America]	
7534	5	31	5	32	If "emissions" means anthropogenic emissions, then this assertion ignores positive feedbacks that could lead to increased total emissions even in the face of no change in direct anthropogenic emissions. The assumption of no positive feedbacks at least should be explicitly acknowledged in the SPM and the underlying text. [United States of America]	
9262	5	31	5	31	"emissions continue at their present rate" is not unambiguous as one could interprete it as "rate of change". Unambiguous wording would be "emissions continue at their present level". [Switzerland]	
3424	5	32	5	32	Please explain to the audience of the SPM what "+-0.1°C likely range" means. Is it the 66-100% of the observations according to footnote 2 (which does not really make sense) or is it the 5-95 percentile of the observations which is associated with a likelihood of 66-100% as in AR5? [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7536	5	32	5	32	The underlying text to support this statement is in 1.2.4: "Leach et al. (2018) use a central estimate of human-induced warming of 1.02°C in 2017 increasing at 0.215°C per decade (Haustein et al., 2017), to argue that it will take 13-32 years (one-standard-error range) to reach 1.5°C if the current warming rate continues." However Haustein et al. (2017) estimates the decadal rate of warming over the past 20 years. It does not project a future warming rate. Suggest replacing the Haustein et al. (2017) reference with one that estimates a projected rate if warming over the next several decades, or removing statement A2.2. [United States of America]	
1800	5	34	5	34	Include statement on timing of net-zero CO2 . "Stabilising GMST requires net-zero CO2 emission by mid-century [fig 2 in SPM] and declining…" [Denmark]	
1876	5	34	5	46	Add statement(s) to corroborate revised A2.3/A3. "Bringing forward the date of net-zero emissions from 2055 to 2040 increases the chance of limiting warming at 1.5o C" [Denmark]	
1878	5	34	5	46	Add statement to corroborate A2.3/A3: "All analysed 1.5o C-consistent pathways use carbon dioxide removal to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also achieve net-negative emission to allow temperature to return to 1.5 oC following an overshoot (high confidence) [2.2, 2.3, 2.6, 4.3.7]" [Denmark]	
1880	5	34	5	46	Add statement to corroborate A2.3/A3 "The longer the delay in reducing CO2 emission toward zero, the larger the likelyhood of exceeding 1.5o C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5 oC (high cofidence) [2.2, 2.3, 2.6, 4.3.7] [Denmark]	
1882	5	34	5	46	Add statement to corroborate A2.3/A3. "Failure to reduce non-CO2 forcing after 2030 reduces the chance for limiting warming to 1.5oC" [Denmark]	
2244	5	34	5	39	CO2 captured and stored by ecosystems needs to be also considered. Stabilising GMST needs to consider all solutions not merely the technological solutions see http://www.drawdown.org [European Union (EU)]	
2246	5	34	5	38	The wording of this paragraph implies that non-CO2 emissions are an afterthought. This must be corrected. For example, the concept of "net-zero CO2 and declining total radiative forcing" should be explained more clearly. How does this relate to say for instance climate neutrality or the wording of the Paris Agreement that refer to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century? Such an explanation could be included in A.2.3 or in the central definition box. [European Union (EU)]	
2248	5	34	5	38	The statement - in particular after the first sentence - is written in a very complex manner, not appropriate for a Summary for Policymakers. [European Union (EU)]	
3426	5	34	5	38	While paragraph A2.1 addresses clearly all kind of anthropogenic emissions and also lists these, paragraph A2.3 only addresses CO2 explicitly and comprises all other greenhouse gases under the term of radiative forcing. This may lead to misinterpretation as non-expert readers may not be aware that other greenhouse gasses are covered by the term of radiative forcing. Furthermore, it is not clear, why CO2 is taken into account separately while there is an averaged statement for all other kinds of radiative forcing. Please clarify why does not the statement cover net greenhouse gas emissions. The concept of "net-zero CO2" may lead to unfavourable priority setting for measures. E.g. for rewetting drained wetlands it is not the most important fact, to minimize CO2-emissions but to minimize overall greenhouse gas emissions. Please see also our suggestion for amendments of this paragraph. [Germany]	
3428	5	34	5	38	We strongly suggest to improve comprehensibility of this paragraph and to use less scientific jargon in order to explain the role of CO2 and non-CO2 for global warming to the audience of the SPM. It would be useful to explain "non-CO2" in relation to "greenhouse gases" which are mentioned in the Paris Agreement. It would also be helpful to add the information that CO2 accumulates in the atmosphere for centuries or millennia and that thus long-term warming is largely dominated by current and past CO2 emissions, and this requires net-zero. Non-CO2-forcers on the other hand mainly contribute to the present warming and that thus instead of net-zero, stabilisation/decline is required. It would be very useful to avoid the term "radiative forcing" or to at least to increase the understandability of footnote 4 for non-experts. [Germany]	
4102	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world. [cont'd below] [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4104	5	34	5	38	[cont'd] Achieving a balance as laid out in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot (that is present in the vast majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Closer investigation into the underlying Cross-Chapter box 2 reveals that this statement is related to a discussion of global warming potentials. CC box 2 also discusses the implications of those different potentials. Although this represents a most welcomed scientific progress, the box completely misses a clear reference to the scientific basis for the Paris Agreement. It even explicitly states that to "Understanding the implications of different methods of combining emissions of different climate forcers is, however, helpful in tracking progress towards temperature stabilisation and 'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases' as stated in Article 4 of the Paris Agreement." [cont'd below] [Saint Kitts and Nevis]	
4106	5	34	5	38	[cont'd] This is extremely dangerous. The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2. [cont'd below] [Saint Kitts and Nevis]	
4108	5	34	5	38	[cont'd] Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Achieving net zero GHGs in GWP* would therefore need to happen before 2050. It is therefore not a warranted interpretation of the Paris Agreement. Rather than suggesting that the language in the Paris Agreement is 'up for debate', the CCBox should provide information on how the GWP100 based Article 4 language can be translated into other metrics such as GWP*. In any case, it must establish the clear linkage with the underlying science base of the Paris Agreement. The SPM statement on temperature stabilisation should be deleted. [Saint Kitts and Nevis]	
4474	5	34	5	35	"Stabilizing GMST requires net-zero CO2 emissions and (…)" should be changed to "Stabilizing GMST requires near-net-zero CO2 emissions and (…)", because it has not been discussed scientifically whether complete net-zero CO2 emissions are required or not. [Japan]	
5356	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world. [cont'd below] [Saint Lucia]	
5358	5	34	5	38	[cont'd] Achieving a balance as laid out in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot (that is present in the vast majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Closer investigation into the underlying Cross-Chapter box 2 reveals that this statement is related to a discussion of global warming potentials. CC box 2 also discusses the implications of those different potentials. Although this represents a most welcomed scientific progress, the box completely misses a clear reference to the scientific basis for the Paris Agreement. It even explicitly states that to "Understanding the implications of different methods of combining emissions of different climate forcers is, however, helpful in tracking progress towards temperature stabilisation and 'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases' as stated in Article 4 of the Paris Agreement." [cont'd below] [Saint Lucia]	
5360	5	34	5	38	[cont'd] This is extremely dangerous. The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2. [cont'd below] [Saint Lucia]	
5362	5	34	5	38	[cont'd] Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Achieving net zero GHGs in GWP* would therefore need to happen before 2050. It is therefore not a warranted interpretation of the Paris Agreement. Rather than suggesting that the language in the Paris Agreement is 'up for debate', the CCBox should provide information on how the GWP100 based Article 4 language can be translated into other metrics such as GWP*. In any case, it must establish the clear linkage with the underlying science base of the Paris Agreement. The SPM statement on temperature stabilisation should be deleted. [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5866	5	34	5	38	Explaining the underlying reason for this paragraph would make it easier to understand. It would be useful to state it explicitely : « Any emission of CO2 leads to a temperature increase which remains relatively constant during many centuries. For some non-CO2 greenhouse gas emissions, the warming effect decreases in the long run. Therefore, » (stablizing GMST requires net-zero CO2 emissions and declining total radiative forcing from other anthropogenic forcers) [Belgium]	
5868	5	34	5	34	Footnote 4 is too complex for the intended audience. Please simplify. We suggest that the definition of RF be limited to "The change in the top-of-atmosphere balance between incoming and outgoing energy resulting from a human or natural perturbation to the climate system, in some specific conditions; for more information, see section XX of the report". Note : we did not find a definition of radiative forcing in the SR1.5. If this is based on the definition of effective radiative forcing in AR5, then there should be a reference to AR5 and presumably a note on this in the report itself - it would probably be inappropriate to have this information only in the SPM. [Belgium]	
5870	5	34	5	35	declining total radiative forcing from other anthropogenic forcers (high confidence). "declining" is a vague concept : how much ? Is declining actually needed (the figure suggests that it is not) [Belgium]	
6220	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world...continued below. [Fiji]	
6222	5	34	5	38	Achieving a balance as in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot, which is present in the majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Is this not refereing to a discussion on global warming potentials...continued below. [Fiji]	
6224	5	34	5	38	The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2...continued below. [Fiji]	
6226	5	34	5	38	Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Suggesting for a language consistent in the Paris Agreement and the CC Box to provide information on how the GWP100 based Article 4 language can be translated with the clear linkageof underlying science and Paris Agreement. The SPM statement on temperature stabilisation is suggested to be deleted. [Fiji]	
6706	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world. [cont'd below] [Marshall Islands]	
6708	5	34	5	38	[cont'd] Achieving a balance as laid out in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot (that is present in the vast majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Closer investigation into the underlying Cross-Chapter box 2 reveals that this statement is related to a discussion of global warming potentials. CC box 2 also discusses the implications of those different potentials. Although this represents a most welcomed scientific progress, the box completely misses a clear reference to the scientific basis for the Paris Agreement. It even explicitly states that to "Understanding the implications of different methods of combining emissions of different climate forcers is, however, helpful in tracking progress towards temperature stabilisation and 'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases' as stated in Article 4 of the Paris Agreement." [cont'd below] [Marshall Islands]	
6710	5	34	5	38	[cont'd] This is extremely dangerous. The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2. [cont'd below] [Marshall Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6712	5	34	5	38	[cont'd] Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Achieving net zero GHGs in GWP* would therefore need to happen before 2050. It is therefore not a warranted interpretation of the Paris Agreement. Rather than suggesting that the language in the Paris Agreement is 'up for debate', the CCBox should provide information on how the GWP100 based Article 4 language can be translated into other metrics such as GWP*. In any case, it must establish the clear linkage with the underlying science base of the Paris Agreement. The SPM statement on temperature stabilisation should be deleted. [Marshall Islands]	
6994	5	34	5	38	Refer to the underlying report Chapter 4: Page 42 Line 15 to Page 43 Line 3: Climate Warming by Black Carbon Aerosols: Mitigation benefits from Black Carbon should be viewed with caution as BC emissions are invariably linked with OC emissions. Putting BC in the same league as CH4 is misleading. Section 4.3.6 should be written with caution. Despite the established importance of BC to climate forcing, estimates of the Direct Radiative Forcing for BC, averaged over the globe, still span over a poorly constrained range from about 0.2–1 W/m2. A possible cause of this is the systematic discrepancy between model and observation estimates of the light absorption of atmospheric BC aerosols. There are compelling experimental evidence and explanation for the underestimation of BC absorption by models. The changes in aerosol morphology and coatings affect the absorption of ambient BC. The aged BC aerosols have an absorption that is enhanced by a factor of 2.4 relative to BC in fresh emissions. Most of the climate model studies assume OC aerosols to be non-absorbing and assume them to be just scatterers of solar radiation. As a result, OC aerosols lead to a net cooling effect in climate models. However, both laboratory and field studies have shown OC aerosols to absorb solar radiation (BrC), particularly in the shorter wavelengths. Both aerosol negative direct and indirect radiative effects are weakened when BC and its co-emitted species (sulfur dioxide and organic carbon) are simultaneously reduced (Wang et al, 2015). Wang, Z., Zhang, H. & Zhang, X. Simultaneous reductions in emissions of black carbon and co-emitted species will weaken the aerosol net cooling effect. Atmos. Chem. Phys. 15, 3671–3685 (2015). [India]	
6998	5	34	5	38	Refer to the Underlying report Chapter 2: Page 20 line 4: Please add: Measurements of black carbon and grey materials and their ingestion in radiative forcing models need special attention. [India]	
7006	5	34	5	38	Underlying report Chapter 1: Page 22: line 26 to 29: Please add: Ecologically and economically viable alternate pathways would build resilience of the existing systems in a sustainable manner. [India]	
7538	5	34	5	34	While Footnote 4 defining radiative forcing is technically correct, it might not be understood by a policymaker. Consider rewriting this in plainer language or adding a plain language description. [United States of America]	
7540	5	34	5	37	There is no indication here of how much the other forcings have to be negative to be confident of net negative forcing. It needs to be said in order to seem as hopeful as this text seems to be about what can be done. There is also no mention that there must be an offset of the indirect GHG emissions that have been caused by climate change to date -- one cannot stabilize GMST unless both natural and anthropogenic forcings are balanced -- and it will take time to get there. [United States of America]	
8900	5	34	5	35	Suggest rephrasing from: "...declining total radiative forcing from other anthropogenic forcers" To: "...anthropogenic warming drivers" [Australia]	
9040	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world. [cont'd below] [Solomon Islands]	
9042	5	34	5	38	[cont'd] Achieving a balance as laid out in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot (that is present in the vast majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Closer investigation into the underlying Cross-Chapter box 2 reveals that this statement is related to a discussion of global warming potentials. CC box 2 also discusses the implications of those different potentials. Although this represents a most welcomed scientific progress, the box completely misses a clear reference to the scientific basis for the Paris Agreement. It even explicitly states that to "Understanding the implications of different methods of combining emissions of different climate forcers is, however, helpful in tracking progress towards temperature stabilisation and 'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases' as stated in Article 4 of the Paris Agreement." [cont'd below] [Solomon Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9044	5	34	5	38	[cont'd] This is extremely dangerous. The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2. [cont'd below] [Solomon Islands]	
9046	5	34	5	38	[cont'd] Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Achieving net zero GHGs in GWP* would therefore need to happen before 2050. It is therefore not a warranted interpretation of the Paris Agreement. Rather than suggesting that the language in the Paris Agreement is 'up for debate', the CCBox should provide information on how the GWP100 based Article 4 language can be translated into other metrics such as GWP*. In any case, it must establish the clear linkage with the underlying science base of the Paris Agreement. The SPM statement on temperature stabilisation should be deleted. [Solomon Islands]	
9114	5	34	5	38	A2.3: The Paris Agreement does not call for temperature stabilization but to keep warming well below 2°C and limit it to 1.5°C. Article 2 of the convention calls for a stabilization at a level that 'avoids dangerous anthropogenic interference', but nowhere is it said that this level is 'at 1.5°C' (and certainly not 'at 2°C'). Much more, the agreement aims to hold warming below those warming levels. At what values global mean temperature might stabilize to be in compliance with Article 2 of the convention is not established in the Paris Agreement and will depend on different perspectives and value judgements. Arguably, a warming of ~1°C might already constitute 'dangerous interference' to ecosystems and human systems around the world. [cont'd below] [Nauru]	
9116	5	34	5	38	[cont'd] Achieving a balance as laid out in Article 4 will result in slowly declining temperatures thereby establishing the 1.5°C limit even after a temporary temperature overshoot (that is present in the vast majority of pathways studied in this report). It is therefore unclear, why a statement of temperature stabilization is included in the SPM. Closer investigation into the underlying Cross-Chapter box 2 reveals that this statement is related to a discussion of global warming potentials. CC box 2 also discusses the implications of those different potentials. Although this represents a most welcomed scientific progress, the box completely misses a clear reference to the scientific basis for the Paris Agreement. It even explicitly states that to "Understanding the implications of different methods of combining emissions of different climate forcers is, however, helpful in tracking progress towards temperature stabilisation and 'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases' as stated in Article 4 of the Paris Agreement." [cont'd below] [Nauru]	
9118	5	34	5	38	[cont'd] This is extremely dangerous. The basis for the Paris Agreement goals including Article 2 and 4 is the IPCC AR5 that has consistently used GWP100 (as have other UNFCCC processes). This was the basis on which Article 4 was designed with 2°C pathways reaching net zero GHGs towards the end of the 21st century and the 1.5°C pathways available in the AR5 around 2060. As explicitly mentioned in the agreement, Article 4 is therefore designed to support achieving the goals set out in Article 2. [cont'd below] [Nauru]	
9120	5	34	5	38	[cont'd] Adopting a different GWP metric such as GWP* would lead to a shift in the timing of achieving net zero global greenhouse gas emissions to be achieved several decades earlier (see CC Box 2, Fig. 1). Achieving net zero GHGs in GWP* would therefore need to happen before 2050. It is therefore not a warranted interpretation of the Paris Agreement. Rather than suggesting that the language in the Paris Agreement is 'up for debate', the CCBox should provide information on how the GWP100 based Article 4 language can be translated into other metrics such as GWP*. In any case, it must establish the clear linkage with the underlying science base of the Paris Agreement. The SPM statement on temperature stabilisation should be deleted. [Nauru]	
1802	5	35	5	36	reformulate to: "The maximum level of 1.5 o C overshoot and needs for atmospheric carbon dioxide removal are then determined by cumulative emissions of CO2 emission up to the time of .....prior to that time." This is an overarching key statement. [Denmark]	
3430	5	35	5	35	It would be helpful to spell out what is meant by "other anthropogenic forcers", or avoid the word forcing here and instead say something along the lines of "other anthropogenic GHG-emissions, albedo change and aerosols" to clarify. [Germany]	
3432	5	35	5	37	The "level of non-CO2 radiative forcing in the decades prior to net-zero CO2": Which level would that be and would it be constant over time? Please explain. [Germany]	
3434	5	35	5	38	The sentence "The maximum level…" is supposedly rather hard to understand for non-scientists. Suggest to simplify, e.g. "peak warming". [Germany]	
9400	5	35	5	37	Please be consistent with terminology (e.g. use one term or the other) in regard to "other anthropenic forcers" and "non-CO2 forcers" to avoid confusion. If these terms are different, they need definitions. [Canada]	
326	5	36	5	36	suggest to add 'net' before 'cumulative CO2 emissions' [Russian Federation]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
768	5	36	5	36	As for the definition of remaining carbon budget : there is some ambiguity in this term, since it could refer to gross emissions over the period or the net emissions less absorptions over the same period. Given that we are aiming for net-zero at the end of the period, the latter would make more sense, but whichever is used it needs clarification. We suggest to write : "net cumulative CO2" [France]	
770	5	36	5	37	It is hard to understand why the SPM makes a difference between CO2 and non-CO2 drivers, without mentioning the difference between SLCF and LLCF. We suggest to add a sentence explaining this specific point in the definition of "remaining carbon budget" (see comment on page 4 line 2). We also suggest to add this sentence to A2.3, taken from chapter 4 p.42 : "Stabilising GMST requires net-zero CO2 emissions and declining total radiative forcing from other anthropogenic forcers (high confidence). All current GHG emissions and other forcing agents affect the rate and magnitude of climate change over the next few decades, while long-term warming is mainly driven by CO2 emissions. The maximum level of warming..." [France]	
3436	5	36	5	37	Please improve the explanation of "Non-CO2 radiative forcing" in footnote 4 to be comprehensible to non-experts. [Germany]	
354	5	37	5	38	Wrong reference to Figure SPM 2. Figure SPM 1 should be referred instead. [Chad]	
3438	5	37	5	38	The reference seems not correct, please replace “Figure SPM 2” by “Figure SPM 1”. [Germany]	
4690	5	37	5	38	This reference should be to figure SPM 1 not SPM 2 [United Kingdom (of Great Britain and Northern Ireland)]	
5254	5	37	5	38	Wrong reference to Figure SPM 2. Figure SPM 1 should be referred instead. [Zambia]	
6872	5	37	5	38	Wrong reference to Figure SPM 2. Figure SPM 1 should be referred instead. [Gambia]	
7542	5	37	5	38	Figure callout should be SPM-1. [United States of America]	
8388	5	37	5	38	Wrong reference to Figure SPM 2. Figure SPM 1 should be referred instead. [Nepal]	
328	5	4	5	42	‘A3. Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C depending on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options’. Since, (by definition adopted in this report) risk is always associated with negative consequences, the statement is trivial for heat-redundant systems and wrong for heat-deficit systems. The statement should be made more specific. [Russian Federation]	
772	5	4	5	42	In order to clarify this statement, we suggest : 1) to add a mention to the non-linearity of the dependance of risks on the GMST 2) to add a mention to the thresholds that could be reached in a warmer world 3) To separate the statement into two sentences, as it is not clear what depends on geographic location etc. We suggest to write it as follow : "Risks for natural and human systems are lower for a global warming of 1.5°C than at 2°C, some of them increasing non-linearly and/or depending on thresholds. The difference between a 1.5°C warmer world and a 2°C warmer world depends on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence) (Figure SPM2). {1.3, 3.3, 3.4, 5. [France]	
1716	5	4	5	42	The statement that risks are lower for global warming of 1.5 °C than at 2 °C is not accurate. Risk as defined on page 4, lines 18-21 of the SPM includes adverse outcomes of mitigation responses. These adverse outcomes are certainly greater at 1.5 °C than at 2 °C. [Saudi Arabia]	
1772	5	4	5	42	Seems obvious statement, but should focus on the quantification of the geographic areas and potential benefit of 1.5? C for the area. What are the increased mitigation and adaptation costs per square area for 1.5? C against 2.0? C? [Saudi Arabia]	
1814	5	4	5	46	A3 and A3.1 are about risks and impacts and should possibly be moved to section B. [Denmark]	
2250	5	4	5	43	Replace 'natural system's with ecosystems [European Union (EU)]	
2252	5	4	5	41	Please replace "depending on geographic location" with "and their magnitude depends on geographic location(...)". Current language may suggest that the geographic location and other factors may reverse the impact of temperature (e.g., there would be locations where the risk would be higher at 1.5 degrees than at 2 degrees). [European Union (EU)]	
2254	5	4	5	47	The statements are without quantification of what risks are reduced and by how much. If it is not quantifiable it should be mentioned. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2256	5	4	5	46	Conclusion A3 is important, however it requires some sort of quantification of explanation in order to stand as a scientific finding. The current text appears to state merely that less warming is always safer than more. [European Union (EU)]	
2258	5	4	5	47	Conclusion A3 brings to the forefront elements of adaptive capacity and mitigation and adaptation choices as important determinants of risks. Yet, these concepts are not highlighted in the subsequent text. Would be good to add a A3.2 paragraph outlining how deliberate adaptation choices (e.g. planning) can reduce the gap between 2 and 1.5 scenario (and/or reduce or avoid impacts). [European Union (EU)]	
3440	5	4	5	42	The logic of argument as it is currently formulated is problematic (if not incorrect) and we suggest to revise the formulation of the sentence. Currently it is stated that the risks under a 1.5 and 2°C scenario among others depend on mitigation options. If the intention is to compare the risks under a 1.5 and 2°C scenario as suggested by the first sentence, then mitigation options do not directly influence the respective residual risks. Mitigation options influence whether 1.5 or 2°C will be reached which influences the scale of residual risks. If it is intended to say that climate protection measures as such can also be used to address the impacts of climate change, then it would be good to provide examples from the literature. [Germany]	
3442	5	4	5	42	Please revise this sentence in order to clarify whether this statement is meant to highlight that a) risks are lower for warming of 1.5 compared to 2 degrees, all else being equal, but also depend on the vulnerabilities etc. ; or b) whether risks are lower at 1.5 than at 2C depends on location, adaptation and development status, mitigation portfolio etc. TO THE SAME OR A HIGHER DEGREE than it depends on the different warming levels. These are fundamentally different statements, and we had asked for clarification already in our comments to the FOD of the SPM. [Germany]	
3444	5	4	5	44	The current formulation of this headline statement does not convey the pathway dependence of risks and impacts: Please add information from the ES of Ch3: "Overshooting poses large risks for natural and human systems, especially if the temperature at peak warming is high, because some risks may be long-lasting and irreversible, such as the loss of many ecosystems (high confidence). The rate of change for several types of risks may also have relevance with potentially large risks in case of a rapid rise to overshooting temperatures, even if a decrease to 1.5°C may be achieved at the end of the 21st century or later (medium confidence). [Germany]	
3946	5	4	5	47	Currently there is an overlap between A3.1 and the second half of B2. Furthermore, perhaps A3 could be moved to the first paragraph (B.1) under section B. This could be a more introductory statement than the current B.1 about hot extremes. [Norway]	
4110	5	4	5	42	The logical connection of the first part of the sentence is unclear. If the climate hazard is lower at 1.5 compared to 2, the risks will be lower at 1.5°C all other things being equal. As it reads right now, an interpretation allowing for a bigger risk at 1.5°C than at 2°C depending on vulnerability is a possible interpretation. This is misleading. Suggestion: Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C, and are dependent on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence) [Saint Kitts and Nevis]	
4476	5	4	5	41	The current version of the paragraph A3 mentions that "Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C depending on geographic location, levels of development and vulnerability, (…).", but the word "risks" here does not seem to include economic risks of mitigation, contrary to the definition of Risk given in Box SPM 1. The reason is it is not clear that risks for human systems are lower for 1.5°C warming than for 2°C warming when mitigation risks are taken into account according to the Risk definition. To avoid misunderstanding, this point needs to be specified in the text of A3. [Japan]	
4692	5	4	5	42	This statement is general to the point of blandness. Could it not be strengthened? E.g. do they differ significantly? "Depending on geographic location, levels of development and vulnerability" is also very general. How about focusing on key risks or Reasons for Concern? The points made in this paragraph could also do with support from additional statements below it (currently there is only one). [United Kingdom (of Great Britain and Northern Ireland)]	
5180	5	4	5	42	Include a previous headline about the level of impact at 1.5ºC warming. Otherwise it seems that there might be almost no risk for a 1.5ºC warmer world. [Spain]	
5364	5	4	5	42	The logical connection of the first part of the sentence is unclear. If the climate hazard is lower at 1.5 compared to 2, the risks will be lower at 1.5°C all other things being equal. As it reads right now, an interpretation allowing for a bigger risk at 1.5°C than at 2°C depending on vulnerability is a possible interpretation. This is misleading. Suggestion: Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C, and are dependent on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence) [Saint Lucia]	
5702	5	4	5	42	The wording is a bit unclear. Suggest "… than at 2oC. The difference in risk depends on…" [Sweden]	
5872	5	4	5	41	proposition of modification for more readability and clarity : "lower for global warming of 1.5°C than at 2°C, and depend on geographic location…" [Belgium]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6228	5	4	5	42	The language and the connection of the sentence is unclear. If the climate hazard is lower at 1.5°C compared to 2°C, the risks will be lower at 1.5°C compared to 2°C. Similarly, the impacts will be more sever at 2°C. The interpretatiion could mislead to severe risk at 1.5°C than at 2°C depending on vulnerability of the location. This is misleading the following suggestion is given for consideration: Risks/impacts for natural and human systems are lower for global warming of 1.5°C than at 2°C, and are dependent on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence). [Fiji]	
6406	5	4	5	46	A.3 is about differences in impacts between 1.5 and 2C, but A.3.1 exclusively addresses differences between 1.5C with/without overshoot and says nothing about the thrust of A.3. Although the two issues are related, this cursory and inconsistent approach does not do justice to either of the two. The overshoot issue should be part of A.3 also. [Netherlands]	
6408	5	4	5	42	without a qualification of "lower" the statement is very general and almost selfevident; suggested to add: "substantially" [Netherlands]	
6714	5	4	5	42	The logical connection of the first part of the sentence is unclear. If the climate hazard is lower at 1.5 compared to 2, the risks will be lower at 1.5°C all other things being equal. As it reads right now, an interpretation allowing for a bigger risk at 1.5°C than at 2°C depending on vulnerability is a possible interpretation. This is misleading. Suggestion: Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C, and are dependent on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence) [Marshall Islands]	
6974	5	4	5	42	Remove the words “and mitigation options” from the statement as it is irrelevant here. [India]	
6978	5	4	5	42	India is experiencing increasing incidences of heat wave related deaths. At +1.5°C more deaths are likely in BAU scenario. However, many cities have already put in place their requisite heat action plans to combat the ill effects of heat waves. [India]	
6988	5	4	5	42	Statistical significance needs to be tested for the difference in the projected risk in water scarcity, flood, and droughts for 1.5 and 2.0 deg scenarios. This is essential to understand the role of additional 0.5 deg C warming in various sectors in different geographical regions. [India]	
6996	5	4	5	42	" Refer to the underlying report Chapter 3 Page 110: Heatwave Matthews et al. (2017) also conclude that Karachi (Pakistan) and Kolkata (India) could have conditions equivalent to their deadly 2015 heatwaves every year at 2°C global warming. Comments: South Indian states of Andhra Pradesh covering Coastal Andhra Pradesh (CAP) and the neighboring Telangana, where around 1735 and 585 people died, respectively, were the areas most affected by the heat wave and not Kolkata. Analogy with Kolkata gives wrong information. (Also, 3-111, line 6-7; Page 3-152, line 3-5) Only study of Matthews et al. (2017) is mentioned; however there are many other studies which needs to be highlighted for Indian region. Perkins-Kirkpatrick and Gibson (2017) conclude that the median change in the longest heatwave duration per season is mostly between 1–3 days, with smaller increases at higher latitudes. Slightly larger increases of 4–6 days are projected per degree of global warming over India, southeast Asia, the United States and southern America. However, the longest event of the season is projected to increase by 10–12 days per degree of global warming across Central America, parts of Africa and the Middle East. During summer of 2015 (late May to early June) eastern coastal states, central and northwestern parts of India experienced severe heat wave conditions leading to loss of many human life in extreme high temperature conditions (Pattanaik et al., 2017). Rohini et al (2016) using a high resolution gridded daily temperature data set for the period 1961-2013, found that frequency, total duration of heat waves per season and maximum duration of heat waves are increasing over India during the summer season. Pattanaik, D.R., Mohapatra, M., Srivastava, A.K., Arun Kumar (2017). Heat wave over India during summer 2015: an assessment of real time extended range forecast, Meteorol Atmos Phys 4, 129, 375-393, https://doi.org/10.1007/s00703-016-0469-6. Perkins-Kirkpatrick, S.E., Gibson, P.B. (2017). Changes in regional heatwave characteristics as a function of increasing global temperature. Nature Scientific Reports, 7: 12256 DOI:10.1038/s41598-017-12520-2. Rohini, P., Rajeevan, M., Srivastava, A. K. (2016). On the Variability and Increasing Trends of Heat Waves over India, 6, 26153, http://dx.doi.org/10.1038/srep26153 Ratnam, J. V., Behera, S. K., Ratna, S. B., Rajeevan, M., Yamagata, T. (2016). Anatomy of Indian heatwaves, Scientific Reports, 6, 24395, http://dx.doi.org/10.1038/srep24395 Mishra V, Mukherjee S, Kumar R and Stone D 2017 Heat wave exposure in India in current, 1.5oC, and 2.0oC worlds Environ. Res. Lett. Online: http://iopscience.iop.org/10.1088/1748-9326/aa9388. " [India]	
7004	5	4	5	42	In the underlying report, chapter 1, page 35, line 37; Add on: Risk and impact are distinct but are closely connected -severity of the impact leads to risk depending upon the capacity of resilience. [India]	
7544	5	4	5	42	This statement would be more clear if it were broken into two sentences to read: "Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C, all else equal. The degree to which risks differ, and can at present be differentiated, depends on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options." [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7546	5	4	5	42	As A3 correctly points out, there are major factors that can impact the risks associated with any warming level, particularly the risk differential between 1.5 and 2°C. This paragraph could be edited to say: "Risk assessments for natural and human systems at global warming of 1.5 and 2°C depend on geographic region..." Giving further charterization to the relative risks is inappropriate when they will depend highly on a priori assumptions. Later in the SPM and report, the relative risks can be explored but only where the factors listed in A3 are fully defined. [United States of America]	
7548	5	4	5	42	The phrase "choices of adaptation and mitigation options" is confusing. Countries and communities do not necessarily have a choice about which options are available or feasible to them. Suggest deleting "choices of." [United States of America]	
8462	5	4	5	42	It will be better to speak of the risks of 1.5 degree in comparison to current climate/impacts or pre-industrial as opposed to the risks at 2.0 degree temperature rise. It sends the wrong signal and is in conflict of the intention of this assessment [Zimbabwe]	
8538	5	4	5	42	Could benefit from greater clarity on impacts, in gneral moreinformation on observed impacts could be included,perhaps with an additional sub-paragraph [Ireland]	
9122	5	4	5	42	The logical connection of the first part of the sentence is unclear. If the climate hazard is lower at 1.5 compared to 2, the risks will be lower at 1.5°C all other things being equal. As it reads right now, an interpretation allowing for a bigger risk at 1.5°C than at 2°C depending on vulnerability is a possible interpretation. This is misleading. Suggestion: Risks for natural and human systems are lower for global warming of 1.5°C than at 2°C, and are dependent on geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options (high confidence) [Nauru]	
9264	5	4	5	42	This is a weak statement; WGII and WGIII can do better here by pointing to the most exposed regions, e.g. the tropics (increased number of days with deadly heat), the dry subtropics (increased risk of drought and crop loss), coastal regions due to SLR. For instance, there is a growing body of literature that quantifies the number of days with wet bulb temperature above 35°C which indicates a high risk of heat-related deaths in the equatorial regions for 2°C warming. [Switzerland]	
9402	5	4	5	42	The wording in para A.3 is problematic because it focuses on the choice, not the implementation, of measures. [ADD]: "choices [and implementation] of ..." [Canada]	
3446	5	41	5	41	Is the "level of development" not one of the factors that determine vulnerability? Then this would be modified to "vulnerability including levels of development". In addition, non-experts might not understand "development" (referring [Germany]	
4694	5	41	5	41	"Depending on geographic location…" could be interpreted as meaning that the opposite is true in some cases, i.e. that risks are lower at 2C than 1.5C/. If this is true, then it should be made clear that overall/on average the risks are lower at 1.5. If this is not true, then it could read along the lines of "risks.....are lower for global warming of 1.5C than 2C, with the magnitude of difference depending on....." [United Kingdom (of Great Britain and Northern Ireland)]	
5182	5	41	5	41	instead of depending, say and depend…otherwise it seems that for some regions (etc) impacts may not be lower for 1.5 as compared to 2ºC [Spain]	
8906	5	41	5	46	Suggest restructuring: Point A3 discusses 1.5 versus 2. Suggest point 3.1 to expand on. Then a new point to discuss 1.5 gradual versus 1.5 overshoot. [Australia]	
9404	5	41	5	41	Recommend replacing 'depending on' with 'and depend on'. Use of "depending on" suggests that in some locations risks are not lower for global warming of 1.5C. [Canada]	
774	5	44	5	44	This could add "Risks for natural and human systems, including irreversible impacts" [France]	
776	5	44	5	44	The term "gradually" is unclear, but seems to mean stabilisation without overshooting. It might be better to leave the word out. [France]	
778	5	44	5	46	It is an obvious statement, so it is not clear why it is only medium confidence. The question is "how much lower". Maybe you mean "significantly lower" or "noticeably lower", which would make more sense. We suggest to write "significantly lower" [France]	
1774	5	44	5	46	Is this feasible, and what level of overshoot? How robust are the models for simulating the dynamics of overshooting? [Saudi Arabia]	
2260	5	44	5	46	It is unclear why this statement was assigned 'medium confidence' only. The following statements seem to support assignment of 'high confidence': * B2: Temperature overshoot, if much higher than 1.5 °C (e.g. close to 2oC), could have irreversible impacts on some species, ecosystems and their ecological functions and services to humans, even if global warming eventually stabilizes at 1.5 °C by 2100 (high confidence)". * Chapter 3, ES: "Overshooting poses large risks for natural and human systems, especially if the temperature at peak warming is high, because some risks may be long-lasting and irreversible, such as the loss of many ecosystems (high confidence)." [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2262	5	44	5	47	Replace 'natural system's with ecosystems [European Union (EU)]	
3948	5	44	5	46	A3.1, Please consider to include some examples of risks mentioned to support the current formulation. [Norway]	
4224	5	44	5	46	The current A3 contains two messages: one is that at 1.5°C, risks for natural and human systems are lower than those at 2°C; the second is that these risks depend on such elements as “geographic location, levels of development and vulnerability, and on the choices of adaptation and mitigation options” as well. However, A3 consists of no more than A3.1, which alone cannot support the findings of the section. So it is suggested to reformulate the statement to support the above two messages. [China]	
4478	5	44	5	44	Just like A3, it seems that the word "risks" here does not include economic risks of mitigation. If this understanding is correct, it needs to be specified. However, if the paragraph A3 is properly modified and the meaning of "risks" in the following paragraph A3.1 is clarified, then modification would not be necessary. [Japan]	
4696	5	44	5	46	Firstly, "risks" is very vague here. What sorts of risks? Secondly, and most significantly, I am not convinced that this point about risks with overshoot is robustly backed up by the underlying chapters (and therefore where the "medium confidence" statement comes from). The referenced sections in Chapter 3 make this claim but don't back it up with peer-reviewed literature. It is intuitive to say that a larger/longer overshoot will have more severe consequences (especially impacts to ecosystems), but if there are no papers which explicitly explore this question (and I don't think there are given the difficulty of modelling impacts dynamically) then this point should be removed. [United Kingdom (of Great Britain and Northern Ireland)]	
4698	5	44	5	46	As the statement about "risks for natural and human systems" is so generic, it means that questions need to be raised about the robustness of this statement. For example, the decarbonisation rates required to avoid overshoot may be so high that they arguably pose greater risk for some "human systems". Unless this statement can be made more precise, it is questionable as to how informative it is (plus see above the concerns re: strength of overshoot evidence). [United Kingdom (of Great Britain and Northern Ireland)]	
5704	5	44	5	44	"gradually stabilises" is unclear. Suggest "Risks for natural and human systems are higher if global warming overshoots 1.5oC and returns to this level later in the century compared to stabilisation at 1.5C without overshooting." [Sweden]	
6410	5	44	5	45	From figure SPM-2 it follows that overshoot is close to impossible to avoid, unless emissions go to zero immediately. I would emphasize that more firmly. [Netherlands]	
7550	5	44	5	44	The statement that "risks for natural and human systems are lower" should be qualified to say that "in aggregate" the risks are lower, as for some systems and in some scenarios, the risks could be higher in a 1.5°C non-overshoot scenario (e.g., risks to certain ecological systems due to changes in land use (e.g., afforestation) or risks to human systems due to mitigation strategies (e.g., coal-producing communities)). [United States of America]	
7552	5	44	5	46	This statement fails to indicate how serious the consequences will be of letting the temperature increase go up to 1.5°C as compared to 1°C. The implications (including long-term implications of sea level rise) of going from 1 to 1.5°C need to be stated. [United States of America]	
7554	5	44	5	44	Substitute "Both positive and negative impacts" in lieu of "Risks". [United States of America]	
8464	5	44	5	44	lower than what? [Zimbabwe]	
9406	5	44	5	46	Chapter 3 section 4 indicates the impacts of a 1.5 degree temperature rise, but does not explicitly model what this rise would look like. Suggest reviewing for consistency purposes. [Canada]	
218	5	45	5	45	"Later" twice in the same sentence - consider revising [Finland]	
2264	5	45	5	45	Remove one 'later' in the sentence [European Union (EU)]	
4418	5	45			The world "later" twice. [Czech Republic]	
5060	5	45			A1.2. Energy continues to accumulate in the global climate system [Hungary]	
5068	5	45	5	45	.. to this level later in the present century [Hungary]	
7556	5	45	5	45	Italicize medium confidence,and the bracket style should be (rather than { [United States of America]	
8540	5	45	5	45	There appears to be an extra "later" in this sentence, suggest removing the first instance. [Ireland]	
2266	5	46	5	46	add: Overshooting 1.5°C will mean loss of coral reefs (3.4.4.2.1) [European Union (EU)]	
780	5	47	5	47	We suggest to add this point, in order to emphazise the role of soils. "A3.2 Soils will store more carbon and permafrost thawing will release less GHG at global warming of 1.5°C than at +2°C {3.4.3.4, 3.5.5.3}." [France]	
8908	5	5	5	5	Footnote 2: suggest changing "energy" to "energy flux" [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4114	6				Sections A4/A5 lack a clear point on the role of limiting warming to 1.5 in achieving poverty alleviation and sutstainable development. Statements currently balance "significant benefits and adverse effects" (point A4.1), whereas the report shows that pathways for 1.5 overarchingly have more synergies than trade-offs. Wording could be taken from chapter 2 (page 7): "Limiting warming to 1.5 can be achieved synergistically with poverty alleviation and improved energy security and can provide large public health benefits through improved air quality, preventing millions of premature deaths. However, specific mitigation measures, such as bioenergy, may result in trade-offs that require consideration". Also wording from chapter 5 exec sum (page 4) brings in the benefits of reducing impacts: "Limiting global warming to 1.5 rather than 2 would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities". These two statements should be combined to provide a useful statement in A4 or A5 on the interactions of 1.5 with sustainable devt, both in terms of mitigation measures and avoided impacts. [Saint Kitts and Nevis]	
5368	6				Sections A4/A5 lack a clear point on the role of limiting warming to 1.5 in achieving poverty alleviation and sutstainable development. Statements currently balance "significant benefits and adverse effects" (point A4.1), whereas the report shows that pathways for 1.5 overarchingly have more synergies than trade-offs. Wording could be taken from chapter 2 (page 7): "Limiting warming to 1.5 can be achieved synergistically with poverty alleviation and improved energy security and can provide large public health benefits through improved air quality, preventing millions of premature deaths. However, specific mitigation measures, such as bioenergy, may result in trade-offs that require consideration". Also wording from chapter 5 exec sum (page 4) brings in the benefits of reducing impacts: "Limiting global warming to 1.5 rather than 2 would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities". These two statements should be combined to provide a useful statement in A4 or A5 on the interactions of 1.5 with sustainable devt, both in terms of mitigation measures and avoided impacts. [Saint Lucia]	
6718	6				Sections A4/A5 lack a clear point on the role of limiting warming to 1.5 in achieving poverty alleviation and sutstainable development. Statements currently balance "significant benefits and adverse effects" (point A4.1), whereas the report shows that pathways for 1.5 overarchingly have more synergies than trade-offs. Wording could be taken from chapter 2 (page 7): "Limiting warming to 1.5 can be achieved synergistically with poverty alleviation and improved energy security and can provide large public health benefits through improved air quality, preventing millions of premature deaths. However, specific mitigation measures, such as bioenergy, may result in trade-offs that require consideration". Also wording from chapter 5 exec sum (page 4) brings in the benefits of reducing impacts: "Limiting global warming to 1.5 rather than 2 would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities". These two statements should be combined to provide a useful statement in A4 or A5 on the interactions of 1.5 with sustainable devt, both in terms of mitigation measures and avoided impacts. [Marshall Islands]	
9126	6				Sections A4/A5 lack a clear point on the role of limiting warming to 1.5 in achieving poverty alleviation and sutstainable development. Statements currently balance "significant benefits and adverse effects" (point A4.1), whereas the report shows that pathways for 1.5 overarchingly have more synergies than trade-offs. Wording could be taken from chapter 2 (page 7): "Limiting warming to 1.5 can be achieved synergistically with poverty alleviation and improved energy security and can provide large public health benefits through improved air quality, preventing millions of premature deaths. However, specific mitigation measures, such as bioenergy, may result in trade-offs that require consideration". Also wording from chapter 5 exec sum (page 4) brings in the benefits of reducing impacts: "Limiting global warming to 1.5 rather than 2 would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities". These two statements should be combined to provide a useful statement in A4 or A5 on the interactions of 1.5 with sustainable devt, both in terms of mitigation measures and avoided impacts. [Nauru]	
782	6	1	6	1	Is "will" appropriate ? In order to be policy-relevant but not policy-prescriptive, we suggest to write it as : "SD, poverty eradication and implications for ethics and equity should be key considerations..." [France]	
1722	6	1	6	2	Delete "will be". It is a duplicate. [Saudi Arabia]	
1864	6	1	6	3	Please clarify the sentence; it is not easy to understand, particularly "and by efforts to adapt" [Denmark]	
1866	6	1	6	18	It is not very clear what the conclusions/messages are in these paragraphs. Para A4.3 should be merged with D5 where a description/definition of CRDP's would be better placed [Denmark]	
2268	6	1	6	4	Clarify, in particular the last sentence "[…] and by efforts to adapt […]." [European Union (EU)]	
2270	6	1	6	2	Remove one 'will be' in the sentence [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2272	6	1	6	18	This section could be rationalised since most of its statements are not scientific and repeat assertions made later on. Save space here by deleting the A4 findings - or briefly signalling (in one or two sentences) that key issues are covered later on. Saving space here could allow underlying findings to be better reflected in the SPM: A4 - is not a scientific statement and largely duplicates D5. Say it once, with more evidence. A4.1 & A4.3 - also duplicate findings under D5. Same recommendation. A4.2 - duplicates section B6 (which in any case should say more about adaptation options available) [European Union (EU)]	
2274	6	1	6	4	these are indeed key considerations, but what about economic and political considerations (e.g. jobs, economic growth, competitiveness)? These seem also important considerations for policy makers. [European Union (EU)]	
3448	6	1	6	2	delete second "will be" [Germany]	
3450	6	1	6	2	"education", "knowledge transfer" or "access to knowledge" are mentioned throughout the report as substantial factors to realize mitigation and adaption options, but missing in this statement. Please include these factors. [Germany]	
3452	6	1	6	4	This is the first time the SPM addresses the complex interlinkages between climate change, mitigation, adaptation and sustainable development, including poverty eradication. The current statement is only addressing a part of these aspects, could be regarded as policy prescriptive and is unclear. It does not provide information on the specific role of sustainable development and poverty eradication (incl. ethical/equity considerations) or on what is meant by "key considerations". We strongly suggest introducing the complex interlinkages between climate change, mitigation, adaptation and sustainable development in a more balanced and general way in this section. Please consider using information from the following statements: "Limiting global warming to 1.5°C rather than 2°C would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities." (ES of chapter 5) "Ethical considerations, and the principle of equity in particular, are central to this report, recognising that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable." (ES of chapter 1) "The fundamental societal and systemic changes to achieve sustainable development, eradicate poverty and reduce inequalities while limiting warming to 1.5°C would require a set of institutional, social, cultural, economic and technological conditions to be met." (ES of chapter 5) "Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication" (ES of chapter 1) [Germany]	
3454	6	1	6	18	The current SPM, and in particular paragraph A4.1, does not convey the important message of the substantial benefits due to avoided damages in 1.5C pathways in the context of sustainable development. The current focus on the positive and negative side effects of climate action (mitigation and adaptation) on SD does not reflect the full picture. Therefore, please include information based on the ES of chapter 5 such as "Impacts avoided with the lower temperature limit could reduce the number of people exposed to climate risks and vulnerable to poverty, and lessen the risks of poor people to experience food and water insecurity, adverse health impacts, and economic losses, particularly in regions that already face development challenges. Avoided impacts between 1.5°C and 2°C warming would also make it easier to achieve certain SDGs, such as those that relate to poverty, hunger, health, water and sanitation, cities, and ecosystems (SDGs 1, 2, 3, 6, 12, 14, and 15)" in an additional subparagraph to headline statement A4. Please see also our comment on A4. [Germany]	
3954	6	1	6	4	The term "Ethics" is only mentioned in the headline statement of A4, and not later in this subsection. In A4.2 and A4.3 only the terms "poverty" and "equity" are mentioned. Except for ethics, the other issues mentioned here (poverty and equity) is part of the Paris agreement. Ethics is an important issue, but please consider to what extend ethical perspectives related to mitigation and adaptation is assessed in the report, and if there are findings related to ethics that could support including it in the SPM. Generally, we find the head line statement in A.4 relatively general, and other findings in A4.1. - A4.3. might be more appropriate to make a head line statement [Norway]	
4112	6	1	6	4	Statement A4 is problematic as it does not reflect the important difference regarding mitigation and adaptation (adaptation efforts are lower for 1.5 than for higher temperature levels, contrary to mitigation efforts. Suggest rewording: Sustainable development, (...) will be key considerations in limiting global warming to 1.5dC". Also suggest adding "Ambitious mitigation actions are indispensable to limit warming to 1.5dC while achieving sustainable development and poverty eradication" (from ES 1-5) [Saint Kitts and Nevis]	
4294	6	1	6	2	will be will be ? will be [Republic of Korea]	
4420	6	1	6	2	The worlds "will be" twice. [Czech Republic]	
4480	6	1	1	3	"will be will be" ==> "will be", and "by efforts" ==> "efforts" [Japan]	
4700	6	1	6	2	Repetition of "will be" [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5070	6	1	6	2	A4. Sustainable development, poverty eradication and implications for ethics and equity will be will be key considerations… [Hungary]	
5184	6	1	6	4	in line 1, the final "will be" can be deleted. [Spain]	
5366	6	1	6	4	Statement A4 is problematic as it does not reflect the important difference regarding mitigation and adaptation (adaptation efforts are lower for 1.5 than for higher temperature levels, contrary to mitigation efforts. Suggest rewording: Sustainable development, (...) will be key considerations in limiting global warming to 1.5dC". Also suggest adding "Ambitious mitigation actions are indispensable to limit warming to 1.5dC while achieving sustainable development and poverty eradication" (from ES 1-5) [Saint Lucia]	
5706	6	1	6	2	Suggest rephrasing (changes in italics): "Sustainable development, poverty eradication and implications for ethics and equity need to be key considerations in global mitigation efforts to limit global warming to 1.5°C and by efforts to adapt to 1.5°C global warming..." ("need to be" instead of "will be", since this better reflects the nature of the statement, and addition of the word "global" to add emphasis of the global perspective of the statement) [Sweden]	
5822	6	1	6	4	Paragraph A.4 is bundling together questions of sustainable development and poverty eradication, on theone hand, and ethics and equity, on the other. We propose the following changes for clarity, bringing in language from Chapter 1 SPM, p.5): "A.4 Sustainable development and poverty erradication will be key considerations in mitigation and adaptation efforts to limit global warming to 1.5°C. Ethical considerations, and the principle of equity in particular, are central to this report, recognising that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable. {1.1.1}" [Brazil]	
5874	6	1	6	4	Please replace "by efforts" with "in efforts". [Belgium]	
6230	6	1	6	4	This statement is not reflecting the important distinction between mitigation and adaptation (adaptation efforts are lower for 1.5 than for higher temperature levels, contrary to mitigation efforts. Suggest rewording: Sustainable development, will be key considerations in limiting global warming to 1.5°C. Also suggesting to add: "Ambitious mitigation actions are indispensable to limit warming to 1.5°C, while achieving sustainable development and poverty eradication" (reference is made to ES 1-5). [Fiji]	
6412	6	1	6	18	A.4 is highly unbalanced in not saying anything about the challenges to humankind from 1.5C, so not contributing to the subjest of Section A: ' understanding …. 1.5C' (p.3, ll.13-14): all statements are valid at any level of global warming. In general almost all conclusions for two degrees are valid for 1.5 also. This leads to formulations that are very obvious, abstract and always true, not really contaning a lot of new information. [Netherlands]	
6414	6	1	6	3	sentence sounds presciptive; and also is very general; better reformulate that SD and equity considerations can be important considerations in opting for 1,5 rather than 2 degree warming given the impacts of climate change on SD and inequality. [Netherlands]	
6716	6	1	6	4	Statement A4 is problematic as it does not reflect the important difference regarding mitigation and adaptation (adaptation efforts are lower for 1.5 than for higher temperature levels, contrary to mitigation efforts. Suggest rewording: Sustainable development, (...) will be key considerations in limiting global warming to 1.5dC". Also suggest adding "Ambitious mitigation actions are indispensable to limit warming to 1.5dC while achieving sustainable development and poverty eradication" (from ES 1-5) [Marshall Islands]	
7012	6	1	6	4	Modify the statement in the following manner - “Sustainable development, poverty eradication and ethics and equity, following the principle of common but differentiated responsibilities and respective capabilities, will be key considerations in mitigation efforts to limit global warming to 1.5 deg. C. Similar considerations also determine efforts to adapt to 1.5 deg. C global warming (high confidence) {1.1,1.4,Cross Chapter Box 4 in Chapter 1, 5.2, 5.3}. [India]	
7028	6	1	6	4	Refer to the underlying report- Chapter 1: Framing and Context, Section 1.1.1 Equity and a 1.5°C warmer world, page 10: The report also talks about “an asymmetry in future response capacity”. In this case, it is important to highlight the historical responsibilities. Fairness demands that the developed countries take the lead in taking actions against climate change and climate actions of the developing countries needs to be supported by transfer of technology and finance. This is important considering the adverse impacts that climate change would have on the vulnerable population in the developing countries and a large part of the expenditure would need to be on adapting to climate change which is unlikely to be financed by private players. [India]	
7030	6	1	6	4	Refer to the underlying report- Chapter 1: Framing and Context, Section 1.1.1 Equity and a 1.5°C warmer world page 10, second para- “The worst impacts tend to fall on those least responsible for the problem” --- This should be taken in tandem with the principles and provisions outlined in the Convention. Developing countries are bearing a huge cost of the climate vulnerabilities. The report emphasized the impacts between generations but has not taken into account the asymmetries in the existing generations among countries. [India]	
7032	6	1	6	4	Underlying report Chapter 1, Page 33, line 15: Please add: These inertia control the processes associated with the thermal impact based on the policies of the State. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7558	6	1	6	2	The phrase 'will be' is repeated. Also, is this the best phrasing? There is a level of confidence about future policy implied in the word 'will'. "will be key considerations" is policy prescriptive. Suggest using "are relevant to" instead. [United States of America]	
7560	6	1	6	4	Not certain what 'key considerations' means here or how useful this construct is. [United States of America]	
7562	6	1	6	4	This headline statement is very unclear. Not clear what it means that these things "will be key considerations" in mitigation efforts and efforts to adapt. "Implications for ethics and equity" should be replaced with "reducing inequalities" which is used in the various sub-bullets. Also not clear why this subsection is included in Section A which is on "Understanding global warming of 1.5" rather than in section C or D, for which it seems more relevant. [United States of America]	
8542	6	1	6	2	"will be" appears twice in this sentence, at the end of line 1 and also at the start of line 2 [Ireland]	
8692	6	1	6	3	New Zealand suggests deleting "and implications for ethics and equity" from line 1, and replacing it with "Sustainable development, poverty eradication and reducing inequalities will be key considerations in determining specific mitigation efforts...". The original sentence could be interpreted as inferring the need for ambitious mitigation efforts is contingent on countries' economic development status. The overall findings of the IPCC report highlight the need for ambitious action by all countries - to the best of their capabilities. The agreed concept of common but differentiated responsibilities, in light of national circumstances means each country's circumstances will inform the mitigation it is capable of undertaking but does not derogate from the need to make that action as ambitious as those circumstances allow. [New Zealand]	
8766	6	1	6	1	term "will be" is repeated, delete one. [Iran]	
8782	6	1	6	1	Delete: will be [Iran]	
8784	6	1	6	1	Edit: … poverty eradication, ethics, equity, CBDR-RC and historical responsibility… [Iran]	
9124	6	1	6	4	Statement A4 is problematic as it does not reflect the important difference regarding mitigation and adaptation (adaptation efforts are lower for 1.5 than for higher temperature levels, contrary to mitigation efforts. Suggest rewording: Sustainable development, (...) will be key considerations in limiting global warming to 1.5dC". Also suggest adding "Ambitious mitigation actions are indispensable to limit warming to 1.5dC while achieving sustainable development and poverty eradication" (from ES 1-5) [Nauru]	
9408	6	1	6	28	Suggest deleting Sections A4 and A5 and ending Section A on page 5, paragraph 46 (Section A3.1). Section A is on "Understanding global warming of 1.5C" which sections A.1, A.2 and A.3 adequetely cover. Sections A4 and A5 contain sub-paragraphs about impacts and sustainable development which are highly repetitive of SPM sections B and D. Detailed rationale is below. [Canada]	
9410	6	1	6	2	Delete the repeated "will be". [Canada]	
9412	6	1	6	4	A key consideration for mitigation efforts that is missing here is the inclusion of multiple knowledge systems, for example co-production of research with both scientific and Indigenous knowledge. Please consider including this. Support for this is provided in the second paragraph in Chapter 4, ES. [Canada]	
9414	6	1	6	4	Suggest revising "will be key considerations" to "provide a framework for evaluating" mitigation efforts to limit global warming to 1.5°C and efforts to adapt to 1.5°C global warming. [Canada]	
4702	6	2	6	2	"and by" should be replaced with "and in" [United Kingdom (of Great Britain and Northern Ireland)]	
5186	6	2	6	2	"key considerations IN mitigation efforts" should be replaced by "key onsiderations WHEN IMPLEMENTING mitigation efforts" [Spain]	
5876	6	2	6	2	delete 'will be' (repeated twice) [Belgium]	
6416	6	2	6	2	Typo: 'will be will be' [Netherlands]	
8694	6	2	6	2	Delete duplicate "will be" [New Zealand]	
8786	6	2	6	2	Delete: by [Iran]	
8910	6	2	6	2	Suggest rephrasing from: "by" To: "for" [Australia]	
9266	6	2	6	2	Because of cumulative carbon emissions, this also applies to the 2°C target and to any temperature limit. In this sense, the current statement is not specific. [Switzerland]	
9602	6	2	6	2	Delete the repeated will be [Madagascar]	
784	6	6	6	9	This sentence is not clear, we don't understand what "depending" applies to. Do you mean : "... as well as by the challenges ..." ? [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2276	6	6	6	7	"The poor and vulnerable are disproportionately affected by ... the challenges of remaining below global warming of 1.5°C". In the context of "remaining below warming of 1.5°C" as the statement notes, this is somewhat counterintuitive. Climate change is closely linked to primary resource use, and the poor use a fraction of the resource used by the rich. There is no way a 1.5 pathway can be approched without the rich drastically cutting their resource use, whilst the poor should not and cannot reduce a lot. So the relative impact of the mitigation effort should be higher on the rich. on teh other hand, the imapcts of climate change will be indeed felt mostly by the poor and vulnerable populations in every country, especially in the absence of efficient adaptation measures. We would therefore reccomend to re-phrase the sentence to reflect the context and avoid any misunderstanding. [European Union (EU)]	
3456	6	6	6	1	The perspective of section A4 is seemingly limited to 'poorer' countries. In order to enhance the equity issue on broader societal circumstances in rather all nations/parties/economies we recommend an addition in line 9 like: "Equity has procedural and distributive dimensions and requires fairness in burden sharing, between generations, and between and within nations." (cf. ES CH1, p1-5). [Germany]	
3458	6	6	6	1	The subsidiary statement starting in line 7 with "with associated …" should be a sentence on its own and the first one in A4.1, because side effects are not specifically linked to vulnerability or poverty issues, but to all mitigation options. In addition, do the "associated mitigation options" also include CDR? Then this expression would not be appropriate and should be amended to "associated options for mitigation or CDR". [Germany]	
3460	6	6	6	1	Some of the references do not seem to be relevant for this statement. Please check. [Germany]	
4116	6	6	6	1	A4.1: The latter part of the statement that "the poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C" is not well corroborated in the report. It is very clear that the poor and vulnerable are disproportionately affected by impacts at 1.5 and higher, but it is not so clear that mitigation challenges will disproportionately affect the poor and vulnerable. Looking at the linked sections and cross-chapter boxes in chapters 1, 2, 3 and 5, there is a lack of robust evidence to support this, and the report is clear that the trade-offs of mitigation depend on the mitigation measures chosen and the enabling conditions. Therefore this statement is misleading. Furthermore, challenges are given equal weight to impacts, which is misrepresenting ES 1-5 that clearly differentiates stating: “recognizing that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable (high confidence)". [cont'd below] [Saint Kitts and Nevis]	
4118	6	6	6	1	[cont'd] Paragraph 4.1 should read: The poor and vulnerable are disproportionately affected by the impacts of global warming. Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence) {1.1.1, 1.4}. Adaptation needs will be lower in a 1.5°C world compared to a 2°C world, and limiting warming to 1.5°C rather than 2°C would make it markedly easier to achieve sustainable development, with greater potential to eradicate poverty and reduce inequalities. {1.1.1, 1.1.2, 1.4.3, 2.5.3, 5.2.2, 5.2.3, Cross chapter Boxes 4 in Chapter 1, 8, Chapter 3, CB11, Chapter 4, Table 5.3 available as supplementary pdf}. [Saint Kitts and Nevis]	
4704	6	6	6	6	Saying that 'the vulnerable' are disproportionately affected seems an obvious statement (i.e. the vulnerable are vulnerable). The text should specify what is meant by this - does it mean the poor, the young/old, the unemployed, those living in certain areas, the disables, minorities etc? This problem appears multiple times in the text. [United Kingdom (of Great Britain and Northern Ireland)]	
4708	6	6	6	1	Convoluted sentence. Suggest splitting in half at the semi-colon and replacing second half with: "Different mitigation options have significant benefits and adverse effects associated with them." [United Kingdom (of Great Britain and Northern Ireland)]	
5370	6	6	6	1	A4.1: The latter part of the statement that "the poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C" is not well corroborated in the report. It is very clear that the poor and vulnerable are disproportionately affected by impacts at 1.5 and higher, but it is not so clear that mitigation challenges will disproportionately affect the poor and vulnerable. Looking at the linked sections and cross-chapter boxes in chapters 1, 2, 3 and 5, there is a lack of robust evidence to support this, and the report is clear that the trade-offs of mitigation depend on the mitigation measures chosen and the enabling conditions. Therefore this statement is misleading. Furthermore, challenges are given equal weight to impacts, which is misrepresenting ES 1-5 that clearly differentiates stating: “recognizing that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable (high confidence)". [cont'd below] [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5372	6	6	6	1	[cont'd] Paragraph 4.1 should read: The poor and vulnerable are disproportionately affected by the impacts of global warming. Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence) {1.1.1, 1.4}. Adaptation needs will be lower in a 1.5°C world compared to a 2°C world, and limiting warming to 1.5°C rather than 2°C would make it markedly easier to achieve sustainable development, with greater potential to eradicate poverty and reduce inequalities. {1.1.1, 1.1.2, 1.4.3, 2.5.3, 5.2.2, 5.2.3, Cross chapter Boxes 4 in Chapter 1, 8, Chapter 3, CB11, Chapter 4, Table 5.3 available as supplementary pdf}. [Saint Lucia]	
5878	6	6	6	1	This sentence is difficult to read, please clarify. In addition, we would like to ask if the underlying science justifies this side-by-side presentation of impacts on poor and vulnerable and "challenges" of staying below 1.5°C for the populations ? A solution could be to stop the sentence at "impacts of global warming", and start a new sentence at "with associated mitigation imply ...". [Belgium]	
6232	6	6	6	1	The poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C; with associated mitigation options implying a combination of significant benefits and adverse effects, depending on the various mitigation options (high confidence). {1.1.1, 1.1.2, 1.4.3, 2.5.3, Cross-Chapter Boxes 4 in Chapter 1, 7 and 8 in Chapter 3 and 13 in Chapter 5}...continued below. [Fiji]	
6234	6	6	6	1	The statement "the poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C" is not well corroborated in the report. It is very clear that the poor and vulnerable are disproportionately affected by impacts at 1.5°C and higher, but it is not so clear that mitigation challenges will disproportionately affect the poor and vulnerable. Looking at the linked sections and cross-chapter boxes in chapters 1, 2, 3 and 5, there is a lack of robust evidence to support this, and the report is clear that the trade-offs of mitigation depend on the mitigation measures chosen and the enabling conditions. Therefore this statement is seems to be inconsistent. Furthermore, challenges are given equal weight to impacts, which is misrepresenting ES 1-5 that clearly differentiates stating: “recognizing that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable (high confidence)". continued below. [Fiji]	
6236	6	6	6	1	Therefore the paragraph 4.1 is suggested to read: "The poor and vulnerable are disproportionately affected by the impacts of global warming. An Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence) {1.1.1, 1.4}. Adaptation needs will be lower in a 1.5°Cwarming compared to a 2°C warmer world, and limiting warming to 1.5°C rather than 2°C would provide convienent pathways to achieve sustainable development, with greater potential to eradicate poverty and reduce inequalities". [Fiji]	
6720	6	6	6	1	A4.1: The latter part of the statement that "the poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C" is not well corroborated in the report. It is very clear that the poor and vulnerable are disproportionately affected by impacts at 1.5 and higher, but it is not so clear that mitigation challenges will disproportionately affect the poor and vulnerable. Looking at the linked sections and cross-chapter boxes in chapters 1, 2, 3 and 5, there is a lack of robust evidence to support this, and the report is clear that the trade-offs of mitigation depend on the mitigation measures chosen and the enabling conditions. Therefore this statement is misleading. Furthermore, challenges are given equal weight to impacts, which is misrepresenting ES 1-5 that clearly differentiates stating: “recognizing that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable (high confidence)". [cont'd below] [Marshall Islands]	
6722	6	6	6	1	[cont'd] Paragraph 4.1 should read: The poor and vulnerable are disproportionately affected by the impacts of global warming. Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence) {1.1.1, 1.4}. Adaptation needs will be lower in a 1.5°C world compared to a 2°C world, and limiting warming to 1.5°C rather than 2°C would make it markedly easier to achieve sustainable development, with greater potential to eradicate poverty and reduce inequalities. {1.1.1, 1.1.2, 1.4.3, 2.5.3, 5.2.2, 5.2.3, Cross chapter Boxes 4 in Chapter 1, 8, Chapter 3, CB11, Chapter 4, Table 5.3 available as supplementary pdf}. [Marshall Islands]	
7014	6	6	6	7	Add the words “especially from developing countries" after the words poor and vulnerable since most of the evidences cited in the report to support this are from developing countries. [India]	
7034	6	6	6	1	Underlying report: Chapter 1, Pge 10, Line 30 to 37: Please add: In realization of the SDGs,prioritization based on the prevailing local / regional set ups is to be duly considered; else there is a problem of their collapse forever. [India]	
7564	6	6	6	1	Examples here would be very helpful. [United States of America]	
7566	6	6	6	1	"challenges" has not been used before, so not sure how to read this. Best to just use 'mitigation'. Likewise "combination of SIGNIFICANT benefits and..." introduces an unnecessary qualifier. Just say there will be both benefits and adverse affects. "significant" adds nothing, unless there is some statistical application. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7568	6	6	6	1	No level of impact could be considered porportionate. The authors should factually note, "the poor and other vulnerable populations are affected..." Everyone will be impacted by climate change. Of course there are inequities on the ablity of some groups to respond and their underlying vunerability, due to a variety of factors. These factors should be explored and options to reduce them presented without implying that the rich and therefore less vulnerable deserve to face the impacts of climate change. This should be also edited elsewhere in the document. [United States of America]	
7570	6	6	6	1	The statement in A4.1 that “The poor and vulnerable are disproportionately affected...” does not track well with the underlying report (3.4, 3.5), which suggests in 3.4.10, 3.4.11, 3.5.2.3, and 3.5.4.4 (albeit based largely on a single paper – Byers et al. 2018) that impacts on the poor become most discernible at warming greater than 1.5°C. Moreover, it implies without clear evidence that impacts and mitigation challenges have a proportional relationship to another variable (income? some index of vulnerability?). This statement should be revised to better track the underlying report, which emphasizes the differential impacts at different levels of warming and under different pathways, and to avoid implying quantitative relationships that are not well-grounded in evidence. [United States of America]	
7572	6	6	6	1	A4.1 makes the critical point that the poor and vulnerable will be affected (with benefits or adverse impacts) by mitigation options. However this point gets lost in the awkward construction of the sentence. Consider revising this phrase "with associated mitigation options implying a combination of significant benefits and adverse effects, depending on the various mitigation options." The text should make explicit and clear the point that while benefits may fall to some, the much more common result will be that others will bear the brunt of adverse impacts; it should not suggest or leave the reader to believe that all people will get both benefits and impacts. [United States of America]	
7574	6	6	6	1	Much like A4, A4.1 implies that benefits and adverse impacts will come from mitigation options alone, while adaptation options will also affect the poor and vulnerable and could have both negative and positive outcomes depending on the population. This allows for serious misunderstanding and should be corrected. [United States of America]	
8788	6	6	6	6	After "The poor and vulnerable" add: people particularly in the developing countries [Iran]	
9128	6	6	6	1	A4.1: The latter part of the statement that ""the poor and vulnerable are disproportionately affected by many impacts of global warming as well as the challenges of remaining below global warming of 1.5°C"" is not well corroborated in the report. It is very clear that the poor and vulnerable are disproportionately affected by impacts at 1.5 and higher, but it is not so clear that mitigation challenges will disproportionately affect the poor and vulnerable. Looking at the linked sections and cross-chapter boxes in chapters 1, 2, 3 and 5, there is a lack of robust evidence to support this, and the report is clear that the trade-offs of mitigation depend on the mitigation measures chosen and the enabling conditions. Therefore this statement is misleading. Furthermore, challenges are given equal weight to impacts, which is misrepresenting ES 1-5 that clearly differentiates stating: “recognizing that many of the impacts of warming up to and beyond 1.5°C, and some potential impacts of mitigation actions required to limit warming to 1.5°C, fall disproportionately on the poor and vulnerable (high confidence)"". [cont'd below] [Nauru]	
9130	6	6	6	1	[cont'd] Paragraph 4.1 should read: The poor and vulnerable are disproportionately affected by the impacts of global warming. Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence) {1.1.1, 1.4}. Adaptation needs will be lower in a 1.5°C world compared to a 2°C world, and limiting warming to 1.5°C rather than 2°C would make it markedly easier to achieve sustainable development, with greater potential to eradicate poverty and reduce inequalities. {1.1.1, 1.1.2, 1.4.3, 2.5.3, 5.2.2, 5.2.3, Cross chapter Boxes 4 in Chapter 1, 8, Chapter 3, CB11, Chapter 4, Table 5.3 available as supplementary pdf}. [Nauru]	
9416	6	6	6	1	Recommend deleting A4.1. Rationale: This section is duplicative of B5.1. Section B5 extensively describes [delete : all] impacts to disadvantaged and vulnerable populations. As such, A4.1 is [delete: unnecessary] [add: repetitive] and should be removed. [Canada]	
9418	6	6	6	1	This section may be better suited to section B5.1 and removed here to avoid duplication. Also, in addition to the poor and vulnerable, Indigenous Peoples are disproportionately affected by climate change due to their interconntectedness with the land (for culture, health, food security, livelihoods, well-being, etc.) This group should be added; specifically people in the Arctic regions who are living on the forefront of climate change and experiencing some of the most pronounced and rapid change in the world. Both Arctic and Indigenous Peoples should be included in this paragraph. [Canada]	
220	6	7	6	9	The continuation of the sentence referes to "associated mitigation options" whose effects depend on the "various mitigation options" and thus is hard to understand. [Finland]	
4706	6	7	6	9	It is unclear what is meant by "with associated mitigation options implying a combination of significant benefits and adverse effects, depending on the various mitigation options". Could you please be clearer, in particular greater clarity on the distinction between climate impacts and the consequences of policy choices around mitigation options [United Kingdom (of Great Britain and Northern Ireland)]	
5072	6	7	6	7	well as the challenges of limiting global warming to 1.5°C [Hungary]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5708	6	8	6	9	"Depending on various mitigation options" may not be needed here. The underlying idea is already raised in the preceeding text. [Sweden]	
8790	6	8	6	8	Delete: significant [Iran]	
3462	6	12	6	13	Add a sentence that reflects the rationale of pursuing adaptation efforts, i.e. to reduce vulnerability towards climate impacts, in the context of poverty eradication and sustainable development. Please add "context-specific" before "scientific, technological and social conditions" to make the message consistent with SPM.D.3. [Germany]	
3464	6	12	6	14	The two statements seem disconnected - the first addressing adaption and the second sustainable development- and they partly repeat the more detailed information in paragraphs D3. Please revise. [Germany]	
3466	6	12	6	14	Please explain what is meant with "scientific conditions need to fall into place." [Germany]	
4296	6	12	6	12	Add "industrial" Effective adaptation requires the integration of scientific, technological and social condistions ~ ? ~ of scientific, technological, industrial and social conditions ~ (Reason) Industrial consensus is also important to achieve short-term and efficient goals. [Republic of Korea]	
4482	6	12	6	14	Should add examples after "enhancing local capabilities". [Japan]	
4710	6	12	6	14	This is a very vague and somewhat obvious statement. As it currently reads it is not particularly informative, nor specific to the 1.5C issue - could you make more substantive and specifically relevant to the subject in hand. [United Kingdom (of Great Britain and Northern Ireland)]	
5188	6	12	6	12	the paragraph explain that effective adaptation requires integration of scientific, technological and social conditions and capacities. This is also true FOR EFFECTIVE MITIGATION. A reference to mitigation should be included in this paragraph. [Spain]	
5880	6	12	6	14	This paragraph is not related to section A ("Understanding global warming of 1.5°C") and is rather obvious; we suggest deleting it or moving to section D and clarifying (the current second sentence may suggest that factors enabling sustainable development are only of local nature - this message is unclear). [Belgium]	
7016	6	12	6	14	This statement should be modified in the following manner - “Effective adaptation requires the integration of scientific, technological, economic, and social conditions and capacities of all countries. For developing countries, sustainable development, poverty eradication, and reduction of inequalities require both the provision of knowledge, technology transfer, and climate finance from developed countries, and enhancing local capabilities (high confidence)”. [India]	
7026	6	12	6	14	Local capabilities is only one of the factors to determine sustainable development. Povery reduction, etc. cannot be achieved by just enhancing local capabilities. Add "enabling conditions including" after "…by enhancing" and before "local capabilities….". [India]	
7576	6	12	6	12	"requires" is policy prescriptive. [United States of America]	
7578	6	12	6	12	What is a scientific "condition"? This should be reworded. [United States of America]	
7580	6	12	6	13	What about economic conditions? socio-economic? It would seem that adaption also requires money. [United States of America]	
7582	6	12	6	13	This statement is only partially true. There are situations where effective adaptation does not require integration of social conditions. For example, an individual can effectively withdraw from the coast without integration of scientific or social conditions. The statement should be reversed: "Incorporating scientific, technological, and social concerns and capabilities can increase the effectiveness of adaptation." [United States of America]	
7584	6	12	6	14	Not sure why these two sentences are grouped together as a single key finding. While related, it seems that the points being made are separate. [United States of America]	
7586	6	12	6	14	A4.2 limits effective adaptation to "the integration of scientific, technological, and social conditions and capacities." This text does not adequately address the role of governments and strong institutions in facilitating adaptation. In addition, A4.2 puts a overemphasis on local capabilities at the expense of other key factors; local capabilities alone do not reduce inequalities and lead to development. Since the report is focused on climate change, perhaps the second sentence should be limited to adaptation and not the full range of development/poverty issues. [United States of America]	
8508	6	12	6	13	The integration should at least also encompass the economics-finance-investments aspect [Belgium]	
8792	6	12	6	13	Change the phrase of "the integration of scientific, technological and social conditions and capacities" To the intergration of scientific and technological capacity and socio-economic conditions." [Iran]	
9420	6	12	6	14	Recommend moving this text to section D3 to align with the discussion on adaptation. Indigenous Knowledge is missing in the discussion of effective adaptation. Furthermore, self-determination is also at the crux of enhancing local capabilities and should also be included. Note that support for the first sentece is provided in Chapter 4, particiarly in section 4.3.5.5. However, the term 'self-determination' is not used in either Chapter 4 or 5. [Canada]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9422	6	12	6	14	Recommend deleting A4.2. Rationale: -Discussion on "effective adaptation" and "enhancing local capabilities" is already covered in Sections D3 and D6, so reptition of information here is not required. In addition, "effective adaptation" is undefined in Chapter 4, rather adaptation is noted to require integration of scientific, tehcnological and social conditions, which may be implying an interpretation beyond what is intended by the research. -There should be a reference to traditional knowledge as apart of effective adaptation efforts. This also identifies a need to include a specific section on traditional knowledge, similar to that in 4.3.5.5, identifying the clear benefit (i.e. medium evidence and high agreement) that traditional knowledge (and thus Indigenous Peoples) have for adaptation efforts. It also identifies that there must be recongition of Indigenous Peoples' rights, laws and governance systems, which ties nicely into Canada's commitments pertaining to the adoption "without qualification" of the United Nations Declaration on the Rights of Indigenous Peoples. [Canada]	
7588	6	13	6	14	This statement seems obvious and has little to do with climate. This finding should be explicitly linked to 1.5°C (with more detail about impacts). Also be sure that 'enabled' is consistently with Box SPM-1 definition. It seems overbroad to state that sustainable development, poverty eradication, and reduction of inequalities "are enabled" by enhancing local capacities. Suggest replacing with something along the lines of "can be enhanced". [United States of America]	
8794	6	14	6	14	After "local capabilities" add: "particularly in the developing countries" [Iran]	
9424	6	14	6	14	Please add the following after capabilities ", including building the capability to utilise Indigenous Knowledge and local knowledge" [Canada]	
786	6	16	6	18	CRDP: it is either too much, or too little: this sentence as it stands does not bring any important conclusion for a policy maker, just introducing a new concept. We suggest to delete it,as this concept is never used again in the SPM, or at least to put it in Box 1 as a definition. [France]	
1718	6	16	6	16	Replace "a framework" with "trajectories", see definition of CRDPs in chapter 1, page 36 (section 1.4.3) [Saudi Arabia]	
1842	6	16	6	18	Statement A4.3 seems to fit better under heading D5. Consider moving. [Denmark]	
1844	6	16	6	18	consider reformulation based on describtion in technical report 5.5.3 [Denmark]	
2278	6	16	6	19	CRDPs are a new concept and should be introduced. [European Union (EU)]	
3468	6	16	6	18	The application of terminologies in this paragraph is not clear in the context of the report, please clarify: a) do you refer to "climate adaptation" or "climate change adaptation" (compare "climate resilient") b) the application of the terminology "resilient" is not clear. Does the term function as one analytical entity or concept which embraces goals and tasks associated with "mitigation" and "adaptation" or does it function as a third analytical entity NEXT to mitigation and adaptation as currently suggested by the formulation. [Germany]	
3470	6	16	6	18	You state that CRDPs "are" a framework to simultaneously achieve all the respective goals listed in the sentence. The sentence suggests that it is possible to achieve all goals without trade-offs and that it (automatically) includes the reduction of inequalities. This contradicts one of your main findings that ethics and equity are key for the implementation of successful mitigation options (A4), the statements on trade-offs on page 18 of the SPM, as well as the equity concerns or concerns related to potential trade-offs that you e.g. refer to in chapter 1 page 9-10. Please revise and clearly define CRDPs, possibly using the text from the glossary. Please consider to move this definition in Box SPM 1 as this concept is also relevant for section D. [Germany]	
4484	6	16	6	18	Suggest this paragraph (definition of Climate Resilient Development Pathways) be moved to Box SPM 1, among other definitions central to SR1.5, instead of here. [Japan]	
4712	6	16	6	18	"CRDPs are a framework" is too vague in its usefulness to policymakers. Are there other frameworks? If so, what makes CRDPs better / more noteworthy? Also, you could remove the CRDP acronym [United Kingdom (of Great Britain and Northern Ireland)]	
7018	6	16	6	18	The statement should be modified in the following manner -" Climate Resilient Development Pathways (CRDPs) is a framework used in this report to study the convergence of the goals of emission reduction, climate adaptation, and climate resilience. In the context of developing countries, it refers to poverty eradication, reducing inequalities, and sustainable development. In the context of developed countries, it refers to accelerated de-carbonisation and rapid transition to sustainable consumption and low carbon lifestyles {1.4.3, Cross Chapter Box 1, 4.3.3, 4.3.4, 4.4.3, 5.1, 5.5.3, 5.4.1, 5.4.2}" [India]	
7590	6	16	6	18	This is far too reassuring a statement given the way the world community has so far been dealing with the issue. The CRDPs that are being referred to here envision actions and changes by the global community of nations that are far faster than there is any indication would be possible, if they are technologically possible at all. The alternative is to resort to solar radiation management, which this report does not really include in its envisioned set of options. There are basically no plausible CRDPs within the mitigation-only framing, and this needs to be very forthrightly presented. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7592	6	16	6	18	This bullet does not add much, if any, content. At minimum, CRDPs need to be defined in Box SPM-1 (if to be used later in the SPM), specifically pointing out that they are a "conceptual framework" -- as they are theoretical pathways and yet to be proven effective or adopted/endorsed by any government or organization. [United States of America]	
7594	6	16	6	18	It is not clear how "climate adaptation and climate resilience" are being differentiated here or in the underlying report. [United States of America]	
8544	6	16	6	19	First reference to Climate Resilient Development Pathways so the concept should be introduced or references in main Report referred to [Ireland]	
8796	6	16	6	16	Change the phrase of "Climate resilient development pathways (CRDPs)" to "To establish Climate resilient development pathways (CRDPs) in according with principals and provisions of UNFCCC to serve" at the framework to … [Iran]	
9426	6	16	6	18	Recommend deleting A4.3. Rationale: "Climate resilient development pathways" are covered extensively under Sections D5, D5.1. As such, the text here is duplicative and should be removed. [Canada]	
788	6	17	6	17	"Climate resilience" is not defined anywhere else and paragraph D.5.2 states that the third goal is sustainable development. We suggest to write it as follow : "...the goals of emission reduction, climate adaptation and sustainable development in the context…" [France]	
4298	6	18	6	18	reducing inequalities ? reduction of inequalities (using the same expression as p. 6, line 13) [Republic of Korea]	
4486	6	18	6	18	Suggest the following change in order to maintain consistency of the way of referring. Cross-Chapter Box 1 ==> Cross-Chapter Box 1 in Chapter 1 [Japan]	
5074	6	19	6	19	It would be important to add the reference to the impacts-SDGs link as A4.4 generally and e.g. with a reference taken from Chapter 3, Cross-Chapter Box 6 .. [Hungary]	
222	6	2	6	22	This paragraph may lead to very confusing conclusions. Now this sentence is saying, that issue is complex, we do not know if anything could be done. Is this chapter indirectly implying that there are no solutions to achieve 1.5 target? This paragraph does not refer to the SDG context. The paragraph is linked to the following para A5.1 which has a clear SDG context. Another, related issue, is that there is a risk that section A5 may fail to carry the message that no mitigation is a much poorer option compared to an unperfect 1.5 degree mitigation that may risk SDG goals. As the impacts of warming and impacts of mitigation are analysed in a different manner (section B with examples on different climate impacts on e.g. ecosystems and sectors, section B5 mitigation tradeoffs with SDG goal by goal), there may be a risk that the reader may get an impression that it is just mitigation that can risk SDG goals. [Finland]	
356	6	2	6	22	This statement about feasibility is not very informative. We suggest using the language of Chap. 2 Exec. Summ.: "1.5°C-consistent pathways can be indentified under a range of assumptions about economic growth, technology development and lifestyles" [Chad]	
790	6	2	6	29	nment think or say that there is no use getting really involved as nothing is sure... We suggest to delete the first part of the statement until "because" and to modify the second part as follow : "The feasibility of limiting warming to 1.5°C and to adapt to the consequences depends on meeting simultaneously and systematically conditions that are multi-dimensional." We also suggest to add a point to A5 : A5.2 Feasibility also depends on rapid and sufficient action and collaboration to reach net-zero global emissions of CO2 around mid-century and to adapt to the consequences and ensure resilience. [France]	
1680	6	2	6	22	This point seems to put mitigation and adaptation to 1.5C on the same footing or it seems to give equal weight to both. However, adaptation challenges at 1.5C are lower than adaptation challenges at warming above that value. Moreover, it is geo-physically feasible to mitigate warming to 1.5C but it is much more harder to adapt to warming greater than 1.5C. [Belize]	
1720	6	2	6	28	This SPM statement will be more informative if in addition added sub-statements reporting to what extent the enabling conditions are feasible within the context of sustainable development based on the multiple categoreis physical, environmental, technological, economical, social, and institutional. [Saudi Arabia]	
1846	6	2	6	28	Statements A5 and A5.1 do not hold concrete messages and appear very fuzzy and in seems to be in contrast with statement D5. If a fairly clear conclusion cannot be stated, it cannot bear a headline statement, and the paras should be reduced. [Denmark]	
2280	6	2	6	23	proposal to delete A.5; generic comment with no added value. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2282	6	2	6	22	A5 somewhat contradicts D5 on page 21, which states that "Pursuing climate-resilient development pathways can limit warming to 1.5°C while adapting to its consequences and simultaneously achieving sustainable development". Also, the phrase "no simple answer to the question of whether it is feasible" is almost impossible for a reader to interpret. Recommend that the report does not spend two paragraphs discussing "feasibility" if it is not able to draw any meaningful conclusions. Instead the report could merely state that the issue of limiting warming to 1.5°C in the context of adaptation and sustainable development is inherently multi-faceted. Understanding of the interactions continues to develop, the most important known interactions are covered later in the report (especially in Section D). [European Union (EU)]	
3472	6	2	6	22	If A5 was kept: The paragraph combines two different assessments (feasibility of limiting global warming to 1.5°C and feasibility of adaptation to 1.5°C). Adaptation does not contribute to limiting global warming and it is not clear to which assessment the stated outcome refers or how these assessments were combined. Denying feasibility of limiting warming to 1.5 °C would imply an even greater demand for adaptation. [Germany]	
3474	6	2	6	22	The concept of feasibility is a central component of the SR1.5. However, the current version of the headline statement does not provide sufficient information to policy makers. Therefore, A5.1 and A5 should be switched, and most of current A5 deleted, because (i) A5 does not provide substantive information on feasibility and (ii) A5 combines two different assessments (feasibility of limiting global warming to 1.5°C and feasibility of adaptation to 1.5°C); it is not clear to which assessment the stated outcome refers or how these assessments were combined; adaptation does not contribute to limiting global warming and denying feasibility of limiting warming to 1.5 °C would imply an even greater demand for adaptation. Instead we suggest lift a modification of current A5.1 to the headline statement A5, and to provide the some background on feasibility (with elements of former A5) as follows: A5. The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development {1-ES-5}. These include institutional capacity, political willingness and ability to mobilize finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} A5.1 Feasibility has multiple dimensions that need to be considered simultaneously and systematically. In this report feasibility is considered as the extent to which a specific climate target and/or a response option are considered possible and/or desirable. Feasibility depends on geophysical, ecological, technological, economic, social and institutional conditions for change. Conditions underpinning feasibility are dynamic, spatially variable, and may vary between different groups {adapted from 1-5, glossary-23}. This could be complimented by a paragraph summarizing lessons learned, as suggested in our comment on p 6 ln 24-28. It may also be useful to move A4.3 on CRDPs as a new subparagraph A5.2 if the CRDP framework can be linked as the overarching objective to the concept of feasibility. Alternatively, and in the light of saving space, we could also see our suggested A5 (current A5.1) being included into a sub-bullet into section A4, and the current headline A5 be amended with a reference to enabling conditions. [Germany]	
3904	6	2	6	22	It is important to stress that does not assess the feasibility of achieving the pathways described in figure SPM 1.2. Such and assessment would require additional work and might be done in AR6. [Luxembourg]	
4120	6	2	6	22	A5: This statement ("there is no simple answer to question of whether it is feasible to limit warming to 1.5?C") does not give any useful message to policymakers and should be removed. The paragraph as it stands is further factually incorrect as it treats mitigation and adaptation at same level, even though feasibility of adaptation increases with lower warming limits. The mitigation component relates to a range of 'feasibility' dimensions (CC Box 3). The science underlying the assessments of these dimensions is not equally robust across them, in fact for some of them very limited. If an assessment of some of the proposed dimensions is outstanding, then a 'we don't know' is a factual correct, but inappropriate summary. Rather, it is advisable to provide the assessment for those dimensions for which sufficient information is available from the ES of Ch 01 and 02. A revised statement A5 should read: "A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles {2.3.1, 2.3.2, 2.5}." [Saint Kitts and Nevis]	
4300	6	2	6	22	A5 headline statesment is very well known information even before showing in SR15 SPM. it is better to remove this headline, and move the contenxts of A5.1 to A4.4. [Republic of Korea]	
4488	6	2	6	22	Suggest inclusion of the explanation that the report assesses the feasibilities of adaptation and mitigation options compatible with a 1.5°C warmer world in six dimensions, as provided in Cross-Chapter Box 3 in Chapter 1. [Japan]	

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4714	6	2	6	28	The text on feasibility is very cursory and general, giving no indication to policymakers of where 1.5C pathways may sit in the different dimensions of feasibility, or even whether 1.5C is more or less feasible than other pathways. I suggest either removing this text or expanding it to set out the dimensions and how 1.5C pathways sit in them (a figure similar to SPM4 may be useful). [United Kingdom (of Great Britain and Northern Ireland)]	
4716	6	2	6	28	This section fails to point out the highly important message that it is still possible to limit global warming to 1.5C (i.e. that pathways exist). It could therefore easily be misinterpreted as saying that it may not be possible. This would be a much more useful section if it was phrased that it was still possible to reach the goal, but there are a number of technological / political / social barriers that could prevent it, such as X, Y, Z. [United Kingdom (of Great Britain and Northern Ireland)]	
4972	6	2	6	22	This is not a very informative key message. It would be clearer to say something along the lines of: "it is/isn't feasible to limit warming to 1.5C as long as/but it depends on…" and then list the challenges, caveats and requirements. [United Kingdom (of Great Britain and Northern Ireland)]	
5076	6	2	6	22	it is still feasible to limit global warming to .. {Figure SPM 1, 1.4, .. ((explanation: insertion of word "still" underlines the substance of this message and Fig. SPM 1 provides a clear demonstration on what is needed for that feasibility)) [Hungary]	
5256	6	2	6	22	This statement about feasibility is not very informative. We suggest using the language of Chap. 2 Exec. Summ.: "1.5°C-consistent pathways can be indentified under a range of assumptions about economic growth, technology development and lifestyles" [Zambia]	
5374	6	2	6	22	A5: This statement ("there is no simple answer to question of whether it is feasible to limit warming to 1.5?C") does not give any useful message to policymakers and should be removed. The paragraph as it stands is further factually incorrect as it treats mitigation and adaptation at same level, even though feasibility of adaptation increases with lower warming limits. The mitigation component relates to a range of 'feasibility' dimensions (CC Box 3). The science underlying the assessments of these dimensions is not equally robust across them, in fact for some of them very limited. If an assessment of some of the proposed dimensions is outstanding, then a 'we don't know' is a factual correct, but inappropriate summary. Rather, it is advisable to provide the assessment for those dimensions for which sufficient information is available from the ES of Ch 01 and 02. A revised statement A5 should read: "A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles {2.3.1, 2.3.2, 2.5}." [Saint Lucia]	
5710	6	2	6	28	Suggest deletion of "There is no simple answer to the question of whether it is". Could write more to the point: "Feasibility to limit…". Also, under A5.1, "In the context of sustainable development" could be left out, as the finding surely is applicable in general. Furthermore, the text does not provide much substance. Appropriate findings from C or D could perhaps be brought in here. [Sweden]	
6146	6	2	6	28	A5 and A5.1 are very vague and rather philosophical statements (there is no doubt that everything depends on actions taken) that do not belong to the SPM and have their place the main report, please delete. The possible options are listed in section C (e.g. C3.1 and C3.2 point out already existing rapid emissions reductions and D5 states feasibility) [Estonia]	
6238	6	2	6	22	There is no simple answer to the question of whether it is feasible to limit warming to 1.5°C and to adapt to the consequences because feasibility has multiple dimensions that need to be considered simultaneously and systematically. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.3, 4.4} ...continued below. [Fiji]	
6240	6	2	6	22	This statement does not provide useful guidance for policymakers and needs to be revisited or eben removed if not enough science to support it. The paragraph seems to lack facts, and my intrepretation is that it looks mitigation and adaptation at samelevel, even though feasibility of adaptation increases with lower warming limits. Suggest to provide the assessment for those dimensions for which sufficient information is available and the statement could ber restructed as follows: "A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles". [Fiji]	
6418	6	2	6	22	fair statement, but can be made clearer: "because feasibility relates to multiple dimensions of capability that cannot easily be assessed simultaniously and systematically." [Netherlands]	
6592	6	2	6	22	This statement about feasibility is not very informative. We suggest using the language of Chap. 2 Exec. Summ.: "1.5°C-consistent pathways can be indentified under a range of assumptions about economic growth, technology development and lifestyles" [Sudan]	
6684	6	2	6	28	A5 and A5.1: These findings are important and shows improvement from the previous version of the SPM. At the same time the reader would like to have an answer to the key Talanoa dialoge question "How do we get there" (Paris agreement). An answer to this question in the SPM here or in other places would therefor be appreciated. In 5.1 it is said that feasibility depends on enabeling conditions. It would then be useful if the text now in 5.1 clarifies the enabeling conditions that are needed in relation to 1,5 degrees. [Norway]	

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6724	6	2	6	22	A5: This statement ("there is no simple answer to question of whether it is feasible to limit warming to 1.5?C") does not give any useful message to policymakers and should be removed. The paragraph as it stands is further factually incorrect as it treats mitigation and adaptation at same level, even though feasibility of adaptation increases with lower warming limits. The mitigation component relates to a range of 'feasibility' dimensions (CC Box 3). The science underlying the assessments of these dimensions is not equally robust across them, in fact for some of them very limited. If an assessment of some of the proposed dimensions is outstanding, then a 'we don't know' is a factual correct, but inappropriate summary. Rather, it is advisable to provide the assessment for those dimensions for which sufficient information is available from the ES of Ch 01 and 02. A revised statement A5 should read: "A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles {2.3.1, 2.3.2, 2.5}." [Marshall Islands]	
6846	6	2	6	22	The question of feasability for developing countries is not an easy question to anwser. All these enabling conditions should be statified and offered by developing countries in accordance to their obligations under the UNFCCC so as the develping countries could take actions in accordance to their national circumstances. [United Arab Emirates]	
6874	6	2	6	22	This statement about feasibility is not very informative. We suggest using the language of Chap. 2 Exec. Summ.: "1.5°C-consistent pathways can be indentified under a range of assumptions about economic growth, technology development and lifestyles" [Gambia]	
7596	6	2	6	22	This statement needs a prefatory remark indicating that given the present levels of commitment, there is no answer even conceivable. Then note that with much stronger commitments that there is then still "no simple answer". Given how far along climate change is now, the world needs not only to quickly eliminate its forcings, but to pull the forcings down further, making sure also to account for the additional natural emissions that have been stimulated. The current phrasing is too optimistic. [United States of America]	
7598	6	2	6	22	The statement is watered down, only saying that there are no simple answers because multiple unstated dimensions to the question need to be considered simultaneously. As discussed in Cross-Chapter Box 3, there are geophysical, environmental-ecological, technological, economic, socio-cultural, and institutional dimensions to feasibility. Section A5 of the SPM needs to acknowledge that meeting 1.5°C warming targets and successfully implementing deep decarbonization and climate resilient development requires rapid and far-reaching systems transitions (e.g. energy, land, urban, and industrial systems) in the next one to two decades, and drastic socio-technical transformations (e.g., policies, governance, markets, and behavior) which all face significant challenges. These are the challenges that the enabling conditions discussed in A5.1 (page 6, lines 24-28) help address. A clearer statement in Section A about feasibility that acknowledges both the challenges posed by 1.5°C warming targets and the enabling conditions that are needed to address those challenges is needed for the SPM to accurately convey the key findings from the underlying chapters. [United States of America]	
7600	6	2	6	22	The questions (1) whether it is feasible to limit warming to 1.5°C and (2) whether it is feasible to adapt to the consequences of a 1.5°C warming are distinct questions and should be addressed separately, rather than treated as a single question. [United States of America]	
7602	6	2	6	22	There is a general philosophical question of what it would mean to say that it is not feasible to "adapt" to a 1.5°C warming, given that such an amount of warming is almost inevitable. Is the question rather one of effectiveness of adaptation strategies and the degree to which they enable or hinder more general sustainable development objectives? [United States of America]	
7604	6	2	6	28	These statements completely fail to communicate actionable information to policymakers. It is not until much later in the SPM where there are more direct and useful statements regarding feasibility. Page 14, lines 44-45, for example, has a statement that is much more useful than the text here and authors should delete these statements and replace with other text already in the report, e.g.: "The rates of change that are consistent with 1.5°C pathways were observed in the past within specific sectors, technologies, and spatial contexts, but there is no documented historic precedent for the scale found in 1.5°C-consistent pathways." Furthermore, the feasibility of limiting warming to 1.5°C and the feasibility of adapting to changes at 1.5°C are so different in scope and scale that they should be in separate statements. [United States of America]	
7606	6	2	6	28	As discussed elsewhere in the report, it is important to acknowledge meeting 1.5°C warming targets and successfully implementing deep decarbonization and climate resilient development requires drastic socio-technical transformations (e.g., policies, governance, markets, and behavior) which face significant challenges. Suggest to modify this section and add some discussion on the challenges for deep decarbonization and climate-resilient development required for meeting 1.5°C warming targets. [United States of America]	

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7608	6	2	6	28	The discussion of feasibility in section A5 says there are no simple answers because of the multiple dimensions that need to be considered, but the subsequent discussion does not even mention the dimensions that are considered in this report. Cross-Chapter Box 3 explicitly lists six dimensions that this report uses to assess feasibility: geophysical, environmental-ecological, technological, economic, socio-cultural, and institutional. The SPM should at least mention what these dimensions are. [United States of America]	
7610	6	2	6	28	Feasibility also depends upon the presence or absence of positive feedbacks that may accelerate the release of GHGs from terrestrial or marine ecosystems (e.g., permafrost thaw wildfire incidence, methane clathrates) and that may occur directly as a result of anthropogenic activity including GHGs already added to the atmosphere and consequent anthropogenic warming to date. There is a robust scientific literature that identifies these and other positive feedbacks as plausible-to-already-observed, some of which appears in the foundational text -- and even elsewhere in the SPM -- e.g., SPM-13, 31-38 -- and some of which could be incorporated. [United States of America]	
7612	6	2	6	28	The feasibility of limiting warming to 1.5°C may depend as much on behavioral shifts as on technological advancement, and will inevitably rely on social accommodation of adjustments to behaviors and/or the landscapes that exist currently. [United States of America]	
7614	6	2	6	28	It would be reasonable for A5 to attempt to make some more specific points about feasibility, specifically with respect to mitigation. For example, the feasibility of limiting warming to 1.5°C (including in overshoot scenarios) will depend heavily on the acceptability, scalability, and implementation of Carbon Dioxide Removal technologies and strategies, including land-based strategies such as afforestation and reforestation, at scale beginning in the next few decades. [United States of America]	
7616	6	2	6	28	This section fails to reflect the foundational text with fidelity. For example, Chapter 5, page 5-6 reads: "Without societal transformation and rapid implementation of ambitious greenhouse gas reduction measures, pathways to limiting warming to 1.5°C and achieving sustainable development will be exceedingly difficult, if not impossible, to achieve (high confidence)." The text in the SPM, that "feasibility has multiple dimensions" and that "feasibility depends on enabling conditions" in no way captures the critical finding in Chapter 5, which is that liming warming to 1.5°C will be "exceedingly difficult" absent "societal transformation" and "rapid implementation of ambitious greenhouse gas reduction measures." In addition, this section of the SPM needs to be revised with a problem in the underlying text in mind. In Chapter 5, analysis that shows trade-offs between development and climate change do not always support recommendations, which assume ideal conditions and risk undercutting 1.5°C impact scenarios. For example: "The fundamental societal and systemic changes to achieve sustainable development, eradicate poverty and reduce inequalities while limiting warming to 1.5°C would require a set of institutional, social, cultural, economic and technological conditions to be met." (pages 5-6 to 5-7). [United States of America]	
8390	6	2	6	22	This statement about feasibility is not very informative. We suggest using the language of Chap. 2 Exec. Summ.: "1.5°C-consistent pathways can be indentified under a range of assumptions about economic growth, technology development and lifestyles" [Nepal]	
8912	6	2	6	22	Suggest restructuring A5 into two separate points as these are two fundamentally different challenges: Point one on the ability to physically limit warming to 1.5, and point two on adaptation to a world that is 1.5 warmer. [Australia]	
9048	6	2	6	22	A5: This statement (""there is no simple answer to question of whether it is feasible to limit warming to 1.5?C"") does not give any useful message to policymakers and should be removed. The paragraph as it stands is further factually incorrect as it treats mitigation and adaptation at same level, even though feasibility of adaptation increases with lower warming limits. The mitigation component relates to a range of 'feasibility' dimensions (CC Box 3). The science underlying the assessments of these dimensions is not equally robust across them, in fact for some of them very limited. If an assessment of some of the proposed dimensions is outstanding, then a 'we don't know' is a factual correct, but inappropriate summary. Rather, it is advisable to provide the assessment for those dimensions for which sufficient information is available from the ES of Ch 01 and 02. A revised statement A5 should read: ""A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles {2.3.1, 2.3.2, 2.5}."" [Solomon Islands]	

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9132	6	2	6	22	A5: This statement (""there is no simple answer to question of whether it is feasible to limit warming to 1.5?C"") does not give any useful message to policymakers and should be removed. The paragraph as it stands is further factually incorrect as it treats mitigation and adaptation at same level, even though feasibility of adaptation increases with lower warming limits. The mitigation component relates to a range of 'feasibility' dimensions (CC Box 3). The science underlying the assessments of these dimensions is not equally robust across them, in fact for some of them very limited. If an assessment of some of the proposed dimensions is outstanding, then a 'we don't know' is a factual correct, but inappropriate summary. Rather, it is advisable to provide the assessment for those dimensions for which sufficient information is available from the ES of Ch 01 and 02. A revised statement A5 should read: ""A warming greater than 1.5°C is not geophysically unavoidable: whether it will occur depends on future rates of emission reductions {1.2.3, 1.2.4}. 1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles {2.3.1, 2.3.2, 2.5}."" [Nauru]	
9268	6	2	6	22	This is an unsatisfactory statement for an SPM. It leaves the impression to dodge the question. At least it should be said that delayed action (rising or constant CO2 emission) bears the high risk that options to keep the warming below certain levels will be lost, overshoots are committed and any achievment of a lost target is very much more difficult than before. S [Switzerland]	
9428	6	2	6	22	Recommend deleting A5.1. in the interest of reducing duplication and shortening the SPM. Rationale: Text is repetitive of the headline statements and sub-bullets, particularly sections C.1.1., D.4. [Canada]	
7618	6	21	6	21	"multiple dimensions" is jargon. Expand. [United States of America]	
8798	6	21	6	21	After "the consequences" add "or not" [Iran]	
2284	6	22	6	22	shouldn't it be be 'systemically' (and not 'systematically')? [European Union (EU)]	
8546	6	22	6	22	Replace "systematically" with "systemically" [Ireland]	
224	6	24	6	28	A5.1 paragraph deals with enabling conditions and it is quite hard to read. In definitions (on page SPM-4) "enabling conditions" have been explained in a clearer way. [Finland]	
358	6	24	6	28	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Chad]	
1682	6	24	6	28	A5.1: The ES of Ch 01 provides a more pointed summary of the first part of the paragraph: A5.1: The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} [Belize]	
2286	6	24	6	28	A5.1 should be deleted or re-written. It repeats the rather poor definition/use of "enabling conditions" (misrepresenting societal response as mere "enabling conditions", whilst assuming that mitigation measures would somehow exist in abstraction), then wrongly suggests that these enabling conditions determine solely the achivability of limiting warming to 1.5 degrees. There should be also a reflections on hard barriers (thermodynamics, resource constraints, ecosystem responses, etc.). To our view enabling conditions are necessary but not sufficient, as they are part of a broader and more complex picture; and in these terms should be discussed. [European Union (EU)]	
2288	6	24	6	28	Feasibility depends also on choices related to stakeholders capacity (not only institutional), technology deployment, own budgetary allocation, and priority choices. [European Union (EU)]	
3476	6	24	6	26	We recommend to also consider "education" and "knowledge transfer" in the context of sustainable development and enabling conditions. "education", "knowledge transfer" or "access to knowledge" are mentioned throughout the report as substantial enabling factors to realize adaptation options, but missing in this statement. Please include these factors. [Germany]	
3478	6	24	6	28	The core message, that feasibility depends on enabling conditions, leads to the impression that the transformation towards climate resilience will start from scratch. Please add a sentence that conveys the relevance of lessons learnt from mitigation and adaptation (incl. risk reduction and risk transfer) efforts for upscaling and mainstreaming adaptation action (cf. SPM.B.6.2-B.6.4). See also our overarching comment on section A5 and A5.1 (p6 ln 22-28). [Germany]	
3480	6	24	6	28	Please include the important statement from chapter 1 either in A5.1 or in A5 that a global transformation would be needed to limit warming to 1.5°C. (Ch 1 ES and Cross-Chapter Box 3.) See also our overarching comment on section A5 and A5.1 (p6 ln 22-28). [Germany]	
4122	6	24	6	28	A5.1: The ES of Ch 01 provides a more pointed summary of the first part of the paragraph: A5.1: The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4490	6	24	6	28	The definition of "Enabling conditions" in Glossary says, "Conditions that affect the feasibility of adaptation and mitigation options" Comparing to this sentence in Glossary, the sentence, "feasibility depends on enabling conditions", intensifies the importance of enabling conditions in relation to the feasibility. We suggest to align the use of "enabling conditions" with Glossary. We seek clarification for a concrete reason why "technological transfer" is included in SPM. [Japan]	
5258	6	24	6	28	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Zambia]	
5376	6	24	6	28	A5.1: The ES of Ch 01 provides a more pointed summary of the first part of the paragraph: A5.1: The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} [Saint Lucia]	
5882	6	24	6	26	Please consider including "political leadership" to the list of enabling factors. [Belgium]	
6242	6	24	6	28	The ES of Chapter 01 provides a more pointed summary of the first part of the paragraph: " The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, legal instruments, regional frameworks, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. [Fiji]	
6420	6	24	6	24	suggest to replace "enabling conditions" with "capabilities" as the former does not equals capabilities: there can be enabling conditions for obtainng capabilities, but these are not the capabilities themeselves. [Netherlands]	
6594	6	24	6	28	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Sudan]	
6726	6	24	6	28	A5.1: The ES of Ch 01 provides a more pointed summary of the first part of the paragraph: A5.1: The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} [Marshall Islands]	
6876	6	24	6	28	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Gambia]	
7010	6	24	6	28	Underlying report Chapter 4; page 96-97: The report also emphasizes and focuses upon lending practices of Multilateral Development Banks (MDBs) as means of mainstreaming climate finance (Chapter 4: Strengthening and implementing the global response section 4.4.5.6 page 96). However, MDBs largely pursue their own 'alignments" quite unrelated to the NDCs. Hence, there is a need to emphasise the role of international cooperation in addressing global concern on the financing framework. i.e. Public finance as clarified in the Article 9 of the Paris Agreement. The front loading has to arrive from the financial pledges the developed country Parties have undertaken under the UNFCCC. Private sector finance also play a supportive and a critical additional role. [India]	
7020	6	24	6	24	Modify first sentence of this paragraph in the following manner - "In the context of sustainable development, feasibility depends on whether climate action and enabling conditions are adequate to meet the constraints set by the remaining carbon budget" [India]	
7036	6	24	6	28	The report has a skewed emphasis on the mitigation aspects. The report talks about societal transformation and social justice, but not much has been mentioned in the provision of means of implementation for climate actions. Indicative planning and climate resilient future could only be justified if international commitments on finance and technology are fulfilled in a timely, transparent, predictable and credible manner. The IPCC Report has to recognize the financial mechanism of the Convention and its role along with ODA, MDBs and national and subnational budgets. Overall, there is a skewed emphasis towards mitigation. The adaptation needs are of particular importance for developing countries. The gap between propensity to save and propensity to invest is more magnified within the gaps between mitigation and adaptation. However, the draft Report is silent in this regard. [India]	
7620	6	24	6	24	Don't use 'feasibility' in a way that it applies to sustainability. Instead, cast as "… of sustainable development or the feasibility of climate adaptation depends on …" [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7622	6	24	6	28	This statement should be made crisper. "Feasibility," as it is used in this report, is not strictly a technical or geophysical question of whether a strategy can be accomplished, but is a more nuanced question of whether the consequences of accomplishing a strategy might be judged by society to be unacceptable because of factors such as cost, environmental damage, the need for cultural or social accommodation or transformation, etc. Suggested alternative: "In the context of sustainable development and as defined in this report, whether a strategy is "feasible" depends on the state and evolution of enabling conditions, such as institutional capacity, policy and finance, governance at multiple levels, technological innovation, and the adaptability of human behaviour and lifestyles. In this sense, a judgment with respect to feasibility reflects consideration of synergies and trade-offs among mitigation and adaptation strategies and sustainable development objectives." [United States of America]	
7624	6	24	6	28	This finding is incoherent. The feasibility of sustainable development is not dependent only on enabling conditions related to climate change mitigation and adaptation, per the definition on page 4. Feasibility of sustainable development is also affected by conflict, education, human health, and other non-climate factors. [United States of America]	
8392	6	24	6	28	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Nepal]	
8468	6	24	6	28	This is a major point that need to be highlighted and in bold. [Zimbabwe]	
8548	6	24	6	28	Consistency of language "emission reduction, climate adaptation and climate resilience" between A4.3 and A5.1 [Ireland]	
8740	6	24	6	28	In the contex of sustainable development, feasibility depends on enabling conditions. These include among other global megatrends, economic system's carbon lock-in, institutional capacity, /…/ Explanation: There is nowhere in the report a mention of a carbon lock-in with the existing and planned fossil fuel capacity (cf. EEA Report No 22/2016: Transforming the EU power sector, avoiding a carbon lock-in) and only one mention of the economic growth as a driver to greenhouse gas intensive lifestyles (Figure SPM 3), while the assessment of global drivers and their implications for GHG emissions have not been considered (cf. EEA Assessment of global megatrends). It needs to be stated clearly. [Slovenia]	
8800	6	24	6	24	Delete: In the context of sustainable development [Iran]	
9134	6	24	6	28	A5.1: The ES of Ch 01 provides a more pointed summary of the first part of the paragraph: A5.1: The global transformation that would be needed to limit warming to 1.5°C requires enabling conditions that reflect the links, synergies and trade-offs between mitigation, adaptation and sustainable development. Enabling conditions include institutional capacity, policy and finance, multi-level governance, technological innovation and transfer, and changes in human behaviour and lifestyles. {1.4, Cross-Chapter Box 3 in Chapter 1, 4.4, 5.6} [Nauru]	
9430	6	24	6	28	Recommend deleting A5.1. Rationale: Text is repetitive.Synergies and trade-offs between sustainable development, mitigation and adaptation are discussed in detail in sections C1.1. and D.4. [Canada]	
3482	6	25	6	28	Please replace in line 25 "policy and finance" by "political willingness and ability to mobilize finance". This is needed to align with the other enabling conditions. Add "2.5.1" in source enumeration in line 28. Please also see our overarching comment on p 6 ln 28 on sections A5 and A5.1 [Germany]	
7022	6	26	6	26	In line 26, after the word "lifestyles" add the following phrase - "as appropriate to the national circumstances of developed and developing countries". [India]	
7024	6	28	6	28	After the word "scales" add the words "including global". [India]	
7626	6	28	6	28	A5.1 should cross-reference to Section 4.5, which addresses feasibility. If Section 4.4 is referenced, Section 4.3 -- which addresses technical and economic feasibility -- should also be referenced. [United States of America]	
7628	6	3	6	31	Suggest adding: "A5.2: Among the mitigation strategies judged most feasible are deployment of wind and solar PV, ecosystem restoration, efficient food production and reduced food waste, deployment and use of public and non-motorized transport where practical, improvements in energy efficiency, including the deployment and use of efficient appliances, and construction of low/zero-energy buildings to meet future building stock needs. These strategies alone may not be sufficient to limit warming to 1.5°C, however. {4.5, Chapter 2}" [United States of America]	
7630	6	3	6	31	Suggest adding: "A5.3: Appropriate adaptation strategies will vary significantly from place to place and will need to be tailored to the sources and magnitude of risk. Among the adaptation strategies judged most broadly feasible are the use of green infrastructure and sustainable water management in urban areas. {4.5}" [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
226	7				1) We appreciate showing the impacts of CO2 and non-CO2 forcing in similar temperature scales. 2) In figure SPM 1 there are linkages between the figures, which are highlighted through colors. Could these linkages been further highlighted since the linkages are essential for understanding the effect of different factors on the change to limit warming to 1.5°C? Perhaps arrows could be added between the figures (e.g. from a) to b) and c) for highlighting the linkages? 3)The texts inside the figures could be shorter in order to make the figures more reader-friendly. Suggestions: • Main figure: Should there be “global warming would reach 1.5°C” instead of “global temperature would reach 1.5°C”? • Main figure: “1.5 °C pathways” would be more informative than “responses to idealized emissions”. Could the text be shortened as “Distribution of 1.5 °C pathways, light grey spanning likely range, dark grey showing central third”? • Main figure: Mentioning and highlighting the year 2055 (which is the year when emissions reach zero) would be useful since the difference (2055 vs. 2040) is a key to figure c). • The figures could also be linked with each other through editing texts. For example in the case of figures a, b and c: Text in figure a could be: “If emissions reach zero in 2040 instead of 2055...” Text in figure b: "…it will lead to lower cumulative emissions” Text in figure c: “…and the change of limiting warming to 1.5 degrees increases.” This would also make the texts shorter. • Is the text presented in figure d relevant information here? Suggestion: If using the idea above, the text in figure d could be “If Non-co2 radiative forcing is not reduced after 2030…” figure e: “... the change of limiting warming to 1.5 is reduced” • Alternative apporach: It might be easier for the reader to have both blue and purple panels presented with the same logic: showing the impact of increasing the ambition level of actions the way of it is done in the blue panels (instead of showing the decrease in ambition level in purple panels). [Finland]	
228	7				Another issue is the difficulty in comparing GtCO2 and W/m2. Is there a need to clarify the metrics used because so many IPCC readers are used to seeing CO2-equivalent analytics. Also, it is not clear what is included in non-CO2 forcing (which gases and aerosols?). The question is relevant when actions in different pathways are considered and evaluated (black carbon, waste management etc.) [Finland]	
230	7				The mixed use of terms "central third" and "likely range" is somewhat confusing. Could "likely" expressed here also in "two-thirds"? [Finland]	
422	7				D6.2) Add "particularly in developing countries" after "public and private sectors" [Chad]	
792	7		8	1	This Figure is far clearer than it was in the previous version of the SPM. However, it could be still clarified. To simplify this figure, we suggest : -to insert the information on 2006-2015 average in the top graph, as it is explicitely cited line 7 page 5 -to delete the third-mean shade. -to insert three boxes for each line, to make clear that a) b) and c) are linked, as well as d) and e). -to insert the letters A B C D to the differents trends as indicated in the joint file [France]	
1806	7				It is unclear how the temperature responses to different scenarios relate to the emission scenarios shown on page 16. [Denmark]	
1808	7				Panel b: add to dotted line: currrent emissions trajectory. How is the relationship between this figure and pathways shown on page 16? Is this the group of model runs in which net zero CO2 emissions are reached in 2040 or?? [Denmark]	
1810	7				panel a, c, : The essential message of the panels are summarized well in the ledgend for panel c. [Denmark]	
1812	7				panel d and e: the ledgend of figure captures the key message. [Denmark]	
3902	7				Figure SPM 1: Please replace the overserved monthly global average temperatures by observed yearly global average temperatures. All other lines and shades on this graph are closer to yearly temperatures than monthly ones. [Luxembourg]	

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4094	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to "hold warming well below 2°C', as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that "At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040" is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Saint Kitts and Nevis]	
4302	7				More explanation is desirable to clarify the definition of "central third" and check a steep gradient of red dotted line.(e.g., a footnote). And more explanations for the lines and shadings in panels (c) and (d) is necessary. [Republic of Korea]	
5190	7		7		probability of temperatures exceeding 1.5°C…replace temperatures with temperature INCREASE [Spain]	
5192	7		7		At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040…add ABOVE PRE-INDUSTRIAL LEVELS. Also, replace human-induced with anthropogenic. [Spain]	
5194	7		7		too many graphs in one page makes it confusing, please find another way to show connections [Spain]	
5326	7				Fig SPM1 has some useful messages in, but it is rather confusing insofar as the pathways shown are not real 1.5°C compatible pathways (e.g. no negative emissions) [Zambia]	
5336	7		7		A: Graph b and d need a legend to indicate what each line indicates. At present it is not clear [Saint Lucia]	
5462	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to "hold warming well below 2°C', as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that "At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040" is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Saint Lucia]	
5476	7				Figure SPM1 is hard to understand. The information given should answer the following questions: What is the intention of the authors? Why do you want to show a scenarios that are unrealistic (panel a). What is the linkage to the real world? If this report did not assess the feasibility of achieving the pathways, clarify (In A5 for example). [Austria]	
5486	7		7		We suggest to add bullets in the part that describes the sections. It´s difficult to read as it is. [Mexico]	
5526	7		7		Change "The are also substantial" to "The are also important" [Mexico]	
5528	7		7		Change "There are decreases in the occurrence of cold extremes, but substantial increases in their temperature" to "There are decreases in the occurrence of cold extremes implying an increase in warm temperatures. [Mexico]	
5884	7				Figure SPM-1 panel a) should have an explicit title to prevent it being used out of its context. [Belgium]	
6662	7				Fig SPM1 has some useful messages in, but it is rather confusing insofar as the pathways shown are not real 1.5°C compatible pathways (e.g. no negative emissions) [Sudan]	

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6812	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to “hold warming well below 2°C’, as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that “At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040” is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Marshall Islands]	
6946	7				Fig SPM1 has some useful messages in, but it is rather confusing insofar as the pathways shown are not real 1.5°C compatible pathways (e.g. no negative emissions) [Gambia]	
8450	7				Fig SPM1 has some useful messages in, but it is rather confusing insofar as the pathways shown are not real 1.5°C compatible pathways (e.g. no negative emissions) [Nepal]	
8686	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to “hold warming well below 2°C’, as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that “At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040” is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Grenada]	
8914	7				Suggest Figure SPM1 be simplified and enlarged to enhance clarity of information presented. Suggest including a panel label on the first graph on the page. Suggest graphs in panels (a) to (e) be more clearly linked to the main graph improved to support the key message. Suggest including a footnote or similar to explain the concept of 'radiative forcing' for policymakers and explain 'non-CO2 radiative forcing', for example: "non-CO2 (methane, nitrous oxide, and others) radiative forcing", or similar. Otherwise "non-CO2 radiative forcing" could be misinterpreted as solar variability, volcanoes etc. Suggest rephrasing the label on panel to avoid a) using the terms 'increasing' and 'decline'(ing) in the same sentence. Suggest rephrasing to: "Two emissions abatement pathways: one with a pathway from the present reaching zero in 2055 and a steeper abatement pathway reaching zero in 2040". Suggest clarifying whether this is 'zero' or 'net zero'. [Australia]	
9092	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to “hold warming well below 2°C’, as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that “At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040” is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Solomon Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9220	7		7		Fig SPM1 This conceptual figure is useful to provide an overview of key concepts related to 1.5°C. However, it requires a set of improvements: •The pathways need to be classified as 1.5°C Paris Agreement compatible pathways, thereby also making reference to “hold warming well below 2°C’, as this is what these pathways illustrate •The concept of illustrative pathways is useful, but would be better served if a connection to IAM scenarios was drawn. A suggestion would be to show classical 5/17/50/83/95 quantile pathways •The figure completely misses any carbon dioxide removal, although there are no pathways that can limit warming to 1.5°C without any CDR •The message that “At the present rate of human-induced warming global temperatures would reach 1.5°C around 2040” is useful but requires additional policy relevant context: •How would the timing of reaching 1.5°C change if current NDCs were fully implemented •Rapid adoption of transformational polices onto a 1.5°C path could result in a peak warming of 1.5°C being reached 10 years as current trends [Nauru]	
4448	7		7		Figure SPM 1, within-figure text:"...light grey spanning likely range...". It will be useful to be explicit regarding what quantity the word "likely" refers to here, because "dark grey" has been quantitatively described as "showing central third". [Singapore]	
4492	7		7		The figures in FigureSPM1 are not identical to those in Chapter1 (e.g. FAQ1.2. Figure1). It might be better to use the same figure if the one is available in Chapter1. Or if there are not same figures, it would be better to clarify with additional explanation about differences. [Japan]	
4494	7		7		The meanings of the dotted lines in Figure c) and e) are not clear. [Japan]	
4496	7		7		The average period to calculate "the present rate" in the figure of "global warming relative to 1850 – 1900 should be mentioned as described in A1.1 for higher clarity. [Japan]	
4718	7		7		Some specific comments follow this one on the figure as currently presented. However, as an overarching point, overall this figure is somewhat confusing and does not present a clear narrative to policy makers. We would question the need for the top image (it doesn't seem to add much value to simply illustrate that temperatures could increase or they could follow a different trajectory) and the bottom two images (which are technical and not likely to add much for the non-specialist). However, graphs a, b and c could be potentially very useful and are intuitive. [United Kingdom (of Great Britain and Northern Ireland)]	
4720	7		7		It is unclear what the light and dark ranges on the graphs, and is not helped by the text which is not clearly written - e.g. "light grey spanning likely range, dark grey showing the central third". It is unclear whether this means the central third of temperatures, or of numbers of pathways, and whether it refers to all pathways or just the central third of the likely range. It should also reiterate that these are 1.5 idealised emissions. [United Kingdom (of Great Britain and Northern Ireland)]	
4722	7		7		In graph a, the text "Increasing the rate of CO2 emissions decline from a pathway reaching zero in 2055 to one reaching zero in 2040" is not a proper sentence, and does not give the reader any information. It needs to be rewritten to clearly describe the point being made in this figure and thus set up the points being made by b and c. It would help the figure overall if it explained that if we choose to model that scenario, it affects the temperatures as shown in graph c. [United Kingdom (of Great Britain and Northern Ireland)]	
4974	7		7		Fig SPM.1. The use of "idealised" can be interpreted in different ways to the one intended. Would "illustrative" be a better word? [United Kingdom (of Great Britain and Northern Ireland)]	
5078	7		7		It would be reasonable to split the complex SPM Figure 1 into several figures, at least by including subpanels d) and e) on non-CO2 radiative forcing in a separate figure [Hungary]	
8746	7		7		Additionally, would be good to include information how the bending of the curves happens in relation to the RCP scenarios in addition to the idealised scenarios. How this would be related to the graphical similar to the AR5 SY Report SPM Figure 5 (a) and SPM Figure 6. [Maldives]	
8916	7		16		Suggest clarification: figure SPM 1(a) on page 7 and figure SPM 3 on page 16 both consider global CO2 emissions pathways, however, they do not appear to have have the same messaging. [Australia]	
2290	7	1	7	1	Panel a: "Increasing the rate of CO2 emissions decline". Very complicated. Do the authors mean going faster to zero emissions? [European Union (EU)]	
2292	7	1	7	1	Panel d: what is the meaning of the purple line? The Figure/text are not very clear about the role of non-CO2 emisison reductions. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2294	7	1	8	1	Figure SPM1 is difficult to get an overview of and to interpret. Specifically: (a) the links between the panels and the visualisation of the decrease/increase in the chance of limiting warming to 1.5 degrees Celsius is not easy to capture. (b) The aspect of probabilities should be specified also for panels c) and e), where presumably the blue and purple shading illustrates the likely range, with the darker ranges indicate the central third of the distribution. It would facilitate the understanding of the figure, if the likelihoods specified in footnote 2 were used/referred to instead. (c) It is unclear how you get to panel c from panels a and b, and to panel e from panel d. More specifically whether both CO2 and non-CO2 forcers are included and considered in panels c and e, and how they are included. Presumably, panel c assumes the idealised scenario for non-CO2 radiative forcing and includes the warming responses from this scenario in panel c, and equivalently for panel e, but it is not specified. [European Union (EU)]	
2296	7	1	8	1	The discussion of carbon budgets and emissions pathways needs to improve for the purposes of clarity and understanding. Instead of splitting findings between a 'budgets part' (currently A1 & A2) and a 'pathways part' (currently C1 & C2) these two should be placed together. Crucially, the SPM needs to explain the relationship between budgets and pathways, because the report relies on them both heavily and they are not necessarily consistent. The fact that it is possible to exceed a 1.5°C budget while remaining on a 1.5°C pathway is not at all obvious to the non-expert reader and is not well explained. * Budgets are based on the relationship between cumulative CO2 emissions and temperature mentioned in A.2.3. They do not consider any kind of socio-economic path, exclude negative emissions and merely imagine zero CO2 emissions following exhaustion of the budget. Crucially, the report pays insufficient attention to non-CO2 emissions, which are an essential companion to any budget estimate. In particular, the non-CO2 forcing pathways in Fig SPM1, Panel D are essentially arbitrary. It is not clear what, if any, policy choice they might correspond to. * Pathways offer a 'socio-economic vision' of how to keep global warming below a certain emissions threshold. Crucially, many (most) of the pathways in SR1.5 allow for temporary overshoot of the identified carbon budgets, followed by subsequent negative emissions. Recommendation: * Place sections A1, A2, C1 & C2 (those comparing budgets and pathways to temperature thresholds) together; * Add a paragraph stating that SR1.5 findings use both budgets and pathways, explaining the relationship between them; * Consider replacing the lower panels of Figure SPM 1 - these 'quasi-pathways' are confusing since they do not appear to be consistent with the pathways presented later on. * Include a simplified version of Table 2.4 from the main report in the SPM. This table conveys important information on the timing of emissions reductions, including 1.5°C & 2°C with probabilities and the importance of different gases and sectors, that is not stated so clearly in the text and figures. [European Union (EU)]	
3484	7	1	7	1	Figure SPM , upper panel: please change "At the present rate….global temperatures would reach 1.5°C…" to "At the present rate….global mean temperature increases would reach 1.5°C…" in order to avoid impression of absolute temperatures being stated. Figure 1.2 in Chapter 1 (p 1-13) correctly gives "temperature anomaly" in the y-axis, but "increase" is easier to understand than "anomaly in the SPM. [Germany]	
3486	7	1	7	1	Figure SPM 1, upper panel: please change "Observed monthly global average temperatures" to "Observed monthly global mean temperature increase relative to 1850-1900" in order to avoid impression of absolute temperatures being stated. Figure 1.2 in Chapter 1 (p 1-13) correctly gives "temperature anomaly" in the y-axis, but "increase" is easier to understand than "anomaly in the SPM. In addition, please change "average" to "mean" consistent with GMST. [Germany]	
3488	7	1	7	1	Figure SPM 1, text left of upper panel: please change "Observed global average temperatures, estimated..." to "Observed global mean temperature increase relative to 1850-1900, estimated..." in order to avoid impression of absolute temperatures being stated. In addition, please change "average" to "mean" consistent with GMST. [Germany]	
3490	7	1	7	1	Figure SPM 1, text left of most panel: please change "Panels (a) to (e) explain....the probability of temperatures exceeding 1.5°C" to "Panels (a) to (e) explain....the probability of warming exceeding 1.5°C" in order to avoid impression of absolute temperatures being stated. [Germany]	
3492	7	1	7	1	Figure SPM1, Panel c and Panel e describe the impact of certain factors on warming responses. However it is unclear what the dashed lines represent. The shaded area seems to represent the warming that occurs under the condition described (e.g. lower future cumulative CO2 emissions). Do the dashed lines represent the range of warming if this condition were not to be met? If so it would be helpful to label the dashed lines somehow, to understand what the reference for the comparison is. If the shaded areas in upper panel are represented in panels c and e by dashed lines, and the corresponding emissions in panels a and d by grey solid, it would be helpful to use a solid line of the same style in all figures to help the reader understand. In addition, please explain the meaning of the lines in the caption. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3494	7	1	7	1	Figure SPM 1, text beside the main figure: It seems difficult to gather the whole sentence. We propose to shorten and divide it into two parts. Therefore, please delete ", estimated human-induced warming to date," and add in the beginning of the second sentence with "In this pathway". So the whole text beside the main figure would be read as follows: "Observed global [average->mean] temperatures and one estimate of the range of temperature responses to an idealised 1.5°C-consistent emissions pathway. In this pathway CO2 emissions decline in a straight line from 2020 to 2055, while non-CO2 radiative forcing increases to 2030 and then declines." [Germany]	
3496	7	1	7	1	Figure SPM 1: It is confusing that the first the panel has no letter and the others are labelled from a - e; we would suggest to label the panels from a - f. Please number all panels, including the upper one. [Germany]	
3498	7	1	7	1	Figure SPM.1, upper panel: Please substitute "plume" by "shading", as it is written on page 8 lines 1-10. Please use coherent language in Figure SPM.3. [Germany]	
3500	7	1	7	1	Figure SPM.1, upper panel: The shading shows the likely and the "central third" range. It is unclear what "central third" means. In addition, relevant ranges in the SR1.5 SPM are 5-95%, likely range (33-66%) , 50 % chance (25-75%) range. We suggest to show ranges that are relevant in this report. [Germany]	
3502	7	1	7	1	Figure SPM.1 is useful to explain the relationship between CO2 and non-CO2-emissions and temperature increase. It shows that the rate of emission reduction after peak emissions around 2020 determines the timing of net zero emissions and the cumulative emissions until net zero that in turn determine peak warming. However, given the current pace of mitigation action it is not unlikely that peak emissions will not be reached in 2020. In addition, it seems from panels a and b that the idealized pathways do not include negative emissions, which does not seem a relevant pathway because most if not all assessed pathway include negative emissions. The understanding of the concept of negative emissions / CDR is however central for the understanding of the SR1.5. We strongly encourage the authors to modify the choice of idealized pathways and to enhance the figure accordingly: Panel a should show that there are negative emissions after net zero emissions and not just be cut off at zero emissions. This would allow to show the smaller dependence on NET technologies for more stringent mitigation action in the blue pathway. Please add this aspect to the panel a and b as well as some explaining text. [Germany]	
3504	7	1	7	1	Figure SPM.1: The idealised pathway in the upper left panel does not limit warming to 1.5C with a likely (66%) chance but rather with a 50 % chance, hence it seems to show an overshoot scenario. This is not consistent with the introduction on the upper left side that states „1.5C consistent scenario". Please explain. [Germany]	
3506	7	1	7	1	Figure SPM.1: Why do non-CO2 emissions increase until 2030, are they not reduced with CO2 mitigation measures? Why do they decline in 2030? Is this rooted in reality, please provide more information on non-CO2 emissions in section C of this report. [Germany]	
3508	7	1	7	1	Figure SPM.1: The figure uses both „pathways" and „scenario" – the difference is unclear but confusing. [Germany]	
3510	7	1	7	1	Figure SPM.1, right hand panels: Please use annual means for the observations, as these are more relevant for climate and for the messages to be conveyed here than monthly variations. [Germany]	
3512	7	1	7	1	Figure SPM.1: The figure mixes CO2-emissions and non-CO2 radiative forcing. The concept of radiative forcing complicates the understanding of the messages of this figure. We assume that non-CO2 contributions include SLCF (GHG, aerosols including secondary aerosols), but we are not sure if albedo effects or other climate feedbacks are included, please specify. We suggest replacing „future non-CO2 radiative forcing" by "future non-CO2-contributions (define what this is)", or some other expression which does not require expert knowledge. Please see also our comment on footnote 5 in our comment on paragraph A2.3. [Germany]	
3514	7	1	7	1	Figure SPM.1: The SPM states the scenarios consistent with 1.5C generally reach net zero around mid-century. This figure however discusses net zero in 2040 and in 2055. It would be useful to have consistency here for easy comparison. It would be much more useful to show a pathway with net zero in 2050 and one with delayed mitigation action coming to zero later, which is also more realistic. Please modify. [Germany]	
3516	7	1	7	1	Figure SPM.1: Please provide information on the idealized pathway, including how it was constructed (using a model?), on the choice and size of the rates of CO2 reduction shown in panel a (annual reduction rate, is this realistic?), and on the non-CO2 scenarios. In addition, it would be helpful for the broader audience of the SPM to provide information about the relationship between the scenario portfolio and the archetype pathways presented in Figure SPM3 and the idealized pathway in this figure. [Germany]	
3518	7	1	8	1	The figure shows the temperature response of earlier net zero emissions (blue in panels a and c) and of a less ambitious reduction in non-CO2-forcing (violet in panels d and e). The blue represents a more ambitious pathway while the violet is less ambitious compared to the reference pathway in the upper panel. This is counterintuitive and we suggest using the less ambitious conditions (i.e. late peaking and constant non-CO2 forcing) in the upper panel and to show the responses to more ambitious pathways in the lower panels (i.e. panels a and c as is, and panels d and e with the grey and the violet exchanged). [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3956	7	1	7	1	Please consider to rephrase the subheading text: "Observed global average temperatures, estimated…". This text should decribe the whole figure, not only the top most one. Perhaps this could also include an explanation of what "idealised 1.5C-consistent emission pathways" are. Also, the small font text below; "Panels (a) to (e) explain..." is important information for understanding the figure and should be enlarged. [Norway]	
3958	7	1	7	1	Please consider to include a dashed line in the middle of the gray plume indicating the 50% percentile. [Norway]	
3960	7	1	7	1	Please consider to insert an arrow from the text "At the present rate of human-induced warming…" to the red dached line crossing 1.5C in 2040. [Norway]	
3962	7	1	7	1	Please consider to rephrase the text in figure SPM 1d). This text could be expanded to explain why the gray line declines, whereas the purple line is flat, as opposed to the CO2-graphs in a) and b). [Norway]	
3966	7	1	7	1	Please consider to also give the top panel figure "Global warming relative to 1850-1900" a letter: figure SPM a) , so that all the figures can be referred to a) to f). [Norway]	
3968	7	1	7	1	In the top panel figure text; "Grey plume shows distribution of warming responses…", please consider to remove the word "responses" as this seems superfluous. [Norway]	
3970	7	1	7	1	Please consider to indicate in panel a) that the emssions are zero after 2055 and 2040 for the two pathways shown here. This will make it clear that there are no negative emissions involved in this figure. This can be done by continuing the grey/blue line from 2055/2040 at zero until 2100 in a). This will also relate panel a) better to b) which shows a constant consentrations up to 2100 after emissions have reached zero for the two emission pathways. [Norway]	
3972	7	1	7	1	Please consider to make a simpler main title and move the message in the current main title to a subheading. The title of this figure should emphasise that this is an explanatory figure with idealised pathways, not to be related to the carbon budgets and emission pathways in section C. [Norway]	
3974	7	1	7	1	In figure SPM1 a): The text "Increasing the rate of CO2 emissions decline from …" is somewhat difficult to grasp, particularly the opposing terms "increasing the rate (...) decline". Please consider if this sentence can be simplified. [Norway]	
3976	7	1	7	1	Please consider to include "net zero" in the text in panel a): "increasing the rate of CO2 emisions decline from a pathway reacing net zero in 2055 to one reaching net zero in 2040" [Norway]	
5712	7	1			Figure SPM-1: (1) "[At the present rate of human-induced warming] global temperatures would reach 1.5oC…" -> "… global mean temperature increase would reach 1.5oC…". (2) Would need to explain better what the dashed line in the topmost panel indicates. (3) suggest also providing likelihood percentages in the topmost panel, not only "likely range" and "central third", would be useful for readers. [Sweden]	
5714	7	1			Consider moving panels a, b, and d into another figure, for enhanced readability. Or in some other way further displaying the red thread across the panels. [Sweden]	
5886	7	1			Figure SPM.1 panel b) : the figure does not show the emission level after it reaches net-zero. Please indicate emissions until 2100. In addition, figure 3 shows that emissions become net negative in almost all scenarios, therefore we wonder if the idealized pathways shown here should also include negative emissions. We note that RCP 2.6, which is a key example of low emission scenario, also included net-negative emissions. Avoiding negative emissions in the reference case will have consequences for how the effect of non-CO2 reductions look like. If possible, the role of net negative CO2 emissions should be clarified. [Belgium]	
5888	7	1			Figure SPM1 and figure SPM3 both relate to scenarios. We suggest moving them closer to each other, and make them as comparable with each other as possible. [Belgium]	
5890	7	1			Figure SPM1 : please clarify "central third". A possibility could be to say that it is "a central range of global warming projection so that the actual warming as one chance out of 3 to be above this range and one chance out of 3 to be below this range". Does this range include natural variablity? [Belgium]	
5892	7	1			Figure SPM1 : please clarify the figure by using each color for a single purpose : as it stands, gray lines are used for past temperature as well as for the reference "future" scenario. The color could be changed for the past values. Grey lines and grey shadings would then always refer to the reference scenario, and this could be stated in the caption. In addition, the paragraph currently in the top left of the figure could move to the caption to clarify the figure. [Belgium]	
6422	7	1	8	1	The main SPM-1 panel and subpanels a) to e) are not helpful to illustrate the single point in the text where the figure is referenced (p.5, ll.20-23), namely A.2 on 'committed' warming in various forms. Suggest to only keep the main panel, but provide all assumptions behind the CO2 and non-CO2 forcings in the captions and address the uncertainties arising from the variants in additional text; with due reference to the underlying sections of the full report. [Netherlands]	
6424	7	1	8	1	in the absence of any clarification or explanation in the caption of SPM-1, the role and point of the 'idealised emissions pathways' is unclear in panels a) to c). [Netherlands]	
6426	7	1	8	1	in the absence of any clarification or explanation in the caption of SPM-1, the role and point of the 'scenarios for non-CO2 radiative forcing' is unclear in panels d) and e) [Netherlands]	
6428	7	1	8	1	In figure SPM-1: Why 'emissions' of CO2 and 'radiative forcing'of non-CO2. This is not directly obvious. Should be explained at least. [Netherlands]	

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6430	7	1	8	1	Panel d) in figure SPM-1 refers to 'scenarios', but it is completely unclear what scenarios are meant here. [Netherlands]	
6432	7	1	8	1	The caption for the GMST graph is very cryptical as for what we see for the historic period 1960-2017. What is the orange band? Are the data the average of four GMST data products? How is the trend estimated (there are over 30 trend methods all with different mathematical and statistical characteristics). What is the dashed red line and why is it linear? [Netherlands]	
6680	7	1	7	1	Please consider to make a closer connection between subfigures SPM a) and b) to point out that the shaded area in a) corresponds to the values on the y-axis in b). Furthermore consider to make the lines in a) go the whole way to 2100 as in b) [Norway]	
7038	7	1	7	1	Fig. 1: The discussion of non-CO2 radiative forcing agents is important but it is a distraction from the main issue which is the CO2 emission reduction. It leads to confusion and vagueness in SPM. The suggestion is to remove non-CO2 radiative forcing component from this figure. For instance, in Fig. SPM1, why to include panel e? The reduction of non-CO2 agents is not very clearly leading to limiting global warming to 1.5 deg C. [India]	
7040	7	1	8	1	Figure SPM1: It should be clearly mentioned in the figure description that these are model scenarios constructed for ease of computation and should not be thought of as real world or feasible pathways. {FAQ 2.1}. [India]	
7632	7	1	7	1	What is the basis for Figure SPM-1? Its elements are not lifted directly from the underlying cited chapters. It is critical that the figure be explained properly, with a legend or caption to clarify for policymakers the data source (e.g., models or scenarios, or some other source) and whether the panels in Figure SPM-1 represent a conceptual or illustrative representation of the points depicted. In addition, recommend the following: (1) If Panel (a) is retained, show the trajectory for non-CO2 gases in Panel (a); (2) delete Panel (b) -- the information it contains can be summarized briefly in the Panel (a) text; (3) Show Panels (c) and (e) side by side with similar scales for comparison purposes; and (4) revise Panel (d) to show more granularity, so that the relative contributions of major non-CO2e gases and aerosols to radiative forcing (and to temperature) can be understood. [United States of America]	
7634	7	1	7	1	If keeping all elements, this provocative figure would benefit from more intuitive graphical layout. It takes some detailed study to figure out that the gray shading and lines in the righthand three panels are identical and that the gray line in the lower left is likely included in the gray shading/lines on the right as well as linking to the inset panels in Figure SPM-3. Another recommendation might be to closely stack the right three panels as the centerpiece of the figure and label gray shading/lines in a way that it is clear they are identical then making clear how the left three panels connect to the centerpiece panels. [United States of America]	
7636	7	1	7	1	Figure SPM-1 contains a lot of helpful information, especially for understanding the carbon cycle and uncertainties in climate sensitivity. However, the example of advancing the date of reaching global net-zero CO2 emissions from 2055 to 2040 is not plausible. Much of today's energy-consuming capital will still be in place in 2040. A more helpful example would show the consequences of a delay in achieving global net-zero CO2 emissions from 2055 to 2070 (or some other year beyond 2055). This would decrease the probability of staying within a 1.5°C ceiling, but would provide policymakers insight on the consequences of delaying rapid reductions of global CO2 emissions. [United States of America]	
7638	7	1	7	1	The BAU scenario (red dashed line in top panel) is too incidental in current layout. It is good to keep in the reader's mind the contrast between BAU and 1.5°C scenarios. One could expand the range of the top panel (leaving scale the same) to include the BAU and uncertainty range in red solid/dashed lines. [United States of America]	
7640	7	1	7	1	The legend in Panel (a) of Figure SPM-1 would read better as: "Increasing the rate of CO2 emissions decline beginning in 2020 along a pathway reaching zero in 2040" [United States of America]	
7642	7	1	7	1	Panel (e) is very hard to read the central lines relative to 1.5°C; also it is not clear whether the "higher non-CO2 RF" is higher than today or actually the level non-CO2 shown in Panel (d). Do not refer to the constant line in Panel (d) as "higher" in Fig (e). Hard to follow. [United States of America]	
7644	7	1	7	1	In the top panel for Figure SPM-1, text in the figure states "at the present rate of human-induced warming" whereas the text on p. 5, lines 21-23, states if emissions continue 1.5°C will be reached around 2040. Both statements may be correct but authors should clarify. [United States of America]	
8550	7	1	7	5	Figure (d) appears to suggest radiative forcing for non-CO" species was zero in 1970, which suggests significant negative forcing to offset methane, N2O and other positive forcing. Does this follow from IPCC AR5? [Ireland]	
8552	7	1	7	5	Figure (e) refers to non-CO2 radiative forcing and builds on figure (d) but does not include the Grey scenario in (d). Perhaps a simpler chart would be more easily understood [Ireland]	
8886	7	1	7	1	Suggest including a 'plume' in the first graph to clarify the projected future rate of human-induced warming and represent the 'idealised' responses. Otherwise the graphs appears to show the uncertainities go to zero from the present into the future. [Australia]	
8918	7	1	7	1	Suggest the illustration be more relevant to the report's objectives of 1.5 versus 2C. For instance, the illustration could detail a scenario that drops to zero by, for example, 2070 (for around 2C final warming) compared with a scenario that drops to zero at 2055,for example (for 1.5C). This would make the illustration relevant for the whole report. [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9270	7	1	7	1	The new design of SPM figures is welcome and it generally works. Still the figure is too complex, containing a lot of text and explanations, small items that clutter the message and overall too much information. It will take 15 minutes to comprehend all the messages in this figure. Therefore, it would be better that this figure be simplified as follows: 1) delete top panel and incorporate information in panel c (detailed below). 2) delete panel a) and incorporate information in panel c, as detailed below. 3) delete panels d and e completely. [Switzerland]	
9272	7	1	7	1	Further to prevoius comment: This would make panel c the main item of Figure SPM.1. In order not to lose some of the important information, it would be better first extend the time axis back to 1960 and therefore cover that part of the top panel that got deleted. The realization of 1.5°C warming in 2040 could be indicated simply by a red dot to which the text "At the present rate of human-induced warming ..." is pointing. The graphical information of panel a) could be placed below the major curve with an additional y-axis either on the left or on the right. If multiple units in the same coordinate system are kept, place the historical/projected CO2 emissions as a slender graph (about 25% of the height) below the main graph with the same time axis. Also mark the 2°C warming with a dashed horizontal line to indicate that the overshoot is still (well?) below 2°C. [Switzerland]	
9274	7	1	7	1	Further to previous comment, regarding the deletion of panels d and e., the loss of this info in the graphics is justified with the gain in simplicity. An additional complication of these two panels is that the messages in panels c and d are placed on the same leve, but they concern drivers with totally different lifetimes and characteristics in the climate system. It is clear that the main concern is CO2, and that should be the focus of Figure SPM.1. The information of the deleted panels could be added as text in an additional bullet. [Switzerland]	
9432	7	1	7	1	Text to the left of the graphic is a run on sentence. Suggested revision: "Observed global average temperatures, estimated human-induced warming to date, and an estimate of the range of temperature responses to an idealized 1.5 C consistent emissions pathway decline in a straight line from 2020-2055. Non CO2 radiative forcing increases to 2030 and then declines." [Canada]	
9434	7	1	7	1	Figure SPM.1: Breaking down this Figure into separate panels is helpful and facilitates messaging. A few revisions are recommended: 1. Top panel: the orange shaded band needs a definition. 2. Panel (c): Suggest rewriting the italicized message to "Lower cumulative CO2 emissions in 2040 (e.g. earlier date of net zero CO2 emissions) increases the chance of limiting warming to 1.5°C". 3. Panel (d): Italicized text should describe what is occuring shifting from the grey to purple lines e.g. "Non-CO2 radiative forcing stays constant instead of declining after 2030" OR "Keeping non-CO2 radiative forcing constant after peak instead of reducing it". [Canada]	
9436	7	1	7	1	1. Figure SPM.1 shows the impact of reducing CO2 emissions more rapidly, and not reducing non-CO2 forcing, on the probability of keeping warming to below 1.5°C. The pathways illustrated show unrealistic idealised emission scenarios, which have an abrupt onset of emissions decreases, beginning around 2020. Achievability of 1.5C under plausible emissions scenarios is are of interest to policy-makers. Therefore, recommend replacing the baseline (net zero CO2 in 2055) scenario with a realistic scenario to keep warming below 1.5C. Panels could still show the effects of idealised perturbations (of CO2 and non-CO2 forcings) about this baseline, to make the same point as at present. Recommend replacing all instances of 'idealised' with 'simple illustrative', since 'idealised' can be misinterpreted by non-specialists. 2. Suggest that text on top-left should be integrated into the caption [Canada]	
5530	8		8		Repetition of the stated facts. Please, more details are necessary if it is to stay: There are large risks at 1.5°Cthan today for many regions and systems, with adaptation being required now and up to 1.5°C. There are, however, greater risks and effort needed for adaptation to 2°C (high confidence)... [Mexico]	
4500	8		11		In addition to the statements that "the risk becomes higher in the 1.5°C warming world compared to 2°C warming world.", we would appreciate it if you could also write about quantitative impacts of 1.5°C warming world. Or we would appreciate it if you could write comparisons between the current 1°C warming world and the 1.5°C warming world. [Japan]	
330	8	1	8	1	Figure SPM-1, upper right panel om page 7: Why monthly temperatures are displayed? Annual means are much more relevant for the purpose of this figure. [Russian Federation]	
3520	8	1	8	1	Please change "Top panel: Observed monthly global average surface temperature (grey line)..." to "Top panel: Observed monthly global mean surface temperature increase (grey line)". Figure 1.2 in Chapter 1 (p 1-13) correctly refers to "temperature anomaly", but "increase is easier to understand for non-scientists. In addition, please change "average" to "mean" as in GMST. [Germany]	
3522	8	1	8	1	Please restructure and sharpen the text: Provide a title and a general overview of all panels, followed by detailed descriptions of the individual panels including references for the sources of information (please see our specific comments on Figure SPM.1) and all colours (including explanation for the blue and violet) and lines (including the dashed) used. Further comments on the wording are provided in our comments on Figure SPM.1. [Germany]	
3524	8	1	8	1	Please exchange "monthly global average surface temperature" by "monthly global mean surface temperature" to be consistent with the definition of GMST. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4304	8	1	8	12	Figure caption is not clear for Fig. 1. The arrangement of figure panels and explanation should be elaborated. [Republic of Korea]	
4422	8	1			Explain orange dashed line in the figure's description. [Czech Republic]	
4976	8	1	8	1	"global average surface temperature". Should this be "global mean surface temperature" to be consistent with Box SPM.1? [United Kingdom (of Great Britain and Northern Ireland)]	
7078	8	1	8	1	Please add: Uncertainties associated with the estmation of emissions vary with the analytical technique employed. [India]	
9604	8	1	8	1	We suggest to add explanation for colour shading in fig SPM1 c) and e) [Madagascar]	
3526	8	3	8	3	Please substitute "plume" by "shading", as in Figure SPM.1 upper panel. Please use coherent language in Figure SPM.3. [Germany]	
4498	8	3	8	7	"grey line in sub-panels b and c" might need to be replaced with "grey line in sub-panels a and b". [Japan]	
4306	8	4	8	4	Figure numbers are mis-cited: (grey line in sub-panels b and c ? a and b) [Republic of Korea]	
794	8	1	8	1	Add reference : {Annex 1.A.6} [France]	
796	8	13	11	21	General comment on B : the impacts of the 1.5°C global warming on soils are not mentioned in this section. This is crucial, given the importance of soils in the climatic system. Moreover, the words « conflict », « political struggle » and « population displacement » have been deleted from the SPM (compared to the january SPM). It is an entire part of the impacts of the global warming and it is present in the SR {see 3.4.10}, so it should be present in the SPM. Suggestions have been made (see comments on B2 and B5) to clarify these points. [France]	
2298	8	13	8	14	Title does not refelct that the section also provides findings that compare 1.5 and 2 degrees outcomes. [European Union (EU)]	
3528	8	13	9	46	The information on geophysical changes provided in the SPM is limited to mainly climate extremes, the ocean and sea level rise. It would be extremely useful to add information on observed and projected changes in large scale climate pattern (ENSO, AMOC, monsoon, NH jet stream). Please add also information on large scale singular events (tipping points). The lack of information on this issue in the current SPM might make the reader believe that these are not affected by climate change. Please add this relevant information. [Germany]	
4438	8	13	11	21	IPCC WGII may wish to include Table 3.2 of Chapter 3 in the SPM. It outlines very clearly the projected changes at 1.5 and 2 degrees celsius, and the differences in impacts. IPCC WGII may also wish to consider a chart similar to Figure SPM.4 of the IPCC AR5 Summary for Policy Makers, which clearly highlights the key impacts for different geographical regions. [Singapore]	
4728	8	13	8	13	The SPM is weak on observed impacts associated with the approx. 1C warming to date even though it is critical underpinning evidence for policymaking. We suggest changing the title of this section to "Observed impacts and projected climatic changes, their potential impacts and...". We also suggest adding in a new subsection (at the start of section B) on observed impacts with the following high confidence statements: - Human-induced global warming has already caused multiple observed changes in the climate system (high confidence). - Increases in temperatures have been observed across every continental region and in the oceans. Observed increases in the frequency of warm temperature extremes are attributable to human influence (high confidence) {3.3.1, 3.3.2} - Changes in temperature extremes and heavy precipitation are detectable between the periods 1991-2010 and 1960-1979, which is a 0.5°C warming (high confidence) {3.3.1, 3.3.2, 3.3.3} (currently this is B1.1) - Mean precipitation over the Northern hemisphere mid-latitudes has increased since 1951 (high confidence) {3.3.3} [United Kingdom (of Great Britain and Northern Ireland)]	
5716	8	13	11	21	Somewhere in section B referring to chapter 3 it should be mentioned that the assessments are mostly done for short-term stabilization responses based on global climate model data, as data for long-term stabilization projections is limited (see Ch 3. p. 19). Also, high-resolution climate model output such as that from regional climate models and analysis of it for 1.5 and 2oC is limited which may be significant for the changes discussed in Annex 1 for Ch 3. [Sweden]	
6148	8	13	8	14	The title of the section B should also include a comparison with 2C [Estonia]	
7056	8	13	8	21	All occurences of the word ‘substantial’ or ‘substantially’ to be removed. The terms ‘increase’ or 'decrease' that appear alongside should be statistically qualified. [India]	
7086	8	13	8	14	Please provide any evidence of impact of 1.5 deg C warming in regions which have already experienced this level of warming? [India]	
7646	8	13	8	14	It is not clear why the key statement here is not right up with the opening statement of Section A (page 5, line 1). Section A now contains hypothetical projections of temperature changes out into the future all put before this section that will explain the significance of going from 1 to 1.5°C warming. Would it not be better to reorder the text? [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7648	8	13	11	24	Section B tends to be highly qualitative and largely seems to say the obvious: "Climate change impacts are larger with more climate change." [United States of America]	
8554	8	13	8	14	Title for B does not reflect that the section also compares outcomes of 1.5 and 2 degrees [Ireland]	
8748	8	13	11	21	Table 3.2 of Chapter 3 of the main report provides a very comprehensive and useful summary of the global synthesis where the impacts are compared of a 1.5 and a 2 degree world. As this is the SPM, this is a good summary to be included for the policy makers. [Maldives]	
8750	8	13	11	21	Furthermore, representation of the information in in Table 3.2 in a geographical format as in SPM Figure 4 of the IPCC AR5 SY would be useful. [Maldives]	
8848	8	13	8	13	Suggest the SPM more clearly state in a headline statement the assessment findings that risks to natural and human systems increase between today and global warming of 1.5°C, and are higher still with global warming of 2°C compared to 1.5°C. [Australia]	
9438	8	13	11	21	Section B is long and highly technical for a summary for policy makers. As such, we suggest limiting the number of sub-bullets for each section. [Canada]	
9606	8	13	8	14	We suggest to add …compared to 2°C after the word warming in line 14 [Madagascar]	
1820	8	15	8	15	Add key finding from chapter 3 of the technical report: "Human-induced global warming has already caused multiple observed changes in the climate system (high confidence). In particular this includes increases in both land and ocean temperatures, as well as more frequent heatwaves in most land regions (high confidence). There is also high confidence that it has caused an increase in the frequency and duration of marine heatwaves. Further, there is evidence that global warming has led to an increase in the frequency, intensity and/or amount of heavy precipitation events at global scale (medium confidence), as well as having increased the risk of drought in the Mediterranean region (medium confidence)" {3.3.1, 3.3.2, 3.3.3, 3.3.4}. [Denmark]	
332	8	16	8	18	'There are substantial increases in extremes between the present-day and a global warming of 1.5°C, and between 1.5°C and 2°C'. 'Substantial' is a subjective term. It should be quantified in some way, that is very important. [Russian Federation]	
1766	8	16	8	16	Remove the word substantial as there no evidence of substantial increases in extremes for 1.5 °C versus 2 °C . [Saudi Arabia]	
1854	8	16	8	19	The text says: "There are substantial….and a global warming of 1.5°C, and between 1.5°C and 2°C, including hot extremes in all inhabited regions…..". Is this to be understood that firstly there will be substantial increases in extreme events between present-day and global warming of 1.5° - and then again substantial increases between 1,5° and 2° of global warming? Could potentially be clarified. [Denmark]	
3530	8	16	8	16	The current formulation referring to "extremes" only is not sufficient. The glossary explains that "climate extremes" refers to both extreme weather and climate events. We suggest that the statement should either use the formulation "climate extreme" or preferably specify "extreme weather and climate events". [Germany]	
4308	8	16	8	19	Proivde the definition of "extreme" via Box. [Republic of Korea]	
4724	8	16	8	16	"There are substantial increases in extremes between…" does not specify extremes of what. This could read 'weather extremes' and alternatively could be phased in a simpler way 'Weather events will be more extreme at 1.5C than the present day, and more extreme at 2C than 1.5C" [United Kingdom (of Great Britain and Northern Ireland)]	
5196	8	16	8	19	graphs should also include models that do not comply with 1.5ºC, not only "idealized" situations. Please complete the text accordingly. [Spain]	
5718	8	16	8	35	This summary of projected changes in climate is solely focussing on extremes. Changes in extreme conditions is of course of high importance but impacts (and associated risks) of climate change are also dependent on changes in average conditions. In Ch 3 the executive summary highligths this in a more appropriate way by using wordings like "... differences in temperature and extreme events are expected if GMST ...". A paragraph on geographical patterns (such as: largest warming in the Arctic region, larger warming over continents compared to oceans) would be in place here, as would a paragraph on changes in large-scale precipitation patterns. This would also build on (A1.3) that concerns already expericenced warming not on projected. [Sweden]	
7058	8	16	8	19	The term “substantial” in the statement is vague, imprecise, and unquantified. In what follows comparisons made between 1.5 and 2 deg. C warming should state clearly the extent of statistical significance of such comparisons. For B1, replace statement with the following - “Model estimations show increases in extremes between the present day and global warming of 1.5 deg. C, and between 1.5 and 2 deg. C., with varying degrees of statistical significance. These include temperature extremes in all inhabited regions (high confidence), heavy precipitation events in most regions (high confidence) and extreme droughts in some regions (medium confidence).” [India]	
7068	8	16	8	19	“projections of extreme drought in some regions (medium confidence)”. It would be good to provide name of the regions. [India]	
7070	8	16	8	2	Refer to the underlyig report: Chapter 4; The likely changes in monsoon system in south east asia and its effects on agriculture drought and likely reductions in water availability included. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7072	8	16	8	2	Refer to the underlyig report: Chapter 4: Studies on likely changes in Indian monsoon may be included. Turner, A. G. and H. Annamalai (2012) Climate Change and the South Asian Monsoon, Nature Climate Change 2: 587-595, doi:10.1038/nclimate1495. [India]	
7080	8	16	8	19	Refer underlying report: Chapter 3, page 150, line 26 to 40: The report should include the references as for Asian Monsoon is a very important phenomenon and para is not written with much insight. The references mentioned are highly cited. We suggest that the complete paragraph 3.5.5.4 Asian Monsoon (Final Draft) should be modified with following: The fundamental driver of all the monsoon systems is differential heating of land and sea that helps to establish a land-sea pressure gradient. It is the pressure gradient between the Indian Ocean and Asian continent that determines the strength of the Asian monsoon. The small scale regional circulations are more vulnerable to variations in monsoon rainfall (Rajeevan et al., 2008). Therefore, a general measurement of strength of monsoon systems is not enough to represent the temporal and spatial distributions. In the study of Turner (2013), it was found that monsoon rainfall in India is likely to increase in the future. The active-break cycles are expected to intensify with the increase of carbon dioxide in the atmosphere. Greenhouse warming that is stronger over land and in the Northern Hemisphere tends to strengthen the monsoon, but increases in planetary albedo over the continent due to aerosol forcing and/or land-use change tend to weaken it (Lenton et al., 2008). Observations show that the 50-year drying trend (weakening of India summer monsoon) in north central India reversed in the past decade. Jin and Wang (2017) found that monsoon rainfall has increased in India at 1.34?mm/d/decade since 2002. This apparent revival of summer monsoon precipitation is closely associated with a favourable land–ocean temperature gradient, driven by a strong warming signature over the Indian subcontinent and slower rates of warming over the Indian Ocean. Global climate models fail to capture the observed rainfall revival and corresponding trends of the land–ocean temperature gradient, with implications for future projections of the Indian monsoon. The overall impacts of the various types of radiative forcing under different emission scenarios are more subtle, with a weakening of the monsoon north of about 25°N in East Asia and a strengthening south of this latitude projected by (Jiang and Tian, 2013) under high and modest emission scenarios. Generally, at the time of composing the SOD there is still low confidence in overall projected changes in monsoons because of insufficient agreement between climate models (Seneviratne et al., 2012). Given that scenarios at 1.5°C or 2°C would include a substantially smaller radiative forcing than those assessed in the studies of Jiang and Tian (2013) there is low confidence regarding changes in monsoons at these low global warming levels, as well as regarding the differences between responses at 1.5°C vs. 2°C levels of gloal warming. Jin, Q. and C. Wang (2017): A revival of Indian summer monsoon rainfall since 2002.Nature Climate Change, 7, 587–594 (doi: 10.1038/nclimate3348) Turner, A. (2013), The Indian Monsoon in a Changing Climate, Retrieved February 10, 2018 from:http://www.rmets.org/weather-and-climate/climate/indian-monsoon-changing-climate. [India]	
7082	8	16	8	19	Refer underlying report: Chapter 3, page 150, para 3.5.5.4: Says “It is the pressure gradient between the Indian Ocean and Asian continent that at a fundamental level determines the strength of the Asian monsoon. As landmasses warm faster than the oceans, a general strengthening of this gradient, and hence monsoons, may be expected under global warming (e.g., Lenton et al., 2008).”. It is to be noted that several recent studies using long-term observed records demonstrate a statistically significant weakening of the monsoon circulation and a decline in the monsoon rainfall over central South Asia (e.g. Roxy et al. 2015, Krishnan et al. 2016). These studies show that the pressure gradient between the Indian Ocean and Asian continent has dampened, due to Indian Ocean warming. Reference 1: Roxy et al., 2015: Drying of Indian subcontinent by rapid Indian Ocean warming and a weakening land-sea thermal gradient. Nature Communications, 6:7423. Reference 2: Krishnan et al. 2016: Deciphering the desiccation trend of the South Asian monsoon hydroclimate in a warming world. Climate Dynamics, 47(3-4), 1007-1027. [India]	
7084	8	16	8	19	Refer underlying report: Chapter 3, page 150: Section on Asian Monsoon needs to be updated with summary from recent works which mainly indicate that there is a declining trend in South Asian Monsoon with changes in frequency of heavy rainfall events. [India]	
7650	8	16	8	16	Define 'extremes' earlier, and note that they are the statistical extremes based on current or last 30-year climate record. [United States of America]	
7652	8	16	8	16	Insert "some" prior to "extremes" [United States of America]	
7654	8	16	8	16	"substantial" here and elsewhere needs to be defined in terms of %. It is not meaningful since someone could argue that saving 1,000,000 people from water shortage is substantial even if it was only 10% of the population exposed. [United States of America]	
7656	8	16	8	19	It would seem appropriate here to also be mentioning changes in associated impacts as well, so sea-level rise, biodiversity loss, ocean acidification, etc. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7658	8	16	8	19	SPM statement B1 is not consistent with the underlying text as written. The underlying text (pages 3-32 and 3-33) states that the "differences in heavy precipitation are generally small between 1.5 and 2°C global warming... While there are variations between regions, the global tendency for heavy precipitation suggests an increase at 2°C versus 1.5°C." The meaning of the word "substantial" may not be well defined, but it generally conveys a meaning of size larger than "small." The text mentions specific areas with statistically significant increases in heavy precipitation: Alaska/Western Canada, Eastern Canada/Greenland/Iceland, Northern Europe, Northern Asia, the Tibetan Plateau, Eastern Asia, and in Eastern North America (medium confidence). There is low confidence in projected changes in heavy precipitation at 1.5°C versus 2°C in other regions." For this reason this statement regarding increases in heavy precipitation should be amended to read: "There are substantial increases in extremes between the present-day and a global warming of 1.5°C, and between 1.5°C and 2°C, including ... heavy precipitation events FAR NORTHERN AND HIGH ALTITUDE [DELETE: most] regions ([DELETE: high] MEDIUM confidence)..." [United States of America]	
7660	8	16	8	19	The use of the term "extreme drought" in statement B1 in the SPM is not consistent with its use in the underlying text in Chapter 3. There is no objective internationally agreed definition of what constitutes an "extreme drought." Since the chapter highlights changing conditions that can contribute to or exacerbate droughts, substitute the words "increased (or increasing) drought conditions" for "extreme drought" to better preserve the meaning of the finding. [United States of America]	
7662	8	16	8	19	It should be noted that so far at a global level there are no increases in intensities or frequencies of a wide categories of extreme events, including droughts (Masson-Delmotte et al. 2013, Hao et al. 2014, Schwalm et al. 2017), floods (Masson-Delmotte et al. 2013, Hodgkins et al. 2016), tornadoes (D'Aleo and Lupo 2018), and hurricanes (Maue 2018; Klotzbach et al. 2018) despite the fact that we are halfway to 2°C of warming. Accordingly, there should be discussion regarding how valid and robust are models that project such trends. [United States of America]	
8924	8	16	8	17	Suggest rephrasing to: "There are substantial projected increases in certain types of extremes between the present-day and a global warming of 1.5°C, and further projected increases between 1.5°C and 2°C". [Australia]	
9276	8	16	8	19	Quantification lacking, this is a missed opportunity. In order for this headline statement to be policy-relevant, some numbers or factors (e.g. "heat waves more frequent by factor of XX for 1.5°C warming and YY for 2°C relative to today", with footnote how extreme is defined). [Switzerland]	
798	8	17	8	17	We suggest to replace "hot extremes" by "heat extremes" [France]	
5720	8	17	8	17	The definition of regions would not seem to be relevant here, given "all inhabited regions" and the fact that no regional statements are made. Suggest deleting the footnote as unnecessarily confusing. [Sweden]	
1706	8	18	8	18	The referenced resources on the change of heavy precipitation events under 1.5? C vs 2? C does not support high confidence as some regions will have less changes than others. Therefore, high confidence should be removed or replaced with the appropriate wording matching the reference Chapter 3 {3.3.3}. [Saudi Arabia]	
1764	8	18	8	18	Reference chapter 3 in relation to heavy precipitation do not support the “high confidence” mentioned in the SPM-8 LINE 18.A consistent and systematic analysis / research study is required to be developed to address and identify the confidence level between the 1.5 °C and 2 °C global warming. This is because in chapter 3 page 3-33 there is the following conditioned statement. There is low confidence in projected changes in heavy precipitation at 1.5 °C versus 2 °C in other regions. Page 4 line 10: [Saudi Arabia]	
4310	8	18	8	18	In this report, it is necessary to present criteria to classify as heavy rainfall (ex: heavy rainfall in Korea: when rainfall of 30mm or more in an hour). [Republic of Korea]	
7076	8	18	8	2	Refer to underlying report Chapter 3: The chapter could use some more satellite data based analysis to strengthen the findings. Some additional observations are : land surface temprature has been identified as an ECV, which could be used to assess evapotranspiration and incidence of drought (page 36), Total alkalinity, dissolved inorganic carbon and pCO2 are measurable and can be used to explain ocean alkalization and acidification (page 80), shifts in crop phenology as indicated by time series NDVI are assessed using satellite data for high confidence and high-evidence (page 71). [India]	
4986	8	2	8	21	"The majority of warm water coral reefs …are already experiencing the large-scale loss of coral abundance…today…". Climate change is now the biggest threat to coral reefs, but reef loss over the last three decades has also been because of pollution, unsustainable coastal development, storms, overfishing, and ocean acidification is making reefs less resilient to the impacts of climate change (heat stress) (see box 3.4). Can you make this distinction clearer please? Suggestion: "... are already experiencing the large-scale loss of coral abundance (cover) today as a result of climate change, OA and other anthropogenic pressures like pollution, and would lose..." [United Kingdom (of Great Britain and Northern Ireland)]	
800	8	21	8	23	We suggest to delete this statement. It deals with findings already presents in the AR5. [France]	
3532	8	21	8	23	Confidence statements are missing in this paragraph, please add "high confidence" as in the ES of chapter 3, para 4 that gives "high confidence" for the full statement. Please add confidence statements to both (1) the change in the first part of the sentence and to (2) the warming in the second part. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3534	8	21	8	23	The two the statements of this paragraph lack connection. The ES of chapter 3 provides additional information that links in the first sentence (change in T and precipitation) to the cause of this change (global warming): "The observed tendencies over that time frame are consistent with attributed changes since the mid-20th century (high confidence)". Therefore, please write, e.g.: "Changes in temperature extremes and heavy precipitation indices are detectable in observations for the 1991-2010 period compared with 1960-1979 (high confidence). These chances can be attributed to the human-induced global warming of approximately 0.5°C that occurred over this time span (high confidence)." [Germany]	
4312	8	21	8	21	"events" seems more suitable than "indicies" . [Republic of Korea]	
4502	8	21	8	23	The statement in the SPM B1.1 mentions that "Changes in temperature extremes and heavy precipitation indices are detectable in observations for the 1991 – 2010 period compared with 1960 – 1979, a time-span over which global warming of approximately 0.5°C occurred." However, according to section 3.3.2.1 (Observed and attributed changes in regional temperature means and extremes) (p.25), it seems that only one study (Schleussner et al., (2017)) mentioned it. Japan would appreciate it very much if a footnote could be added to provide particular references to this information. [Japan]	
4726	8	21	8	21	"Precipitation indices" may not be understood by a non-specialist. A simpler phrasing could be "Observations... showed changes in temperature extremes and an increase in precipiation…" or "Changes in temperature extremes and an increase in precipitation have already been observed, according to measurements between...". The latter would help emphasise that effects of global warming are already being seen today. [United Kingdom (of Great Britain and Northern Ireland)]	
4982	8	21	8	23	This paragraph concerns observed changes, not projected, and should be moved into a separate and new section on observed impacts as suggested above. [United Kingdom (of Great Britain and Northern Ireland)]	
5894	8	21	8	23	As section B.1 does not relate to observed changes (but rather to projected ones), we suggest to move this sentence to section A (see our comment about section A on providing more information on observed changes). [Belgium]	
6150	8	21	8	23	Please add the direction and magnitude of the changes in these indices [Estonia]	
7060	8	21	8	23	Change the statement in the following manner - “Changes in temperature extremes (high confidence) and heavy precipitation indices (medium to low confidence) are detectable in observations for the 1990-2010 period compared with 1960-79 , a time-span over which global warming of approximately 0.5 deg. C has occurred. {3.3.1, 3.3.2, 3.3.3}” [India]	
7664	8	21	8	21	The phrase "Changes in temperature extremes" gives no real hint at the amount of change occurring. The sliding bell curves described by Hansen et al. based on observational data of NH summer temperature variations indicate that what were 0.1% (3-sigma) possiblilities in the period 1951-80 are now occurring over 12% of the time, so over a 100 times the likelihood, leading to what in the past have been 1-in-100 year events starting to recur much more often. The statement here would be much more meaningful if it provided a more quantitative indication thant just saying the change is detectable. The changes are very evident and leading to times when regions are experiencing multiple 100-year flood events in a single year, and much more severe conditions than before. [United States of America]	
7666	8	21	8	23	Statement B1.1 does not directly address the impact or pathways toward 1.5°C of warming above pre-industrial levels. The statement is contextually relevant based upon an assumption of a linear response of precipitation patterns and intensity to warming. Suggest removing the statement or amending it to more clearly describe its assumptions: Changes in temperature extremes and heavy precipitation indices are detectable in observations for the 1991-2010 period compared with 1960-1979, a time-span over which global warming of approximately 0.5°C occurred. ASSUMING THAT TEMPERATURE EXTREMES AND HEAVY PRECIPITATION INDICES HAVE A UNIFORM RELATIONSHIP TO TEMPERATURE, CHANGES SHOULD BE DETECTABLE BETWEEN PRESENT DAY AND A WARMING OF 1.5°C, AND BETWEEN 1.5 AND 2°C. {3.3.1, 3.3.2, 3.3.3}" A confidence statement should be added to the sentence. [United States of America]	
8926	8	21	8	21	Suggest rephrasing to ensure terminology is consistent, as in B1.3: "Changes in temperature extremes and heavy precipitation events" [Australia]	
9278	8	21	8	21	Use more direct language: "indices are detected" [Switzerland]	
9280	8	22	8	22	WGI should provide more uptodate numbers, e.g. 1997-2016 instead of 1991-2010 [Switzerland]	
232	8	25	8	5	Why change order of things: increase when going from 1.5 to 2 or decrease when going from 2 to 1.5. When the expressions are systematically same and consistent they might be easier for the reader to follow. [Finland]	
802	8	25	8	26	Extremes "increase" rather than "warm". Plus, the increase in extreme hot days is 3°C in a 1.5°C warmer world. The factor 2 is confusing because it refers to the increase, not to the temperature. We suggest to write it as : "Temperature extremes on land are projected to increase more than the global average : extreme hot days in mid-latitudes by 3°C at 1.5°C global warming, and extreme cold nights in high-latitudes by 4.5°C at 1.5°C global warming." [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2300	8	25	8	29	Is it posible, based on the scientific literature, to draw a comparison between temperature extremes in a 1.5 and 2 degrees? [European Union (EU)]	
2302	8	25	8	29	Are these aggregate numbers over a year ? What about the seasonality of these figures (e.g. do hot days refer to summer months ?) [European Union (EU)]	
3536	8	25	8	25	global average = GMST? [Germany]	
3538	8	25	8	27	"extreme hot days in mid-latitudes by a factor of up to 2, i.e. ~3°C at 1.5°C global warming, and extreme cold nights in high-latitudes by a factor of up to 3, i.e. ~4.5°C at 1.5°C global warming" … please specify whether the increase in extreme hot days by a factor of up to is in frequency (as we would understand the text) or in temperature, as indicated by the i.e. ~ 3°C. But then the factor of 2 means, that without global warming the temperature in extreme hot days is only 1,5° C? Please increase the understanding, also regarding extreme cold nights. [Germany]	
3540	8	25	8	29	Please consider to add more specific information on temperature extremes from chapter 3, e.g.: "A warming of 2°C versus 1.5°C leads to more frequent and more intense hot extremes in all land regions, as well as to longer warm spells (very likely). Cold extremes would become less intense and less frequent, and cold spells would be less extended (very likely)." (as in Chapter 3-28; para:1, possibly using the conditional also in the first sentence) Rationale: This clear message on a 'very likely' level should be lifted to SPM, possibly substituting the current statements. [Germany]	
3978	8	25	8	27	Consider to rephrase, "factor of two" to "doubled". Thanks for explaining with examples! [Norway]	
4314	8	25	8	27	Rephrase for clear understanding. For example, warming of extreme hot day in mid-latitudes reaches ~3C by a factor of up to 2 at 1.5C warmer world. Or Re-describe it by replacing "extreme hot days" and "extreme cold nights" to "maximum temperature" and "minimum temperature", respectively. [Republic of Korea]	
4504	8	25	8	29	Suggest adding definition of "extreme hot days" and/or "cold nights" in the Glossary ("extreme weather event") as this will be helpful for the reader. [Japan]	
4506	8	25	8	27	Inconsistency of the description for confidence between "Temperature extremes on land are projected to warm more than the global average: extreme hot days in mid-latitudes by a factor of up to 2, i.e. ~3°C at 1.5°C global warming, and extreme cold nights in high-latitudes by a factor of up to 3, i.e. ~4.5°C at 1.5°C global warming (high confidence)." and "Warming of temperature extremes highest over land, ..., with increases of up to 3°C in midlatitude warm season, and up to 4.5 in highlatitude cold season (medium confidence)" shown in Table 3.2 (p. 3-58, Chapter 3). [Japan]	
4730	8	25	8	27	For a non-specialist, 'factors' do not need to be specified. It would be sufficient, and clearer, to say "extreme hot days in mid-latitudes by up to 3C at 1.5C global warming, and extreme cold nights in high latitudes by up to 4.5C at 1.5C global warming" [United Kingdom (of Great Britain and Northern Ireland)]	
5896	8	25	8	29	Complete § by adding concrete illustration of impacts (+1.5° versus +2°) in order to provide some illustrative figures : "limiting global warming to 1.5°C instead of 2°C could result in around 420 million fewer people being frequently exposed to extreme heatwaves, and about 65 million fewer people being exposed to exceptional heatwaves, assuming constant vulnerability (medium confidence) (3.3.1; 3.3.2) [Belgium]	
6152	8	25	8	35	B1.2 and B1.3 - when would these changes happen? Please give an indication of a time period [Estonia]	
6434	8	25	8	25	replace by: High temperature extremes on land are projected to increase more that the global average (…) [Netherlands]	
7066	8	25	8	29	This bullet should include projections for 2 degrees as well as 1.5, since that is what is promised in the headlne B1. Right now it only states the 1.5 projections. Other sub-bullets in B1 and B2 provide a comparison and this one should too. [India]	
7668	8	25	8	25	Technically, "temperature extremes" don't "warm". Instead this needs to say that temperature extremes will be larger over land than elsewhere. [United States of America]	
7670	8	25	8	29	The sentence is confusing as written. Revise to state: "Temperature extremes on land are projected to warm more than the global average. Temperature of extreme hot days in mid-latitudes are projected to increase by a factor of up to 2 with respect to global warming, i.e. ~3°C at 1.5°C global warming..." (and similar edit for next sentence). [United States of America]	
7672	8	25	8	3	The use of "factors of X" here is confusing. It may be more clear to provide the ranges in temperature changes. The authors should consider providing more specific information on the geographic region affected by these extremes than "mid-latitudes" here. [United States of America]	
8466	8	25	8	26	Where is the quantified result for th tropics? [Zimbabwe]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8506	8	25	8	44	There is limited literature on Africa extremes. Also refer to Moyo, E. N., & Nangombe, S. S. (2015). Southern Africa's 2012-13 violent storms: Role of climate change. In Procedia IUTAM (Vol. 17, pp. 69–78). Elsevier B.V. https://doi.org/10.1016/j.piutam.2015.06.011 as well as Nangombe, Shingirai & Zhou, Tianjun & Zhang, Wenxia & Wu, Bo & Hu, Shuai & Zou, Liwei & Li, Donghuan. (2018). Record-breaking climate extremes in Africa under stabilized 1.5 °C and 2 °C global warming scenarios. Nature Climate Change. 10.1038/s41558-018-0145-6. Why are we emphasising the difference between 1.5 and 2.0 instead of the impacts of impacts of 1.5. For Africa, Instead of saying there is no significant response (which is misleading), decompose the precipitation and write of the changes in intra-seasonal charactiristics such as changes in rain days, intensity and extremes as well as changes in seasonal onsets and cessation or less precipitation in early summer and more precipitation in late summer [Zimbabwe]	
9282	8	25	8	29	Missing definitions of "temperature extremes", "highly unusual hot days". Provide definition in a footnot, or point to glossary if these notions are defined there. [Switzerland]	
9440	8	25	8	29	The first three lines discuss changes in the magnitude of extremes and the last, frequency of extremes. While the frequency of unusually hot days may increase the most in the tropics, the magnitude of the increase in extremes is likely to be less than at high latitudes.? As such, the first sentence should include the amount by which hot extremes are projected to increase on land in the tropics. [Canada]	
4732	8	26	8	27	The phrasing surrounding a warming of extreme cold nights is slightly confusing - does this mean that the coldest nights will be 4.5 warmer (therefore the temperatures are less extreme), or does it mean that the range of extremes will increase? [United Kingdom (of Great Britain and Northern Ireland)]	
4984	8	26	8	27	Is it possible to specify where exactly in the high latitudes extreme cold nights are warming? The implications of warming might be very different if extreme cold nights are warming at the poles than from someowhere slightly lower. [United Kingdom (of Great Britain and Northern Ireland)]	
5722	8	26	8	27	Avoid using "cold nights" when talking about TNn. This ETCCDI-index is defined as "Monthly minimum value of daily minimum temperature" and in cold conditions at high latitudes it need not be nighttime conditions (lowest temperatures are often encountered in the morning just after sunrise). [Sweden]	
8922	8	26	8	27	Suggest clarifying: "...and extreme cold nights in high-latitudes by a factor of up to 3" Are extreme cold nights projected to increase or decrease by a factor of three under global warming? [Australia]	
3542	8	27	8	27	Please insert: …in the northern high-latitude… (as in 3-27; para:1). [Germany]	
804	8	28	8	29	To limit the length of the SPM, we suggest to delete this sentence, since this finding is strongly dependent on the definition of "hot days", especially regarding the inter-seasonnal variability. Indeed, a hot day is defined regarding the seasonnal variability of the temperature, so it is logical that their number increase the most in the tropics since these regions have a weak seasonnal variability. [France]	
2304	8	28	8	28	Please add: … "unusual hot days is projected in many areas, the most in the tropics …" [European Union (EU)]	
3544	8	28	8	28	The term "unusual hot days" should please be explained (e.g. X°C more than average temperature or days above some percentile of hot days). [Germany]	
4316	8	28	8	28	Check statistics for unusual hot day in tropics. [Republic of Korea]	
4508	8	28	8	29	Inconsistency of the description for confidence between "The number of highly unusual hot days is projected to increase the most in the tropics (high confidence)." and "Highest increase of frequency of unusually hot extremes in tropical regions (medium confidence)" shown in Table 3.2 (p. 3-58, Chapter 3). [Japan]	
4734	8	28	8	28	What's the definition of highly unusual? In context this seems colloquial rather than scientific, could you please quantify. [United Kingdom (of Great Britain and Northern Ireland)]	
5724	8	28	8	28	Here, it is stated "highly unusual hot days" but it is unclear what this means. The underlying chapter (Fig 3.7 (for that particular figure it is also unclear exactly how the index is calculated - is it based on diurnal average temperature, TX, TN???)) speaks about "number of hot days (10% warmest days)". Should "highly unusual" be interpreted as the 10% warmest days (doesn't sound that unusual...)? It is left unclear how large the changes are, and how these regional changes compare to changes in other regions, such as sub-tropics and mid-latitudes. [Sweden]	
5898	8	28	8	28	This is very general and does not contain much information. Could you provide something more specific about the magnitude of the increase in the tropics. [Belgium]	
7674	8	28	8	28	What is a "highly unusual hot day"? Quantify. [United States of America]	
8932	8	28	8	28	Suggest clarification: is there a differenc between 'highly unusual hot days' and 'extreme hot days' [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
806	8	31	8	33	It seems not coherent with B1 statement "in most regions" and "high confidence". Indeed, there could be a difference between headline statement which deals with "increase in extremes" and B1.3 statement which deals with "likelihood of increase", but it has to be clarified, regarding the information given in chapter 3 and Annex 3. {3.3.3} : Regarding changes in precipitation associated with a global warming of 0.5°C, the observed record suggests that robust increases in observed precipitation extremes can be identified for annual maximum 1-day precipitation (RX1day) and consecutive 5-day precipitation (RX5day) for GMST changes of this magnitude Annex 3.3 : there is low confidence regarding changes in monsoons at these low global warming levels, as well as regarding differences in responses at 1.5°C vs. 2°C. [France]	
3546	8	31	8	32	Why is this statement only associated with "medium confidence"? Please delete "Limiting global warming to 1.5°C compared to 2°C" and substitute it by: "Limiting global warming to 1.5°C limits risks of increases in heavy precipitation events in several regions (high confidence). It reduces the likelihood…". (as in ES 3-7; para:2) Rationale: This clear message with high confidence should be considered in the SPM. [Germany]	
3548	8	31	8	33	The ES of Chap 3 states "Limiting global warming to 1.5°C limits risks of increases in heavy precipitation events in several regions (high confidence)." The sentence in the SPM is quoted with medium confidence only. The SPM is more specific than the ES by adding "compared 2°C", but please check confidence level. [Germany]	
4318	8	31	8	32	"heavy precipitation events in several northern hemisphere high latitude and high elevation regions (medium confidences)" - this looks rather weak compared to the conclusion given in B1 as "heavy precipitatoin events in most regions (high confidence)". Providing more regions would be suggested, including the Asian summer monsoon for which there are recent studies based on the HAPPI simulations. [Republic of Korea]	
4320	8	31	8	35	It should be essential to mention about changes in monsoon rainfall over the monsoon area where more than 2/3 world population live. It should be also mentioned on changes in Tropical cyclones and extratropical storms under consideration of their significant impacts. [Republic of Korea]	
4442	8	31	8	35	The precipitation differences between the 1.5 and 2 degree celsius scenarios are most markedly different in the tropics (see fig 3.9 in chapter 3). This should be highlighted in the SPM instead of the focus on the Northern Hemisphere region. [Singapore]	
4736	8	31	8	35	Can these statements be quantified? Currently, it's very vague - "reduces the likelihood", "less land", "probability….less in some regions". How much land? How much reduced probability? Which regions? [United Kingdom (of Great Britain and Northern Ireland)]	
7042	8	31	8	35	Refer underlying report: Chapter 3, page 31, line 10 to 15: Monsoon seasonal rainfall is an important phenomenon over India and its variation needs to be highlighted properly. The para 3.3.3 of Final Draft should be suitably modified with inputs provided below: The all-India annual and monsoon season rainfall for the period 1901-2015 does not show any significant trend. However, Indian summer monsoon rainfall depicts a decreasing tendency during the last three decades of the 20th century (Kulkarni et al., 2012). Guhathakurta et al (2015) also highlighted that while the monsoon seasonal rainfall had a significant increasing trend during the period 1901-50, insignificant decreasing trend in the same was observed over the 1951-2011 period, but with substantial spatial variations. The decades 1971–1980. Pai et al. (2014) using the 0.25 deg x0.25 deg gridded data found that during the recent decades, there has been significant decrease of moderate rainfall events, while heavy and very heavy rains have increased in frequency. During the period, 1901–2010, heavy rainfall events (rainfall exceeding 15 cm in 24 hours) over northern parts of the India show an increasing trend of about 6 % per decade. The analysis of rainfall data from observational network of India for the period 1901-2010 revealed increasing trends in the frequency of dry days in most parts of the country during the winter, pre-monsoon and southwest monsoon seasons. The decades 1971–1980 onwards were drier than normal with the recent decade 2001–2010 being the driest. Frequency of rainstorms (weather systems with potential of causing large scale floods) has shown an increasing trend of 4 rainstorms in 65 years during 1951–2015 (Guhathakurta et al., 2017). Duration of rainstorms has shown a substantial increase of about 15 days during the same period. All-India annual precipitation increases by 1.2–2.4% by 2030s under different RCP scenarios and by 3.5–11.3% by 2080s, relative to the pre-industrial base (Chaturvedi et al., 2012). All models and all scenarios project an increase in both the mean and extreme precipitation in the Indian summer monsoon (IPCC WGI AR5). [India]	
7054	8	31	8	34	Refer to the underlying report, chapter 3, page 53, The statement that the number of people exposed annually to a 20th-century 100-year river flood is projected to be three times greater for RCP8.5 than for RCP2.6. may be examined in detail before arriving at the conclusion. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7676	8	31	8	33	Wording needs adjustment here. Yes, the likelihood is down, but the increases in the extremes will be very large (so more than today, etc.). Yes, 1.5 likelihood is smaller than for 2°C, but the increase in the frequency of heavy precipitation is nonetheless still there. The present phrasing makes it seem as if the increase in likelihood will be limited as well. [United States of America]	
7678	8	31	8	35	The use of the term "extreme drought" in statement B1.3 in the SPM is not consistent with its use in the underlying text in Chapter 3. There is no objective internationally agreed definition of what constitutes an "extreme drought." Since the chapter highlights changing conditions that can contribute to or exacerbate droughts, substitute the words "increased (or increasing) drought conditions" for "extreme drought" to better preserve the meaning of the finding. [United States of America]	
7680	8	31	8	35	Provide a quantitative estimate for the increase in likelihood. [United States of America]	
7682	8	31	8	35	The first sentence refers to likelihood of heavy precipitation in several Northern hemisphere regions but without examples. The second sentence refers to likelihood of flooding but it isn't clear if this refers to the same regions as the previous sentence or is more general. Then the second clause in that sentence specifies Mediterranean and Africa (as examples) with respect to drought. This could be more clear if regions and examples were specified for all impacts discussed. [United States of America]	
8470	8	31	8	31	Lets compare 1.5 to pre-industrial periods or current period rather than compare it to 2.0 degree scenario. It defeats the purpose of this report [Zimbabwe]	
8930	8	31	8	32	Suggest clarification: are these the only regions where changes are likely, or are they likely to happen in many regions but these are the only regions where studies have actually been done? [Australia]	
9284	8	31	8	35	"reduces the likelihood". It would be helpful if this reduction could be quantified by a factor, e.g. "halved" ? [Switzerland]	
3550	8	32	8	32	Is this statement referring to regions that are situated both at NH high latitude and high elevation, or to regions that are situated either at NH high latitude or at high elevation? Please clarify, possibly by inserting "in" before "high elevations". [Germany]	
6436	8	32	8	33	why is the confidence level here medium, while it is high in B1 (line18) [Netherlands]	
9442	8	32	8	32	The word "several". Suggest deleting or replacing with 'most'. [Canada]	
1708	8	33	8	33	Add the following: There is low confidence in projected changes in heavy precipitation at 1.5? C versus 2? C in other regions. [Saudi Arabia]	
1762	8	33	8	33	Add the following: There is low confidence in projected changes in heavy precipitation at 1.5 °C versus 2 °C in other regions. Reference page 4 line 10. [Saudi Arabia]	
4322	8	33	8	34	The probablity of extreme droughts would be less in some regions, including~ southern Africa: Southern Africa such as Republic of South Africa has been suffering from severe drought. It would be better that recommend showing extreme drought- conditions or taking an another region instead of southern Africa as an example. (https://www.aljazeera.com/news/2018/01/extreme-drought-grips-parts-south-africa-180118092847342.html) [Republic of Korea]	
5726	8	33	8	34	"Less land" and "less in some regions" are too unspecified. How much less? [Sweden]	
5900	8	33	8	35	We suggest reformulating the last part ('and the probability of extreme droughts would be less is some regions, including the Mediterranean and Southern Africa') to align with key messages in summary of chapter 3: "[..] and the probability of extreme droughts and risks associated with water availability would be substantially reduced is some regions, including the mediterranean and Southern Africa' (cf summary chapter 3) [Belgium]	
9444	8	33	8	33	If the statement: "Less land would be affected by flood hazards (medium confidence)" relates to precipitation and streamflow related floods and not coastal flooding from sea level rise, the text should clarify this. [Canada]	
7062	8	36	8	36	Please add the following - “Current observations do not show significant changes in the frequency of cyclones. The difference in the frequency of cyclones between 1.5 and 2 deg. C warming is small (limited evidence, low confidence). {3.3.6}. [India]	
9608	8	36	8	36	We suggest to add a paragraph B1.4 summarizing the findings on tropical cyclones in ocean basin including the South West Indian Ocean from Chap.3 paragraph 3.3.6 page 3-46 [Madagascar]	
9610	8	36	8	36	We suggest to insert the Fig.3.4 in Chap3 showing maps on extremes hot,cold and rainfall at 1.5°C warming.Table 3.2 should be included in the SPM. [Madagascar]	
334	8	37	8	44	Warming definitely is NOT detrimental for MANY terrestrial ecosystems. The following sub-items highlight it clearly. Therefore, the general statement should be made more specific. [Russian Federation]	
2306	8	37	9	7	The large section of climate change risks for terrestrial and wetland ecosystems is not well represented in the SPM. This may be because the executive summary of chapter 3 does not deal well with that important section. [European Union (EU)]	
3552	8	37	8	44	This paragraph provides information on the relative changes between 1.5 and 2C, but it lacks information about the absolute number of this change. Please add this information from chapter 3. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3554	8	37	9	7	The economic and social consequences of a limited / no availability of ecosystem services, like fresh water, for economic activity, global value chains as well as the accumulation of risk factors would strengthen the message. Please provide more detail on B2 by including reference to economic and social impacts of limited availability of ecosystem services. This is addressed in Ch3, for example page 77 last para, page 85 second para, top of page 87, page 89 last paragraph. [Germany]	
4324	8	37	8	44	It would be better to add a sentence about importance of global warning of 1.5? and the regional differences of the impacts. [Republic of Korea]	
4738	8	37	8	38	Consistency of style would help the reader understand the messages. So for instance this sentence could be reversed to match the style of the previous paragraph ie "Limiting global warming to 1.5°C compared to 2 C reduces the risks of climate-induced impacts...". This applies to a number of other sentences throughout the SPM [United Kingdom (of Great Britain and Northern Ireland)]	
5198	8	37	8	44	Include a previous headline about the level of impact at 1.5ºC warming. Otherwise it seems that there might be almost no risk for a 1.5ºC warmer world. Also, split into separate headlines, they should never be so long. [Spain]	
5902	8	37	8	4	The two first sentences of B2 do not make an explicit link between biodiversity loss and human beings. The term "preservation of their services" is vague and does not specify why these services are essential. A minimum would be to add the word "humans", following chapter 3 : "B2. Limiting warming to 1.5°C has large benefits for terrestrial and wetland ecosystems and for the preservation of their services to humans". It could possibly be useful to further clarify using text from §3.4.3.6 : (...) their services to humans, such as soil conservation, flood control, water and air purification, pollination, nutrient cycling, some sources of food, and recreation". [Belgium]	
7044	8	37	8	44	Refer underlying report: Chapter 3, page 77: Para 3.4.3.6 Summary of implications for ecosystem services. Summary is provided only for "Terrestrial wetland" or for both Terrestrial and wetland ecosystem. Please check. [India]	
7046	8	37	8	44	Refer underlying report: Chapter 3. Biome shifts in Indian Himalaya. In the past half a centuary, there has not been significant changes in biome boundaries considering 0.5 degree rise in temperature. This aspect needs to be checked. [India]	
7048	8	37	8	44	Refer underlying report: Chapter 3. Phenological changes in tropical forests respond to moisture stress as well as to temperature. Rephrase sentence. [India]	
7052	8	37	8	44	Refer to the underlying report, chapter 3, page 74, line 7: General conclusions are provided on the effect of 1.5 degree C temperature rise on invasives species, changes in ecoystem fuction biomass and carbon stocks. While these aspects are very important from point view informing policy makers for taking control measures for invasive and implementing REDD+ activities in developing countries. [India]	
7074	8	37	8	44	Refer to the underlying report chapter 3, page 76, line 37-38: It can be included Declassified Corona satellite data, aerial photographs along with satellite datasets during 1962–2011 revealed woody species ingression in grassland in a well-known protected area in India, Rates of ingression on linear transects were found to be 60–120 m per decade. (Lele et al 2015, Space-based long-term observation of shrinking grassland habitat: A case-study from central India,J. Earth Syst. Sci. 124, No. 7, October 2015, pp. 1389–1398). [India]	
7684	8	37	8	38	The use of the word "substantially" in this statement is unclear, given the uncertainty in the underlying text on page 3-74: "Globally, GPP increases or remains approximately unchanged in most models (Hashimoto et al., 2013). This is confirmed by Sakalli et al. (2017) for Europe using Euro-Cordex regional models under a 2°C global warming for the 2034-2063 period (storage will increase by +5% in soil and by +20% in vegetation). But using the same models, Jacob et al. (2018) showed that limiting warming to +1.5°C instead of +2°C avoids an increase in ecosystem vulnerability of 40-50%." A confidence level should be added to the sentence. [United States of America]	
7686	8	37	8	44	It should be noted that the risks of climate-induced impacts on biodiversity and ecosystems may or may not be positive (see, e.g., Steinbauer et al. 2018). Also, any estimated negative impacts should be weighed against a possible increase in productivity, as has apparently already occurred and may continue into the future (Zhu et al. 2016; Rafique et al. 2016; Gao et al. 2016; Cheng et al. 2017; IPCC AR5 WG2 report, p. 293). Such increase can increase the amount of biomass that can exist on the globe, which many would regard as a net positive. [United States of America]	
7688	8	37	8	44	What is meant by "substantially"? How is this term defined? [United States of America]	
8472	8	37	8	4	Same as above, this is misleading. We would rather have it as Limiting warming to 1.5 degree has less damage and impact to ecosystems than 2.0 [Zimbabwe]	
8690	8	37	9	7	The New Zealand Government strongly endorses the statements in section B2 and are pleased to see that the report stresses with high confidence that impacts on some species, ecosystems and their ecological functions and services to humans may be irreversible if the global mean temperature overshoots 1.5 °C above pre-industrial temperature. [New Zealand]	
7690	8	38	8	4	Statement B2 is not consistent with the evidence described in the section on wetlands (3-97): "It remains unclear how wetlands will respond and under what conditions (including other climate parameters) with a rise in 1.5°C and 2°C." Suggest removing "wetland" from the statement. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7692	8	38	8	38	"substantially" is a meaningless qualifier, especially in translation. Give quantitative range in %. [United States of America]	
808	8	39	8	39	Replace "large benefits" by "less negative impacts than at 2°C", otherwise the sentence may let express that a 1.5°C-global warming has benefits. [France]	
3556	8	39	8	39	The use of the term "benefits" might be misleading here ("Limiting global warming to 1.5 degrees has large benefits for terrestrial and wetland ecosystems..."). Limiting global warming to 1.5 would avoid much larger negative impacts on terrestrial and wetland ecosystems, but might not create (net?) benefits for ecosystems. Therefore, we suggest to change the sentence accordingly. [Germany]	
8920	8	39	8	39	Suggest rephrasing to: "warming to 1.5°C would confer large benefits" [Australia]	
1822	8	4	8	44	consider to break section B2 into two separate sections. [Denmark]	
2308	8	4	8	44	This sentence illustrates the important implications of overshooting; the SPM should bring out this impotrant element more clearly and in a more pronounced manner. [European Union (EU)]	
4740	8	4	8	4	It is unclear to a non-specialist what is meant by "preservation of their services". Could you please clarify. [United Kingdom (of Great Britain and Northern Ireland)]	
4742	8	4	8	44	Several points to make about this sentence. Firstly that it is a repetition of point A3.1 (but stated somewhat confusingly with an increased confidence level), and secondly as I said about point A3.1 - I do not think that there is sufficient/any evidence about the link between temperature overshoot (particularly if we come back down to 1.5°C by 2100) and severity/irreversibility of impacts and the underlying text certainly doesn't cite any papers that back this claim up. As above - intuitively I think this is probably true particularly for impacts to ecosystems but it's vital that statements made in the SPM are able to be robustly backed up by the underlying text in order. Therefore I strongly recommend removing this point entirely. [United Kingdom (of Great Britain and Northern Ireland)]	
6438	8	4	8	42	Statement B2 refers to overshoot, but the subpoints do not mention it. [Netherlands]	
7694	8	4	8	41	The use of "much higher" in this sentence could be construed as a value judgement. Consider changing to "greater than". [United States of America]	
8928	8	4	8	44	Suggest clarification: it is unclear if the sentence referencing 'overshoot' is intended to apply to "on land" or more broadly. [Australia]	
810	8	46	8	48	This is an important paragraph that underlines the difference between 1.5°C and 2°C. It might however benefit by recalling the scale of impacts implied at 2°C and not only the relative impacts. We suggest to write as follow : "The number of species projected to lose over half of their climatically determined geographic range at 2°C is reduced at 1.5°C by a factor two for plants (16% to 8%) and for vertebrates (8% to 4%) and by a factor three for insects (18% to 6%). {3.4.3.3}" [France]	
3558	8	46	8	5	This paragraph provides information on the relative changes between 1.5 and 2C, but it lacks information about the absolute number of this change. Please add this information from chapter 3, last para on page 8 and first para on page 9. [Germany]	
3980	8	46	8	48	Consider rephrase more simple wording, i.e. avoid "factor of two", use "Double" instead. [Norway]	
4226	8	46	8	51	'B2.1. The number of species projected to lose over half of their climatically determined geographic range at 2? is reduced by a factor of two or more at 1.5°C, i.e. by 50% (plants, vertebrates) or 66% (insects) (high confidence).' – The number of species assessed in this report is very limited relative to the very large one in the world. There is not a clear picture of the changing geographic ranges and distributional limits suitable for many other species that have not been assessed. In addition, the changing climatically determined geographic ranges and distributional limits for species are also related to the size of the original ones. So it is suggested that this paragraph be reformulated to read: 'B2.1. The number of species assessed so far projected to lose over half of their climatically determined geographic range at 2? is reduced by a factor of two or more at 1.5?, i.e. by 50% (plants, vertebrates) or 66% (insects) (medium confidence).' Furthermore, in 'Impacts associated with other biodiversity-related risks such as forest fires, and the spread of invasive species, are also reduced substantially at 1.5°C compared to 2°C of global warming (high confidence)', (high confidence) is inconsistent with the underlying report, in which Chapter 3 (page 72) states that: "Also, there is the potential for highly invasive species to become established in new areas as the climate changes (Murphy and Romanuk, 2014), but there is no literature that quantifies this potential for 1.5°C warming." Without adequate support by literature, 'high confidence' should not be given here. So it is suggested to reword (high confidence) as (medium confidence). [China]	
4510	8	46	8	5	This sentence is difficult to understand for the non-native. We would propose the following two changes: - to omit the sentence "by a factor of two or more" - to change "or 66%" to "and 66%" [Japan]	
4744	8	46	8	48	Can we say what the total % of species affected is? [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5904	8	46	8	48	Reference to 'climatically determined geographic range' might not be self evident for policy makers. We suggest reformulating the 1st sentence as "Risks of local species losses and extinction are much higher in a 2° versus a 1.5° warmer world (cf summary chapter 3)" [Belgium]	
7064	8	46	8	5	First sentence may be reworded as follows: “The number of species projected to lose over half of their climatically determined geographic range at 2 deg. C (18% of insects, 16% of plants, and 8% of vertebrates) is reduced by a factor of two or more at 1.5 deg. C., i.e. by 50% (plants, vertebrates) or 66%(insects) (high confidence). However, both 1.5 and 2 deg. C warming range losses are significantly less compared to the warming associated with the current NDCs.” This correction reflects more accurately the conclusions of the paper from which the original statement was drawn. {Warren 2018b in references to Chapter 3}. [India]	
7696	8	46	8	48	This statement is based on varying results from a limited number of studies (pg 3-72). Given the wide (1-18%) confidence interval of insect species experiencing >50% range loss at 1.5°C, it is misleading to perform an operation on the mean value (i.e., comparing to proportion of insect species experiencing range loss at 2°C) without propagating and stating the uncertainty. Taking the uncertainty into account, if there is a statistically significant difference between the numbers of species experiencing range loss at the two temperatures, an appropriate revision of the sentence would read "The number of species projected to lose over half of their climatically determined geographic range at 1.5°C is significantly lower than at 2°C warming." [United States of America]	
7698	8	46	8	49	The first sentence is good, providing percentage of species lost. The second sentence should either be deleted or insert percentage differences in impacts at 1.5 and 2.0°C due to fires and invasive species. [United States of America]	
7700	8	46	8	5	The statement fails to indicate how large and significant the number of species lost at 1.5°C relative to 2°C or what the fraction is at 1.5°C. Saying that it is half of what would happen at 2°C without saying how much it would be is hiding the seriousness of the situation. There are losses at 1°C. This needs to be stated, along with the increase going up to 1.5 and 2°C. [United States of America]	
7702	8	46	8	5	This section should note the relative importance of the warming differential between 1.5 and 2°C versus other environmental and human-caused factors that influence biodiversity. [United States of America]	
8846	8	46	8	47	Suggest making this a positive statement that conveys the relative benefits of staying below the 1.5ºC threshold as opposed to the 2ºC threshold. Suggest re-word as: 'The number of species projected to retain half of their climatically determined geographic range at 1.5ºC is increased by a factor of two or more than at 2°C' [or similar] [Australia]	
7704	8	47	8	48	Suggest small edit for clarity: "e.g. 50% for plants and vertebrates, 66% for insects" [United States of America]	
2310	8	48	8	5	impacts such as forest fires can also be substantially reduced by appropriate management (hence reducing/eliminating the impact gap between 1.5 and 2 scenario). Importance of adaptation choices needs to be highlighted, wherever relevant. [European Union (EU)]	
3560	8	48	8	48	Please remove the parentheses around plants and vertebrates as well around insects. [Germany]	
4512	8	48	8	5	It seems to be inconsistency between abstract*1 and text*2. One assesses the impacts of invasive species by the global warming. The other says “No literature”. *1: “Impacts associated with other biodiversity-related risks such as forest fires, and the spread of invasive species, are also reduced substantially at 1.5°C compared to 2°C of global warming (high confidence).” *2 “there is the potential for highly invasive species to become established in new areas as the climate changes (Murphy and Romanuk, 2014), but there is no literature that quantifies this potential for 1.5°C warming.” To solve this inconsistency, we suppose to write again the literature in the SOD, Chapter 3 Page 78 Line 44 – 46, which describes that the potential habit of invasive exotic bamboos is compared quantitatively under 1.5°C or 2.0°C global warming (Takano et al. 2017),to the Chapter 3 Page 72 Line 33 . An amendment is as below, Also, there is the potential for highly invasive species to become established in new areas as the climate changes (Murphy and Romanuk, 2014). Such an example is shown for highly invasive exotic bamboos in Japan: Takano et al. (2017) detected newly establishments of invasive bamboos towards higher altitude and latitude during the last three decades, and projected that the proportions of future range expansions would be increased from 130% under 1.5°C warming to 150% under 2.0°C warming, compared to the current range in central/northern Japan. [Japan]	
3562	8	49	8	49	Why are there commas around ",and the spread of invasive species,"? If they are one of the two examples for biodiversity-related risk, please remove the commas. [Germany]	
3564	8	49	8	49	The reader might think that climate change is the central trigger of "other biodiversity-related risks such as forest fires, and the spread of invasive species". However, these risks are the consequence of complex interactions between human activities (transportation, ecosystem transformation & degradation etc.) and various biotic and abiotic processes on different scales, including climate change as outlined in chapter 3. Therefore we suggest writing "Impacts associated with other multi-stressor risks related to biodiversity such as forest fires and the spread of invasive species" or something along these lines. [Germany]	
4746	8	49	8	49	Substantially is very vague. What does this mean? [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7050	8	49	8	49	Refer underlying report: Chapter 3. page 71: Include changes in fire regime in examples of accompanying changes in climate variability. [India]	
7706	8	49	8	49	"substantially" needs to be replaced by a % as in bullet B2.2 [United States of America]	
812	8	5	8	5	3.4.3.3 instead of 3.4.3.2 [France]	
5488	9		9		We suggest to include more discussion on the difference between Holocene vs Antropocene in the section geological dimesion. [Mexico]	
5490	9		9		Check the paragraph 1.1.1, the idea is not clear, we suggest to add more details to complete the idea. [Mexico]	
5080	9		9		information on the possible risks in mountainous areas is missing (e.g. glacier retreat, mountain ecosystems) [Hungary]	
336	9	1	9	1	It remains unclear if an “ecosystem transformation” is negative or positive outcome? Or it depends on particular location, ecosystem type and ecosystem services provided? [Russian Federation]	
2312	9	1	9	1	what is exactly meant by the term 'ecosystem tranformation' ? [European Union (EU)]	
3566	9	1	9	2	What is meant by "ecosystem transformation"? Please specify, if not in SPM than in the glossary. [Germany]	
4228	9	1	9	2	‘B2.2. The terrestrial area affected by ecosystem transformation (13%) at 2°C is approximately halved at 1.5°C global warming (high confidence).’ -- No adequate information can be found in the underlying report to support high confidence. So it is suggested to make a further check. [China]	
4748	9	1	9	1	What exactly is meant by ecosystem transformation? [United Kingdom (of Great Britain and Northern Ireland)]	
4750	9	1	9	7	It would be helpful to specify why policymakers should be concerned with these two points, linking them to their knock-on effect on human populations. [United Kingdom (of Great Britain and Northern Ireland)]	
5728	9	1	9	1	Unclear what is meant by ecosystem "transformation". This should be explained. [Sweden]	
5906	9	1	9	2	The reference to 'ecosystem transformation' is not evident. Are those transformations generally negative? Or negative in some regions ? How can policymakers use that information? We suggest to delete §B2.2 or to reformulate. [Belgium]	
6154	9	1	9	7	We believe the first sentence of B2.3 belongs to B2.2 and the second sentence of B2.3 on permafrost should be the only sentence under B2.3 [Estonia]	
7088	9	1	9	2	Refer underlying report: Chapter 3, page 73, line 4 to14: Provide names of few regions identified as climate refugia for clarity. Also mention why lower number of terrestrial species loss is expected in 1.5 degree as compared to 2.0 degree C. [India]	
7708	9	1	9	2	The phrase "ecosystem transformation" needs to be explained, making clear that all sorts of changes will be occurring in ecosystems around the world, creating more and more stresses until collapse and transformation occurs -- so the low number of 13% really does not give a good indication of the amount of environmental stress that will be evident and affecting ecological services. [United States of America]	
7710	9	1	9	2	Statement B2.2 is very misleading and must be revised to better reflect the underlying chapter which provides the basis for the conclusion. The statement appears to be based on models of biome shifts at 1.5 and 2.0°C of warming described in Section 3.4.3.1 that indicate "a doubling of the areal extent of biome shifts between 1.5°C and 2°C warming." The sentence in the SPM should be edited to reflect the uncertainty in the following statement in Section 3.4.3.1: "13% (range 8-20%) of biomes transforming at 2°C warming, but only 4% (range 2-7%) doing so at 1°C; suggesting that about 7% may be transformed at 1.5°C." How can the authors assume a linear relationship here when many ecosystem responses are nonlinear? It is not reasonable or scientifically sound to average out the impacts at 1.0 and 2.0°C knowing that ecosystems response is typically non-linear. If authors are going to simply average impacts at 1.0 and 2.0°C to arrive at a 1.5°C world, many other conclusions in the SPM would need revision. [United States of America]	
7712	9	1	9	2	Consider using "estimated" or equivalent when including these type of values even though the confidence is high. [United States of America]	
8936	9	1	9	2	Suggest rephrasing: "The terrestrial area protected from ecosystem transformation is approximately doubled at 1.5°C global warming compared to at 2°C (13%)". Suggest clarifying to ensure this is interpreted as a statement of the benefits of remaining at or below 1.5. [Australia]	
8938	9	1	9	1	Suggest rephrasing the term: "ecological transformation" to adequately convey possible negative implications, as transformation is commonly expressed as a positive. [Australia]	
9446	9	1	9	2	Suggest deleting reference to Box 4.2. Box 4.2 is about watershed management in a 1.5°C world. It does not have text to support the finding here regarding ecosystem transformation. [Canada]	
9448	9	1	9	5	B2.2 and the beginning of B2.3 do not clearly convey that ecosystem transformation is a reason for concern. Consider adding text to support the message (e.g. concern is due to the rate of change in the consequent likelihood of species extinction). [Canada]	
234	9	4			… and boreal forests are particularly at risk … might need few explanatory words. Is the risk in question "loss of biodiversity"? [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
814	9	4	9	4	"Particularly at risk" from what? warming at 2°C? this paragraph could be clearer. We suggest to add : "High-latitude tundra and boreal forests are particularly at risk from warming and associated increasing drought, with…" [France]	
816	9	4	9	4	Add « already » : "with woody shrubs already encroaching..." regarding the information given in {3.4.3} [France]	
4514	9	4	9	7	Many impacts are projected to be larger at higher latitudes due to mean and cold-season warming rates above the global average (medium confidence; mentioned in executive summary in Chapter 3).Although the confidence level is not high enough (i.e. medium confidence), we may want to note that many impacts are projected to be larger at higher latitudes due to mean and cold-season warming rates above the global average. [Japan]	
4516	9	4	9	7	"with woody shrubs encroaching into the tundra" should be replaced with "and woody shrubs are already encroaching into tundra" like executive summary in Chapter 3. [Japan]	
4752	9	4	9	5	How are high latitude tundra and boreal forests at risk? This is a very vague statement. [United Kingdom (of Great Britain and Northern Ireland)]	
5824	9	4	9	7	We suggest deletion of paragaph B2.3 since there is no corresponding mention to other regional ecosystems that are particulalry at risk. [Brazil]	
7090	9	4	9	7	Refer underlying report: Chapter 3, 3.4.3.1 Biome shifts explained as shrub (belonging to which biome?) encroachment in Tundra. Please clearify. Correct shrub encroachment on tundra to shrub encroachment in tundra. [India]	
7714	9	4	9	4	Policymakers may interpret "at risk" to necessarily imply a negative outcome. Accordingly, replace "at risk" with "prone to change". [United States of America]	
8942	9	4	9	5	Suggest rephrasing to: "High-latitude tundra and boreal forests are particularly at risk, with woody shrubs encroaching into the tundra due to global warming" to clarify that woody shribs encroached poleward due to warming . [Australia]	
3982	9	5	9	7	Please consider to mention that thawing of permafrost is an irreversible process. Perhaps it could be included like this: "Limiting global warming to 1.5C could prevent the irreversible thawing of an estimated permafrost area…." [Norway]	
4230	9	5	9	6	In “Limiting global warming to 1.5°C could prevent the thawing of an estimated permafrost area of 2 million km2 of permafrost area over centuries (high confidence)”, the characterization of ‘high confidence’ is inconsistent with the underlying report, in which Chapter 3 (page 153) indicates a medium confidence for the finding. So it is suggested to reword ‘high confidence’ as ‘medium confidence’ in this sentence for the sake of consistency. [China]	
7716	9	5	9	7	Nice to know there would be less area of permafrost thawing, but the statement needs to also indicate how much area will be melting at not just 1.5°C but at, say, 0.5°C. And the statement needs to indicate that such thawing leads to release of some amount of CO2 and CH4 as a natural carbon cycle response. This statement gives no indication of the significance of this change. [United States of America]	
818	9	6	9	6	Write "over the next centuries" instead of "over centuries", in order to be more precise. [France]	
820	9	6	9	6	We suggest to add at the end of this sentence : "...compared to limiting warming to 2°C, which would avoid irreversible release of thawed carbon as CO2 or CH4" Regarding {3.4.3.5} [France]	
2314	9	6	9	6	How much is that relative to the current area? [European Union (EU)]	
3568	9	6	9	6	The reference to the number provided is missing: 2 million km2 less than what? Please give the temperature level this number is compared to and the related thawed area. [Germany]	
3570	9	6	9	7	It should be mentioned that the thawing of permafrost would trigger a positive feedback mechanism. Please add "resulting in further amplification of global warming" or some similar formulation, and a reference to SPM-section C1.2 to convey this important message. [Germany]	
4518	9	6	9	6	an estimated permafrost area of 2 million km2 of permafrost area ==> an estimated permafrost area of 2 million km2 [Japan]	
4754	9	6	9	6	This point was raised in the last review too (although possibly only for chapter 3) and not addressed. The underlying text is inconsistent and states that an additional 4 million km^2 of permafrost will be thawed if we reach warming of 2°C rather than 1.5°C. The Executive Summary of chapter 3 states that an additional 2 million km^2 will be thawed. This needs to be checked and corrected. Additionally, there is repetition of "permafrost area" here. [United Kingdom (of Great Britain and Northern Ireland)]	
7718	9	6	9	6	This 2 million km2 saved is for 1.5°C vs. what? Cannot be 2.0°C, perhaps this is RCP8.5? If this is 1.5 vs. 2.0°C, then give the thaw area under 1.5°C and say how much extra it would be for 2.0°C. [United States of America]	
7720	9	6	9	6	"permafrost area" used twice in this line. [United States of America]	
8714	9	6	9	6	delete one use of "permafrost area" [New Zealand]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
822	9	8	9	8	We suggest to add this point : "B2.4. Biomass and soil carbon stocks in terrestrial ecosystems are currently increasing (high confidence), but they might decrease at a global warming of 1.5°C and even more at 2°C as a result of projected increases in the intensity of storms, wildfires, land degradation and pest outbreaks. Soils will be impacted by multiple forms of degradation, which can lead to desertification. This would contribute to a decrease in the terrestrial carbon sink. {3.4.3.4, 3.4.3.6}" This sentence has been adapted from chapter 3 p.73. A mention to desertification has been added following section 3.4.3.6. [France]	
236	9	9	9	16	The reader is somewhat confused on what is the message on irreversability and ecosystem changes in the Arctic Ocean. Para B3 states that there are differences in risks to Arctic sea-ice ecosystems between 2 and 1.5 warming. However, para B3.1 describes only sea ice conditions and states that "effects of an overshoot are reversible for Arctic sea-ice cover (high confidence)". What about the irreversibility of Arctic ecosystem changes? [Finland]	
3572	9	9	9	31	Paragraph B.3 mentions projected differences in ocean warming, acidification and oxygen levels but does not provide quantitative information. Please add this information to the paragraphs under B.3. including information at different depth levels for 1.5 and 2C, as provided in Chapter 3. [Germany]	
4326	9	9	9	12	Include "fisheries". ? ?reduce risks to marine biodiversity, ecosystems, fisheries and their ecological functions? [Republic of Korea]	
5200	9	9	9	12	no level of confidence associated to this headline. SPM should only include statements with an associated level of confidence. [Spain]	
7722	9	9	9	12	B3 lacks a confidence statement. [United States of America]	
8556	9	9	9	12	Paragraph lacks clarity [Ireland]	
7724	9	11	9	11	Recommend cutting "in ocean and coastal areas" or at least cutting "ocean and". [United States of America]	
4520	9	12	9	12	Warm water ==> warm-water [Japan]	
7726	9	12	9	12	With virtually all warm water coral reefs already significantly damaged by the increasing likelihood that natural variations on top of climate change exceeding their tolerances, it is not at all clear there will be any coral left to benefit from the global average temperature increase being 1.5 rather than 2°C. Similarly in the Arctic, the changes are already becoming very significant and it is just not clear what is going to be left when the global average temperature increase reaches 1.5°C (with the Arctic up by over 3°C). [United States of America]	
7728	9	12	9	12	"especially..." This bullet is convoluted enough, make this a separate sentence for clarity. [United States of America]	
4328	9	14	9	16	Add substance about MHWs(Marine Heat Waves). ? ?Arctic sea-ice cover (high confidence). Extreme events on the world's ocean like MHWs(Marine Heat Waves) will be limited with 1.5? global warming compared to 2?. [Republic of Korea]	
4424	9	14			Explain meaning "ice-free Arctic". [Czech Republic]	
4756	9	14	9	16	It's not clear to the non-expert reader why the lower (or higher) frequency of ice free summers is significant. Could you please clarify. [United Kingdom (of Great Britain and Northern Ireland)]	
6828	9	14	9	15	Reservations on the statement outlined given that Special Report on the Ocean and Cryosphere in a Changing Climate will only be finalized by September of 2019, which means this statement is inconclusive. [United Arab Emirates]	
7730	9	14	9	15	Given observed trends, this result, based on model simulations that have been underestimating the observed retreat of Arctic sea ice, seems unduly optimistic. With global average warming of 2°C in the paleo-past, there was no Greenland ice sheet and sea level was up a few tens of meters. Were there not a high percentage of ice-free summers during the Eemian interglacial when the average global average temperature was no more than 1°C above present day? This statement just does not convey the risk and likelihood of there being a much greater likelihood of significant sea ice retreat, not just in the summer but in the spring and fall. [United States of America]	
7732	9	14	9	16	The "effects of an overshoot are reversible for Arctic sea-ice cover" under what conditions? Does this refer to just presence/absence of sea ice or broader effects? It is a very surprising statement and therefore needs clarification. [United States of America]	
8558	9	14	9	16	B.3.1 makes an important point and the reversible nature of the effects of an overshoot should be further elaborated on [Ireland]	
2316	9	15	9	16	Over which timeframe would the effects of an overshoot be reversible? [European Union (EU)]	
7734	9	15	9	15	To improve clarity, do not use 'this' as a noun. Suggest changing to 'This likelihood is reduced to...' [United States of America]	
8946	9	15	9	15	Suggest including the thawing area at both 2C and 1.5C for comparison. Suggest rephrasing to: "…thawing of an estimated 2 million km2 of permafrost area over…" [Australia]	
8950	9	15	9	15	Suggest if possible, an estimate of the time it would take for the reversal to occur. [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3574	9	16	9	16	Page 50/51 of chapter 3 reads "There is high confidence that an intermediate temperature overshoot has no long-term consequences for Arctic sea-ice coverage." Please write "... effects of an intermediate temperature overshoot", and it would be useful to explain in a quantitative way, what "intermediate" means. [Germany]	
6440	9	16	9	16	Reference should be 3.3,9 instead 3.3.8 [Netherlands]	
6442	9	16	9	16	add Temperature to overshoot [Netherlands]	
1868	9	18	9	22	Please highlight more clearly why loss of coral reefs leads to loss of biodiversity and impacts livelihood. Suggest to insert text from box 3.4: coral reefs .. provide habitat for over a million species. As corals, disappear, so do fish stocks, and many other reef-dependent species, directly impacting industries such as tourism and fisheries, as well as livelihoods for many often disadvantaged people. [Denmark]	
4758	9	18	9	19	There is conflation here between currently observed effects ("are experiencing large-scale changes") with possible future effects ("with critical thresholds being exceeded at 1.C and above"). These should be separated for clarity (assuming it is supposed to be referring to different temporal periods) [United Kingdom (of Great Britain and Northern Ireland)]	
4760	9	18	9	22	The statement re: corals is very stark, worrying and high confidence. It would therefore warrant being a headline statement in the SPM. Additionally, this statement could be further strengthened by making a comparison with what will happen at 2C and not just implying that it will be worse. [United Kingdom (of Great Britain and Northern Ireland)]	
5908	9	18	9	26	Paragraphs B3.2 and B3.3. present related information on temperature thresholds and acidification effects. Could you please consider using a similar approach, with the same level of clarification of processes in both cases ? Currently paragraph B3.3. is rather detailed (calcification, growth, ...) while B3.2 only refers to corals. [Belgium]	
7736	9	18	9	31	It would be helpful here (e.g., in B3.2) to more specifically compare the consequences for coral reef ecosystems of 1.5°C of warming (reported in B3.2) to the consequences of 2°C of warming for the same ecosystems. [United States of America]	
8560	9	18	9	22	Are all critical thresholds coral-related or can others be included? Other examples may strengthen point. [Ireland]	
8854	9	18	9	19	Suggest re-phrasing to clarify this is a conditional statement about the 1.5°C threshold, which has not yet been crossed. Suggest: "Ocean ecosystems would experience large-scale changes with critical thresholds likely to be exceeded at 1.5°C and above (high confidence)." [Australia]	
8864	9	18	9	22	Suggest including a clarifying statement to note that some thresholds may be exceeded before 1.5°C. For example, some evidence and observations for warm water coral reefs suggests critical thresholds may occur below, not at, global warming of 1.5°C. [Australia]	
8940	9	18	9	19	Suggest rephrasing to ensure tense is consistent with earlier paragraphs. The current present tense is confusing. Suggest naming the critical thresholds for the benefit of policymakers. [Australia]	
9450	9	18	9	26	B3.2 and B3.3 do not reference impacts at 2°C, and could be read as implying that all climate change impacts will have already occurred at 1.5°C. Recommend adding text to convey additional impacts at 2°C. [Canada]	
2318	9	19	9	22	There seems to be some inconsistency between this statement and chapter 3, page 9, where it says: "For example, multiple lines of evidence indicate that the majority of warmer water coral reefs that exist today (70-90%) will largely disappear when global warming exceeds 1.5°C (very high confidence)", i.e. at above 1.5 degrees rather than at 1.5 degrees. [European Union (EU)]	
6830	9	19	9	19	Remove "Crossing these thresholds may have irreversible effects". [United Arab Emirates]	
7738	9	19	9	22	This statement on coral seems much more realistic and up-to-date than earlier ones in this SPM, and here the result is stated with "very high confidence". Also note the very small likelihood that any warmwater coral will survive at 1.5 to 2°C warming. [United States of America]	
7740	9	19	9	22	This key finding (B3.2) about 70-90% coral loss at 1.5°C global warming appears to be at odds with the following statement in Chapter 3: "Even achieving emission reduction goals consistent with the ambitious goal of 1.5°C under the Paris Agreement will result in the further loss of 90% of reef-building corals compared to today, with 99% of corals being lost under warming of 2°C or more above the pre-industrial period." [United States of America]	
4522	9	2	9	2	Warm water ==> warm-water [Japan]	
7742	9	2	9	21	To clarify, remove "the" and "today" from this section of the sentence, "the large scale loss of coral abundance (cover) today..." [United States of America]	
9452	9	2	9	22	This finding is clearer in the Chapter 3 Executive Summary which states that "The majority of warm water coral reefs that exist today (70-90%) will largely disappear when global warming exceeds 1.5C (very high confidence)." Suggest replacing current text with this. [Canada]	
5910	9	21	9	22	We suggest to add information about the level of projected coral loss at 2°C in the SPM, based on Box 3.4 : "Even achieving emission reduction goals consistent with the ambitious goal of 1.5°C under the Paris Agreement will result in the further loss of 90% of reef-building corals compared to today, with 99% of corals being lost under warming of 2°C or more above the pre-industrial period" [Belgium]	
2320	9	24	9	26	The sentence is difficult to read for an SPM. We suggest to replace in line 26 "taxonomic groups" with "marine species" for making it easier to understand and communicate. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4762	9	24	9	26	Also need to show the impact at 1.5C vs 2C, not just how severe at 1.5C. Furthermore, "amplifying the adverse effects" is quite vague. This statement would be improved by being more quantitative. [United Kingdom (of Great Britain and Northern Ireland)]	
7092	9	24	9	26	Refer underlying report: Chapter 3, Page 48, Para 3.3.7 says, "The surface of three ocean basins have warmed over the period 1950–2016 (by 0.11°C, 0.07°C, and 0.05°C per decade for the Indian, Atlantic and Pacific oceans respectively; Hoegh-Guldberg et al., 2014, AR5 Chapter 30), with the greatest changes occurring at the highest latitudes". How does these references older than year 2014 give estimates up to year 2016? Cheng et al. (2017) provides improved estimates of ocean heat content for the global ocean basins. Cheng, L., Trenberth, K. E., Fasullo, J., Boyer, T., Abraham, J., & Zhu, J. (2017). Improved estimates of ocean heat content from 1960 to 2015. Science Advances, 3(3), e1601545. [India]	
7744	9	24	9	26	This is a very important statement but, without some sort of examples given, it just sort of slides by when it really deserves to be featured and explained. [United States of America]	
7746	9	24	9	26	Need to restate this sentence to make it clear that the acidification is associated with CO2 enrichment that results in an increase in temperature of 1.5°C. [United States of America]	
8856	9	24	9	26	Suggest clarifying this statement to distinguish between ocean acidification and warming. Suggest re-phrasing as: "The level of ocean acidification under the CO2 emissions of a 1.5°C warmer world is expected to amplify the adverse effects of warming, impacting the survival, calcification, growth, development, and abundance of a broad range of organisms." [Australia]	
7748	9	25	9	25	If it is necessary to use "impact" as a verb, it should be made clear whether the impact is favorable or adverse. In this case, recommend saying "adversely impacting." [United States of America]	
824	9	26	9	26	Is it possible to add this in order to be more precise ? "Organisms with shells and skeletons made out of calcium carbonate are particularly at risk. {3.4.4.5}" [France]	
238	9	28	9	31	"B3.4. The risk of declining ocean productivity, distributional shifts (to higher latitudes), damage to ecosystems (e.g. coral reefs, wetlands), loss of fisheries productivity (at low latitudes), and changing ocean chemistry (e.g., acidification, hypoxia) are projected to be substantially lower at 1.5°C of global warming, as compared to 2°C." would read better as follows: "B3.4. Limiting global warming to 1.5°C compared to 2°C is projected to substantially lower the risk of declining ocean productivity, distributional shifts (to higher latitudes), damage to ecosystems (e.g. coral reefs, wetlands), loss of fisheries productivity (at low latitudes), and changing ocean chemistry (e.g., acidification, hypoxia)." [Finland]	
4330	9	28	9	31	Add "deoxygenation". ? ?changing ocean chemistry (e.g., acidification, hypoxia and deoxygenation)? [Republic of Korea]	
4764	9	28	9	28	"Ocean productivity" is an unclear term for non-specialists, and should be explained / expanded upon. [United Kingdom (of Great Britain and Northern Ireland)]	
7750	9	28	9	31	It would be good to include some quantification of the effect of going from 2 to 1.5°C instead of just saying "substantially". Insert an example with the percentage lost at 1.5 versus 2°C warming. [United States of America]	
7752	9	28	9	31	The syntax of this sentence is not correct -- there is a lack of subject-verb agreement. "The risk . . . is" or "The risks . . . are. . . ." [United States of America]	
9456	9	28	9	31	In order to avoid repetition of results and to help shorten the SPM where possible, we suggest that B3.4 be deleted since B3.2 and B3.3 already address impacts on oceans ecosystems. Information comparing impacts at 1.5C vs 2C could be integrated into B3.2 and B3.3 as needed. [Canada]	
4332	9	29	9	29	ecosystems (e.g., coral reefs, wetlands): We would recommend taking a specific example such as "tidal mud flat" rather than "wetlands". [Republic of Korea]	
8954	9	29	9	29	Suggest clarification: will fisheries productivity will only be affected at low latitudes? [Australia]	
4766	9	3	9	3	What is the definition of "substantially"? Could you be more precise? [United Kingdom (of Great Britain and Northern Ireland)]	
6444	9	3	9	3	What is meant with "substantially lower"? Can this be quantified? [Netherlands]	
8562	9	3	9	31	Can "substanitally lower" risk be quantified? [Ireland]	
340	9	33	9	36	'B4. By 2100, sea level rise would be around 0.1m lower with 1.5°C global warming compared to 2°C (medium confidence). Increased saltwater intrusions, flooding, and damage to infrastructure associated with increased sea level are especially harmful for vulnerable environments such as small islands, low-lying coasts, and deltas'. The second statement is correct, but not necessarily follows from the first one (that could be also correct!). [Russian Federation]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
826	9	33	9	33	Given the uncertainties highlighted in 3.3.9 and table 3.1, some indication of the absolute ranges would improve understanding this important pargraph. We suggest to give this range in B4, as follow : "By 2100, sea level rise would be [0-0.2]m lower with 1.5°C global warming compared to 2°C" [France]	
1856	9	33	9	41	B4 states that sea level rise would be 10 cm lower at the global warming at 1.5°C compared to 2°C. However, B4.1 says that even with a 1.5°C increase, the Greenland and/or Antarctic ice sheet instability coould result in multi-metre rise in sealevel in the longer term even if global warming is limited to 1.5°. How should this be seen in relation to the reduced 10 cm rise mentioned in B4.? [Denmark]	
2322	9	33	9	33	Referring to the 0.1 m difference seems to understate the see level rise impact. The reduced risk of ice sheet instability should be emphasized. [European Union (EU)]	
3576	9	33	9	46	The headline statement B4 in its present form does not reflect the high level of risks from SLR and the benefits of limiting warming to 1.5°C vs. 2°C because it only provides information up to 2100. The more significant long-term risks resulting from further SLR beyond 2100 and from potential tipping points due to ice sheet instabilities are only mentioned in paragraph B4.1. Such long-term change in SLR would however have major consequences for future generations. We therefore strongly encourage the writing team to include the most relevant information from the subparagraphs B4.1 and B4.2, i.e. long-term SLR, potential triggering of tipping points and risks for people, in the headline statement. Possibly the information of the second sentence in the B4 could be joint with the last sentence in B4.2 in one of the modified subparagraphs. In addition, please provide the absolute figure for SLR by 2100, not only the decreased rise due to half a degree less warming. Please see also our comment on P9 L 38-40. [Germany]	
3578	9	33	9	46	Please clarify versions of sea level rise! Which sea level scenario does the small difference of 0.1m between 1.5°C and 2°C refer to? Is it the scenario with a "multi-metre" rise mentioned in line 39? [Germany]	
3906	9	33	9	36	The statement “By 2100, sea level rise would be around 0.1m lower with 1.5°C global warming compared to 2°C”, seems incomplete. We would suggest adding “The risk of triggering multi-metre rise in sea level on centennial to millennial time scales is lower at 1.5°C than 2°C.” [Luxembourg]	
3984	9	33	9	36	0.1m is not relative to a given sea level rise. What is the projected sea level rise at 1.5 degrees? [Norway]	
4768	9	33	9	38	I don't think it will be clear to a non-expert whether 0.1 m of sea-level rise will make much difference - either this sentence could be contextualised in terms of the associated impacts of sea-level rise or swapped out with the first sentence on line 38 ("Sea level rise will continue beyond 2100"). Additionally, it would be helpful to have the absolute value of slr. [United Kingdom (of Great Britain and Northern Ireland)]	
5202	9	33	9	36	Include a previous headline about the SLR for a 1.5ºC warmer world. Also, split into two separate headlines. [Spain]	
5912	9	33	9	34	B4 addition proposal : "By 2100, sea level rise would be around 0.1m lower with 1.5°C global warming compared to 2°C (medium confidence). In both cases, sea level will continue to rise well beyond 2100, the rise being faster at 2°C warming (virtually certain)." (see 3.6.3.2 "it is virtually certain that sea level will continue to rise well beyond 2100, the amount of rise depends on future cumulative emissions (Church et al., 2013) as well as their profile over time (Bouttes et al., 2013; Mengel et al., 2018)") [Belgium]	
6446	9	33	9	46	It is surprising to note a single point estimate for the difference in SLR of 0.1m between 1.5C and 2C, given the wide ranges for any SLR estimates in research and all other IPCC reports. The report says 0-0.2m, and at least that range should be copied here, not the single average of that. [Netherlands]	

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7094	9	33	9	36	Refer underlying report: Chapter 3, Page 83, Line 19 to 41: The report does not mention suitable comments on sea level change for Indian region.The sea level change over Indian Ocean, Bay of Bengal and Arabian Sea may be included in section 3.4.4.8 of Final Draft as described below: Indian Ocean sea level change displays large diverging nature as compared to the rest of the global ocean, and its future projection is also equally ambiguous (Church et al. 2006). Tide-gauge-observed and HYCOM-simulated annual mean sea level data revel that sea level has decreased substantially in the south tropical Indian Ocean whereas it has increased elsewhere in Indian Ocean (Han et al., 2010). This pattern is driven by changing surface winds associated with a combined invigoration of the Indian Ocean Hadley and Walker cells, patterns of atmospheric overturning circulation. The sea level rise over the Arabian Sea and Bay of Bengal from the T/P altimeter monthly mean observations depict that the rate over the Arabian Sea is about 0.5–3 mm/year and over the Bay of Bengal is 0.75 to about 6 mm/year (Parekh et al., 2017). The sea level rise in the Indian ocean over the last 60 years amounts to 1.5 mm/year, which is slightly less than the global average. The AR5 projected sea level rise for all the scenarios with the highest emission scenario (RCP8.5) projecting sea-level rise in the range of 0.45–0.82 m for the late twenty-first century (average over 2081–2100) for the Indian Ocean. Palanisamy et al. (2014) used sea level reconstruction for the period 1950–2009 to understand the sea level change and variability in the Indian Ocean. They found the major contribution of the total sea level rise (about 1.5 mm/year) is of steric origin. Kusche et al. (2016) separated the mass and steric contributions to sea level variability by applying inverse approach (Rietbroek et al. 2012) to the Jason-1/2 radar altimetry and Gravity Recovery and Climate Experiment (GRACE) data and revealed that steric origin sea level change in the Bay of Bengal dominates by a factor of two over the mass-driven sea level change. References: Parekh, A., Gnanaseelan, C., Deepa, J.S., Karmakar, A. and Chowdary, J.S. (2017). Sea Level Variability and Trends in the North Indian Ocean. In: Rajeevan M., Nayak S. (eds) Observed Climate Variability and Change over the Indian Region. Springer Geology. Springer, Singapore Han, W., Meehl, G., Rajagopalan, B., Fasullo, J., Hu, A, Lin, J., Large, W, Wang, J-W, Quan, X.-W., Trenary, L., Wallcraft, A., Shinoda, T., Yeager, S. (2010). Patterns of Indian Ocean sea-level change in a warming climate. Nature Geoscience. Published online: 11 July 2010. Church J A, White N J and Hunter J R (2006), Sea-level rise at tropical Pacific and Indian Ocean islands; Global and Planetary Change, 53 155–168. Kusche, J., B. Uebbing, R. Rietbroek, C. K. Shum, and Z. H. Khan (2016), Sea level budget in the Bay of Bengal (2002–2014) from GRACE and altimetry, J. Geophys. Res. Oceans, 121, doi:10.1002/2015JC011471. Palanisamy, H., Cazenave, A., Meyssignac, B., Soudarin, L., Wöppelmann, G. and Becker, M. (2014) Regional sea level variability, total relative sea level rise and its impacts on islands and coastal zones of Indian Ocean over the last sixty years. Global Planet. Change, doi:10.1016/j.gloplacha.2014.02.001. Rietbroek R, Brunnabend SE, Kusche J, Schröter J (2012) Resolving sea level contributions by identifying fingerprints in time-variable gravity and altimetry. J Geodyn 59:72–81. [India]	
7098	9	33	9	34	Refer to the underlying report: Chapter 4-39, Table 4.4: The issue of human migration in dryland India is not related to 1.5 deg C. Migration to cities is a global phenomenon and is not attributable solely to climate change. This should be deleted. [India]	
7754	9	33	9	34	The statement needs to provide an indication of projected sea-level rise itself -- not just the change in amount in the near-term. First, the equilibrium rise at 1.5 ° will be a good bit larger than 1°C (in turn larger than at 0.5°C if return to that threshold via solar intervention) and what needs to be said is not just the difference in 2100, but the level of rise that would occur out to equilibrium. [United States of America]	
7756	9	33	9	34	Suggest rephrasing: "The amount of sea-level rise associated with 1.5°C of warming by 2100 would be X, about 0.1 m less than the amount projected for 2°C warming in that year." [United States of America]	
7758	9	33	9	36	It would be helpful to set the perspective on 0.1 m by citing the average expected SLR in 2100, thereby showing that the difference is a small fraction of the average expected. [United States of America]	
7760	9	33	9	36	An error bar is needed for 0.1 meter sea level rise. [United States of America]	
7762	9	33	9	36	Sea-level rise in 2100 will depend on the pathway (overshoot/no overshoot). This should be captured here. [United States of America]	
8474	9	33	9	34	Compare to the pre-industrial level [Zimbabwe]	
8564	9	33	9	33	To clarify - refers to a range of 10cm? [Ireland]	
8712	9	33	9	36	In B4, New Zealand strongly supports the acknowledgement of the particularly significat risks from climate change on small islands, low-lying coasts and deltas. This captures a large number of vulnerable nations in the Pacific region, and New Zealand would be opposed to any proposal for removing this reference. [New Zealand]	

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8872	9	33	9	36	Suggest that this statement is inconsistent with the chapter reference and this difference of 0.1m is not a well-established value. It is not a value that is known with medium confidence, and even low confidence could be an overstatement. The existence of potential several tenths of a metre from unassessed loss of marine ice sheets makes it difficult to bound the 2 °C increase at only 0.1m more than 1.5 °C increase. Even if this 0.1m comes from a difference between median projected sea level increases, it has a long tail that makes it uncertain. Indeed, the SR1.5 SOD, says (3-9 line 39) that current literature is insufficient to quantify the current difference in sea level between 1.5°C and 2°C. [Australia]	
8948	9	33	9	46	Suggest clarification: is section B4 discussing average sea level rise? Suggest expanding: the section may benefit (where possible) from discussion of extremes such as storm surges and king tides, as well as sea level rise. Suggest clarification: the difference of 0.1m is not a well-established value. However, page 9 line 39 claims current literature is insufficient to quantify the current difference in sea level between 1.5°C and 2°C [Australia]	
8952	9	33	9	33	Suggest changing "lower" to "less" since both represent increases. [Australia]	
9458	9	33	9	33	Delete "around" and add assessed uncertainty range on the reduction in sea level rise. [Canada]	
828	9	34	9	34	We suggest to add : "...compared to 2°C (medium confidence), and the difference might be much greater on a longer term" We also suggest to add this sentence on the headline, taken from {3.6.3.2} (p.3-164), in order to emphazise the long-term consequences of our current actions : "The impacts of current policies will have a profound impact on sea level for many millennia to come" [France]	
2324	9	34	9	36	Adaptation options can reduce the risks associated to sea level rise (at 2 and 1.5 degree). This needs to be reflected. [European Union (EU)]	
3580	9	34	9	36	Please add the expected reduced exposure to risk for many people at 1.5°C compared to 2.0°C in the key message. So far, the message only addresses impacts for environments but not explicitly for the exposed people. (cf. Sections 3.4.5.1, 3.4.5.2,3.4.5.3) [Germany]	
5730	9	34	9	36	The "Increased…" is not specifically in the 1.5oC context, but rather generic. Suggest deletion, or reformulating so as to provide 1.5oC-related substance. [Sweden]	
7764	9	34	9	36	This sentence does not specifically address the consequences of 1.5°C of warming. It should be revised accordingly or deleted. [United States of America]	
9460	9	34	9	36	Include impacts on the North (e.g. artic) to the list of effected regions. To ensure balance, if there will be impacts in all parts of the world, it is important to reflect these in high-level statements. [Canada]	
4524	9	35	9	35	This paragraph describes small islands, low-lying coasts and deltas as “vulnerable environments”, while Executive Summary of Chapter 3 calls them “sensitive environments” (Page 12). Request clarification of the different wording. If there is no special intention, suggest they be kept consistency between the Chapters. [Japan]	
5732	9	36	9	36	Consider replacing “low-lying coasts” med “low-lying coastal areas” [Sweden]	
830	9	38	9	38	We suggest to write : "by 2100, and with higher likelyhood at 2°C" [France]	
2326	9	38	9	4	It is surprising that this statement does not include a comparison between 1.5 °C and 2.0 °C warming. Please add a statement such as "The risk of triggering these instablities is considerably higher at 2.0 °C warming compared to 1.5 °C warming." The evidence for such a statement is provided in Section 3.5.2.5 and in Section 3.6.3.2, which specifically mentions 1.6 °C as the best estimate of the instability of the Greenland ice sheet. [European Union (EU)]	
2328	9	38	9	41	B4.1 fails to indicate any difference between 1.5 and 2.0 scenarios. This suggests that limiting to 1.5 would not reduce risk on the long run. Is this indeed the case? [European Union (EU)]	
2330	9	38	9	41	If possible, please clarify the difference between 1.5°C, 2°C & higher thresholds in terms of the described ice sheet instability. [European Union (EU)]	
3582	9	38	9	4	The statement in lines 38-40 does not adequately capture the significant long-term risks of SLR, see e.g. 3.5.2.5. It only states (with "medium confidence") the possibility of ice sheet instabilities larger than zero. It would be very useful to quantify this possibility, if this information was available in the underlying report. The statement would be even more relevant, if it could be turned around in order to inform the avoided risk at 1.5°C and 2°C global warming: The Greenland and/or Antarctic Ice sheet instability will likely/very likely be prevented/not occurring if global warming is limited to 1.5°C (and same for 2°C). Please consider these suggestions. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4770	9	38	9	41	These are important statements and should be included in the headline message. Additionally, based on the available evidence, do we know whether limiting warming to 1.5C reduces the risk of catastrophic multimetre sea level rise (even if it remains a possibility)? If yes, it would be useful to state here. [United Kingdom (of Great Britain and Northern Ireland)]	
5204	9	38	9	38	it should be specified that the sea level will continue rising IN BOTH SCENARIOS (2 and 1.5ºC), to avoid any missunderstanding [Spain]	
5914	9	38	9	41	The report indicates that risks of sea-level rise are substantially increasing between 1.5°C and 2°C (page 3-141). Please provide as much information as possible about how risks changes between 1.5, 2°C, and possibly above - even if this cannot be in a fully quantitative form. We suggest the following changes (in red) to reflect this in the SPM : B4.1 : Sea level rise will continue beyond 2100 but will be less rapid with more mitigation. Greenland and/or Antarctic ice sheet instabilities (…) maybe triggered even if global warming is limited to 1.5°C by 2100, however the risk is substantially larger at 2°C [Belgium]	
5916	9	38	9	41	Please add information on regional aspects of sea-level rise, which could be important and is currently missing. [Belgium]	
5918	9	38	9	39	We did not find support for "centennial" time scales associated to "multi-meter rise" at 1.5-2°C in the report ; it appears more appropriate to refer to "multi-centennial" time scales (in particular a maximum of 1-2 meters over two centuries, chapter 3 page 140). Please consider referring to "multi-centennial" rather than "centennial" in this sentence. [Belgium]	
5920	9	38	9	41	The word "instabilities" is used in an unclear manner. Following the text of chapter 3, page 140, we suggest to refer to "marine ice sheet instability in Antarctica or irreversible loss of the Greenland ice sheet". [Belgium]	
6448	9	38	9	41	It is suggested to also make this a bold statement as a mere focus on additional SLR in 2100 marginalizes the relevance of the risk of multi-meter SLR due to instabilities of the Greenland and Antarctic icesheets. Is of major concern. Add and the end: , "but the risk is likely to be higher with 2 degrees than 1,5 degrees." [Netherlands]	
7096	9	38	9	41	Add the following sentence - “However more studies suggest that there is no distinguishable change in global mean sea level rise between 1.5 and 2 deg. C {Table 3.1}”. This statement is drawn from the references provided in the Chapter which have not been brought forwarded to the SPM. [India]	
7766	9	38	9	4	"Sea level rise will continue beyond 2100" regardless of temperature? At the current global warming? [United States of America]	
7768	9	38	9	41	It would be helpful in B4.1 to address -- in quantitative terms if possible -- the relative risk of Greenland and Antarctic ice sheet instabilities with 1.5°C of warming as compared to higher levels of warming. [United States of America]	
8566	9	38	9	41	Can SPM elaborate on how this would vary vs 2 degrees? [Ireland]	
8858	9	38	9	38	Suggest clarifying this statement by referring to "West Antarctica" rather than the "Antarctic" being at risk of causing multi-meter sea-level rise due to anthropogenic emissions. We understand East Antarctica is predicted to be stable (which makes up the overwhelming bulk of the continent's ice). [Australia]	
8860	9	38	9	41	Suggest clarifying this statement to note that the risk is greater at 2°C, as this is an important comparison in the context of the report. [Australia]	
9462	9	38	9	41	This statement is poorly quantified, and is of limited use to policymakers. This is because there is no probability associated with 'could result', and 'multi-metre' and 'centennial to millenial timescales' are vague. Taken at face value, the text could be read as saying that a 5m sea level rise could occur over the next 100 years due to these processes even if global warming is restricted to 1.5C. A better assessment statement would assign a probability level, a numerical value to SLR and a specific timescale (500 years, 1000 years). Also, the statement does not compare with the risks at 2C. [Canada]	
8934	9	39	9	39	Suggest rephrasing sentence: From "on centennial to millennial time scales" To "over hundreds to thousands of years" [Australia]	
240	9	4	9	4	"maybe" should be spelled "may be" [Finland]	
4526	9	4	9	4	Suggest replacing “maybe” with “may be.” [Japan]	
5206	9	4	9	4	replace maybe with may be [Spain]	
7770	9	4	9	4	Typo: "maybe" to "may be" [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
832	9	43	9	45	Is this a projection made in 2010, or the actual 2010 population? {3.4.5.1} states that it is the 2010 actual population. We suggest to write "based on the past 2010 population estimate" to be more precise. Moreover, {3.4.5.1} states : "At 1.5°C in 2100, 31–69 million people world-wide could be exposed to flooding assuming no adaptation or protection at all (and 2010 population values), compared with 32–79 million people at 2ºC in 2100. As a result, up to 10.4 million more people would be exposed to sea-level rise at 2°C compared with 1.5°C in 2100." But "10 million fewer people" is correct only if we consider the upper range alone. Giving the exact numbers or writing it as "up to 10 million fewer people" would be more honest. [France]	
1824	9	43	9	43	A reduction to global sea level rise of 10 cm by 2100 at a global warming of 1.5….adaptation. [Denmark]	
2332	9	43	9	46	What is the timescale for the 0.1m reduction in SLR in 1.5°C vs 2°C? to 2100? How many people are affected overall in the 1.5°C & 2°C scenarios? (to get a sense of the order of magnitude of the difference). [European Union (EU)]	
4232	9	43	9	46	The current B4.2 lacks the characterization of confidence. So it is suggested to make such an addition to be consistent with other paragraphs. [China]	
5012	9	43	9	46	For further clarity, the sentence could be divided in 2 parts. The 'greater opportunities for adaptation' apply to more people then those 10 millions mentioned in the first part of the sentence. [Italy]	
5826	9	43	9	52	The level of likelihood and of confidence of the finding is missing. [Brazil]	
5922	9	43	9	45	The chapter says that those number of people exposed are calculated "assuming no adaptation or protection at all" (page 3-94). We think that this is important and ask you to add the information here in the SPM. [Belgium]	
5924	9	43	9	47	Please indicate the confidence level ("medium confidence" ?). We did not find information on the confidence level in the chapter (page 3-94); what is the level of confidence regarding the "10 million people" ? The chapter refers to it as a maximum (up to) while this SPM uses the word "approximately" : please check that this is fully justified. [Belgium]	
6832	9	43	9	45	Reservations on the statement outlined given that Special Report on the Ocean and Cryosphere in a Changing Climate will only be finalized by September of 2019, which means this statement is inconclusive. [United Arab Emirates]	
7772	9	43	9	45	The first sentence of statement B4.2 should include the uncertainty on the estimate of 10 million fewer people exposed to risks associated with sea level rise and the relevant study's assumption of no adaptation. Suggest that the sentence be revised to read "ASSUMING NO ADAPTATION MEASURES, a reduction to global sea level rise of 0.1m at global warming of 1.5°C compared to 2°C implies that approximately 10 million (±X) fewer people are expected to be exposed to related risks, based on a 2010 population estimate." A confidence level should be assigned to this statement. [United States of America]	
7774	9	43	9	46	What is missing here is consideration of the quite high equilibrium sea level sensitivity based on the paleoclimatic record, which suggests a sensitivity of 15 to 20 METERS per °C change, so this notion that the difference will be only 0.1 meters is really very, very short-sighted. The difference will be growing a lot over time, if Earth's climatic and sea level history is at all applicable. [United States of America]	
7776	9	43	9	46	B4.2 lacks a confidence statement. [United States of America]	
7778	9	43	9	46	Statement B4.2 that 10 million more would be affected at 2.0°C is an exaggeration of the following conclusion in Chapter 3 (3.4): "At 1.5°C in 2100, 31-69 million people world-wide could be exposed to flooding assuming no adaptation or protection at all (and 2010 population values), compared with 32-79 million people at 2°C in 2100 (Rasmussen et al. 2018) (Annex 3.1, Table S4). As a result, up to 10.4 million more people would be exposed to sea-level rise at 2°C compared with 1.5°C in 2100." What happed to the wide range of people affected and the words "up to" that are in the underlying chapter? The finding must reflect the conclusion and the uncertainty stated in the underlying chapter. Insead of approximately 10 million people, the finding should state "up to" 10 million fewer people would be impacted and give the range (32-79 million). [United States of America]	
8944	9	43	9	45	Suggest rephrasing to include conditional language on population: "A reduction to global sea level rise of 0.1m at global warming of 1.5oC compared to 2oC implies that approximately 10 million fewer people would be exposed to related risks, based on a 2010 population estimate. The lower global warming threshold of 1.5°C would provide ..." [Australia]	
9464	9	43	9	46	There should be confidence qualifiers to B4.2 statements. [Canada]	
9612	9	43	8	46	We suggest to mention the confidence level [Madagascar]	
3584	9	44	9	45	Please change "a 2010 population estimate" to "the 2010 global population" as stated in Chapter 3, p. 3-8 (third para). Or is the sentence meant to be referring to an estimate of the global population in 2100? Then the date should be corrected to "2100" in the underlying chapter. [Germany]	
5734	9	44	9	45	It is not immediately clear why the number is based on a population estimate from 2010 (follows from available literature?), given that the UN has issued more recent estimates. How do these compare? The finding should also specify the (population projection?) time period that it applies to. [Sweden]	
6450	9	44	9	45	Why is the population estimate based on 2010 population levels? The impact is given for 2100, with very different population levels and distributions. Why not use SSP scenarios to give range by 2100? [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7780	9	45	9	46	It would be helpful here to characterize in quantitative terms how much the rate of warming would be expected to be slower in a 1.5°C scenario vs. a higher temperature scenario. This could address the rate of warming or the number of years or decades until a threshold is reached. [United States of America]	
8716	9	45	9	45	it is unclear whether "2010 population estimate" refers to the population in the year 2010, or an estimate made in the year 2010 of future population. [New Zealand]	
9286	9	45	9	45	Write more explicitly: "... will provide …" [Switzerland]	
3586	9	46	9	46	Please insert: …adaptation (medium confidence). {….} (as in ES 3-8; para:3) [Germany]	
7782	9	46	9	46	This paragraph does not appear to relate to 4.3.2; recommend deletion of the reference. [United States of America]	
360	9	48	9	52	The message from the executive summary of chapter 5, page 4 should be included here ("Impacts avoided with the lower temperature limit could reduce the number of people exposed to climate risks and vulnerable to poverty by 62 to 457 million") [Chad]	
362	9	48	1	4	The following point from Executive Summary of Chapter 3 is important and should be incorporated into the SPM: "Poverty and disadvantage have increased with recent warming (about 1oC) and are expected to increase in many populations as average global temperatures increase from 1oC to 1.5°C and beyond (medium confidence). Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap {3.4.10, 3.4.11, 5.2.2, Table 3.5}." [Chad]	
372	9	48	1	4	Add "with the potential to also limit economic damages at 1.5°C of global warming" to the end of this point (from 3-11) [Chad]	
834	9	48	9	49	We suggest to add "on" to be clearer : "...and on the underlying potential..." [France]	
2334	9	48	9	52	similar to the above - adaptation options can reduce the associated risks and impacts. This needs to be reflected. [European Union (EU)]	
2336	9	48	9	52	It is a very generic statement. Does it add anything to what said before or after? Could it be better substantiated? [European Union (EU)]	
3588	9	48	1	4	In headline statement B5, "impacts on infrastructure" are referred to. However, in the following statements B5.1-B5.6, there is no further explanation neither about the type of impacts nor about the type of infrastructure. Impacts on infrastructure are very relevant to policymakers. We therefore suggest to give more details about impacts on infrastructure as they can be found for example in the executive summary of chapter 3 (page 3-11). [Germany]	
3590	9	48	1	4	Please insert the following paragraph from Ch. 3, Page 7 into the SPM: "Some regions are projected to experience multiple compound climate-related risks at 1.5°C that will increase with warming of 2°C and higher (high confidence). Some regions are projected to be affected by collocated and/or concomitant changes in several types of hazards. Multi-sector risks are projected to overlap spatially and temporally, creating new (and exacerbating current) hazards, exposures, and vulnerabilities that will affect increasing numbers of people and regions with additional warming. Small island states and economically disadvantaged populations are particularly at risk. {Box 3.5, 3.3.1, 3.4.5.3, 3.4.5.6, 3.4.11, 3.5.4.9}." Rationale: the question of compound climate-related risks is not represented in the SPM although this point seems to be important for an integrated assessment of risks. [Germany]	
3592	9	48	11	21	Please add the year of the projection as in B4 line 33: By 20XX … [Germany]	
3594	9	48	11	22	The paragraphs B5 and B6 including their subparagraphs describe the risk of climate change on human and natural systems, but they do not identify influences from and the interaction with socioeconomic drivers on these risks. We strongly encourage the authors to carefully indicate information on the significance of the climate change and these other drivers for the resulting risks, because providing such context is key for the credibility of the IPCC. [Germany]	
4234	9	48	9	52	This paragraph only considers the reduced impacts by climate risk on water, health, security, infrastructure, economic growth, etc. without considering the impacts by mitigation actions taken in 1.5°C-consistent pathways on water, health, security, infrastructure, economic growth, etc. So it is suggested to add 'Climate change' before "Impacts on health, livelihoods, food and water supply, human security, infrastructure…" to read: "Climate change impacts on health, livelihoods, food and water supply,…" [China]	
4772	9	48	9	52	Would be good if a confidence statement could be assigned. [United Kingdom (of Great Britain and Northern Ireland)]	
4774	9	48	9	48	The text should specify that negative impacts will increase with 1.5C of warming, as opposed to general 'impacts', as this could also mean positive ones (which will generally decrease in all of these case - presumably). [United Kingdom (of Great Britain and Northern Ireland)]	
5082	9	48	9	49	B5. The adverse impacts on health, ... the underlying potential for economic development, and in general, on the ability to achieve the Sustainable Development Goals (SDGs) will increase .. [Hungary]	
5208	9	48	9	52	no level of confidence associated to this headline. SPM should only include statements with an associated level of confidence. [Spain]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5260	9	48	9	52	We suggest adding A5.2, based on Chap. 2 Exec. Summary "Under emissions in line with current pledges under the Paris Agreement (NDCs) global warming is expected to surpass 1.5°C" Additionally: Mitigation becomes more challenging or impossible to achieve if more ambitious reductions are not undertaken than those implied by the NDCs. (2.2, 2.3.3, 2.3.5) [Zambia]	
5262	9	48	1	4	The following point from Executive Summary of Chapter 3 is important and should be incorporated into the SPM: "Poverty and disadvantage have increased with recent warming (about 1oC) and are expected to increase in many populations as average global temperatures increase from 1oC to 1.5°C and beyond (medium confidence). Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap {3.4.10, 3.4.11, 5.2.2, Table 3.5}." [Zambia]	
5272	9	48	1	4	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [Zambia]	
5736	9	48	9	48	Consider replacing "...on health…" with "...on human health and well-being...". And consider replacing "Impacts" with "Negative impacts", if appropriate. [Sweden]	
6596	9	48	9	52	The message from the executive summary of chapter 5, page 4 should be included here ("Impacts avoided with the lower temperature limit could reduce the number of people exposed to climate risks and vulnerable to poverty by 62 to 457 million") [Sudan]	
6598	9	48	1	4	The following point from Executive Summary of Chapter 3 is important and should be incorporated into the SPM: "Poverty and disadvantage have increased with recent warming (about 1oC) and are expected to increase in many populations as average global temperatures increase from 1oC to 1.5°C and beyond (medium confidence). Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap {3.4.10, 3.4.11, 5.2.2, Table 3.5}." [Sudan]	
6600	9	48	1	4	Add "with the potential to also limit economic damages at 1.5°C of global warming" to the end of this point (from 3-11) [Sudan]	
6878	9	48	9	52	The message from the executive summary of chapter 5, page 4 should be included here ("Impacts avoided with the lower temperature limit could reduce the number of people exposed to climate risks and vulnerable to poverty by 62 to 457 million") [Gambia]	
6880	9	48	1	4	The following point from Executive Summary of Chapter 3 is important and should be incorporated into the SPM: "Poverty and disadvantage have increased with recent warming (about 1oC) and are expected to increase in many populations as average global temperatures increase from 1oC to 1.5°C and beyond (medium confidence). Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap {3.4.10, 3.4.11, 5.2.2, Table 3.5}." [Gambia]	
6890	9	48	1	4	Add "with the potential to also limit economic damages at 1.5°C of global warming" to the end of this point (from 3-11) [Gambia]	
7100	9	48	9	52	Please include maps representing impacts and vulnerabilities to highlight the regional differences of impact of 1.5 and 2 degree C. [India]	
7784	9	48	9	49	The final in the list ("the underlying potential for ...") is really too obscure and overly qualified compared with the others in the list. The idea that it will "increase" is obvious. Quantify. [United States of America]	
7786	9	48	9	52	B5 lacks a confidence statement. [United States of America]	
8394	9	48	9	52	The message from the executive summary of chapter 5, page 4 should be included here ("Impacts avoided with the lower temperature limit could reduce the number of people exposed to climate risks and vulnerable to poverty by 62 to 457 million") [Nepal]	
8476	9	48	9	5	This is good and how the whole 1.5 SR should be compared [Zimbabwe]	
9466	9	48	9	52	In this section (B5) on the impacts of changes on human populations, culture is not mentioned but is a significant aspect that has been, and continues to be, massively impacted by climate change for cultures that are intricately tied to the land. Also, the sentence is confusing with regards to economic growth. What does the following mean: "impacts on….the underlying potential for economic growth will increase with 1.5°C of warming compred to today, and even more with 2°C warming compared to 1.5°C.? [Canada]	
836	9	5	9	5	We suggest to add this sentence, regarding the information given in {3.4.10.2} which are not reported in the SPM for now : "The actual increase of 1°C has a significant effect on outmigration for agricultural-dependent communities and increases the frequency of intergroup confilcts, and these impacts would be exacerbated by any further warming {3.4.10.2}" [France]	
838	1	1	1	1	There is nothing here, and almost nothing in chapter 3, about the specific challenges for least developed countries. They are implicitly included in this definition. Is this a deliberate choice of the IPCC? [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4776	1	1	1	1	As above, saying that 'the vulnerable' are disproportionately affected seems an obvious statement (i.e. the vulnerable are vulnerable). The text should specify what is meant by this - does it mean the poor, the young/old, the unemployed, those living in certain areas, the disables, minorities etc? This problem appears multiple times in the text. [United Kingdom (of Great Britain and Northern Ireland)]	
4782	1	1	1	6	'many of which' - what does this refer to, many SIDS or many of these groups? What does the confidence level relate to? Please make clearer. [United Kingdom (of Great Britain and Northern Ireland)]	
6176	1	1	1	2	This part is very important especially for most of the developing countries, which largely depend on rainfed agriculture for their livelihoods. This include East Africa. Therefore the information provided in this paragraph need to be more comprehensive and balanced and be consisntent with the underlying chapter (Chapter 4). Most parts of East Africa Largerly rely on rainfed Agriculture for livelihoods and for socio-economic developments are severely affected by climate variability and change, particualrly increasing frequency and intensity of weather and climate including droughts and floods. Unfortunately this is not adequately reflected in the underlying chapters and is not refelected in SPM. This need to be reflected in SPM. [United Republic of Tanzania]	
7788	1	1	1	2	Aside from a single citation (Gerten et al. 2013) regarding ecosystem transformation data represented in Figure 3-16, ecosystem transformation is not discussed in the underlying text with respect to 1.5°C of warming, or in any other manner. Suggest removing this statement. [United States of America]	
7790	1	1	1	6	This point is not specific to 1.5°C and the topic of this report, and therefore it should be removed. [United States of America]	
7792	1	1	1	6	Cross-chapter Box 9 is also germane to the issues discussed in B5.1; however, it doesn't specifically support the statement with respect to "disadvantaged" populations. [United States of America]	
7794	1	1	1	2	These three findings are no different from those in WGII AR5. This report should quantify the difference in 1.5 and 2.0°C outcomes, not just say the impacts would be worse. [United States of America]	
8964	1	1	1	1	Suggest rephrasing to avoid using the term "will be": "Disadvantaged and vulnerable populations and nations would be disproportionately affected..." [Australia]	
9468	1	1	1	1	Delete "nations" since it is duplicative. The wording "disadvantaged and vulnerable populations" is sufficient and captures that vulnerable populations exist in all nations (for example, Indigenous and Arctic communities in Canada are particularly vulnerable to the impacts of climate change, because these populations are tied to the land in ways that others are not, and they also live in regions where environmental changes are significantly more pronounced and experienced). If there is evidence, supported by the contents of the report chapters, that impacts will disproportionately affect specific nations; perhaps indicate this. [Canada]	
9470	1	1	1	6	peoples' needs to be capitalized on line 3. [Canada]	
9472	1	1	1	6	While it is true that many Indigenous Peoples are disproportionately affected by the impacts of global warming, it is also true that Indigenous Peoples have an inherent understanding of adaptation. This paragraph would be more well-rounded if Indigenous Peoples were dipicted as active agents with specialized knowledge and skills in this regard. [Canada]	
364	1	2	1	5	There is an indirect mentioning of LDCs here i.e. "populations dependent on agriculture- and coastal livelihoods". It should be more direct, something like "....systems in the Arctic, populations of least developing countries dependent on agriculture and coastal livelihoods, and small-island..... [Chad]	
3596	1	2	1	5	What is meant by "systems in the Arctic"? Please specify. [Germany]	
5264	1	2	1	5	The following point from Executive Summary of Chapter 3 is important and should be incorporated into the SPM: "Poverty and disadvantage have increased with recent warming (about 1oC) and are expected to increase in many populations as average global temperatures increase from 1oC to 1.5°C and beyond (medium confidence). Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap {3.4.10, 3.4.11, 5.2.2, Table 3.5}." [Zambia]	
5266	1	2	1	2	There is an indirect mentioning of LDCs here i.e. "populations dependent on agriculture- and coastal livelihoods". It should be more direct, something like "....systems in the Arctic, populations of least developing countries dependent on agriculture and coastal livelihoods, and small-island..... [Zambia]	
6602	1	2	1	5	There is an indirect mentioning of LDCs here i.e. "populations dependent on agriculture- and coastal livelihoods". It should be more direct, something like "....systems in the Arctic, populations of least developing countries dependent on agriculture and coastal livelihoods, and small-island..... [Sudan]	
6882	1	2	1	5	There is an indirect mentioning of LDCs here i.e. "populations dependent on agriculture- and coastal livelihoods". It should be more direct, something like "....systems in the Arctic, populations of least developing countries dependent on agriculture and coastal livelihoods, and small-island..... [Gambia]	
7796	1	2	1	2	Suggest changing to 'This outcome...' [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8396	1	2	1	5	There is an indirect mentioning of LDCs here i.e. "populations dependent on agriculture- and coastal livelihoods". It should be more direct, something like "....systems in the Arctic, populations of least developing countries dependent on agriculture and coastal livelihoods, and small-island..... [Nepal]	
3598	1	3	1	4	In its current wording, referring to „limits of adaption“ in such a general way is not consistent with the underlying chapters, i.e. by not specifying which limits of adaptation (soft or hard) apply to which populations. For example, it is unclear which populations dependent on agriculture livelihoods (potentially a big share of mankind) face which limits of adaptation. Lumping these populations together without pointing to the type of factors (i.e. biophysical, institutional, financial, social, and cultural) constraining them to adapt could be perceived as alarmist and should be avoided. [Germany]	
4426	1	3			Change "agriculture-" by "agriculture" [Czech Republic]	
4778	1	3	1	3	While indigenous people are clearly vulnerable to the impacts of climate change, this specific statement is ultimately not backed up by underlying text and so should be remove [United Kingdom (of Great Britain and Northern Ireland)]	
7798	1	3	1	3	Typo: agriculture- should not have a hyphen(-) at the end. [United States of America]	
7800	1	3	1	3	Suggest changing the text that reads "populations dependent on agriculture" to 'populations dependent on agriculture for their livelihood', since all populations depend on agriculture in the sense that everyone needs to eat. [United States of America]	
2338	1	4	1	4	This paragraph introduces the concept of limits to adaptation in the context of small island developing states. This concept is introduced only later in the text. Besides, small islands, low lying coastal areas, etc face similar challenges (not limited to small island developing states). Suggest removing this sentence, as the concept is introduced on same page, from line 42. [European Union (EU)]	
3600	1	4	1	4	The statement "many of which face limits to adaptation already" is too general. In addition, it is not clear, if this statement refers to the list of peoples and population in the first part of the sentence or to "many SIDS". Please specify possibly differentiating between information of different levels of confidence. In addition, Please add "context-specific" before "limits of adaptation" (cf. SPM.D.3) to reflect the risk framing introduced in AR5 which is absent from the deterministic wording in this message. [Germany]	
4780	1	4	1	4	I am not sure if there is enough evidence to say that "many of which face limits to adaptation" already. There is good evidence for some of these e.g. observed impacts to systems in the Arctic which suggests there may be limits to adaptation.. But I would perhaps change "many" to "some" [United Kingdom (of Great Britain and Northern Ireland)]	
7108	1	4	1	24	The report builds a strong case to restrict temperature rise to 1.5°C. It also talks in several places about Small Island Developing States (SIDS) and their vulnerability (Page 9, Line 36; Page 10, Line 4; Page 10, Line 24; Page 10, Line 50). There is no mention of developing countries in general. While SIDS could be mentioned, it is important to reiterate the vulnerability of all developing countries. The coastline of developing countries is equally vulnerable. [India]	
8802	1	4	1	4	Add "dry land regions" after "small-island developing states" [Iran]	
5084	1	5	1	5	(medium confidence). Average global temperatures that extend beyond 1.5ºC are likely to increase poverty and disadvantage in many populations globally. By the mid to late 21st century, climate change is projected to be a poverty multiplier that makes poor people poorer and increases poverty head count, and the association of temperature and economic productivity is not linear (high confidence). {3.4.10, .. ((explanation: This addition to B5.1. is a key message also from Chapter 3, taken from 3.4.10.2)) and mentions also the poor in general that is missing from the previous two sentences of that paragraph)) [Hungary]	
3602	1	7	1	2	Please add to B5.1 or to B5.3: "Outmigration in agricultural-dependent communities is positively and statistically significantly associated with global temperature (medium confidence). Our understanding of the linkages of 1.5ºC and 2ºC on human migration are limited and represent an important knowledge gap". {3.4.10, 3.4.11, 5.2.2, Table 5.3}." (as in the ES 3-11; para:3) Rationale: Impacts of CC on Migration could be politically relevant in the future and should be mentioned in the SPM. [Germany]	
342	1	8	1	9	‘B5.2. While any future increase in global warming will affect human health (high confidence), risks will be lower at 1.5°C than at 2°C for heat-related morbidity and mortality.’ The statement is correct, but trivial if heat-related effects are assessed. [Russian Federation]	
2340	1	8	1	12	Mixes statements related to differences between effects at 2 and 1.5 degrees with statements regarding increased warming. Could be formulated more clearly. [European Union (EU)]	
4530	1	8	1	12	Suggest addressing other risks that are projected to increase as a result of global warming with high confidence, in addition to vector-borne-disease-related risks; for example, ozone-related respiratory mortality, and mobility, O3 inhalation exposures. [Japan]	
5926	1	8	1	12	Please check that the uncertainty language is appropriate and needed : no confidence statement is needed if the statement is obvious, and "very high confidence" should be provided each time there is sufficient knowledge to do so. [Belgium]	
7802	1	8	1	9	It would be helpful to quantify or detail the risks more specifically here, if that can be done reliably. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7804	1	8	1	12	The sole attribution of higher risks of heat stress in urban areas to the urban heat island effect is problematic. This emphasis is not supported by the underlying text of the health chapter, which does not refer to the heat island effect, but instead emphasizes access to air conditioning, extremes of age, medications, etc. It is possible that the authors wanted to incorporate the focus of the urban areas section on urban heat islands into this health impact point, because there is a strong focus on urban heat islands in the urban areas section. This places misleading emphasis on urban heat islands as driving morbidity and mortality from heat stress. It negates the other important risk factors and implies that rural and non-urban areas do not have as much risk, which is not supported with consistency in the literature. [United States of America]	
8568	1	8	1	8	Can different mobidity and mortality risks at 1.5 vs 2 degrees be quantified? [Ireland]	
8574	1	8	1	8	Can changes in risk be quantified? [Ireland]	
8962	1	8	1	9	Suggest rephrasing to ensure this is a conditional statement: "While any future increase in global warming would affect human health (high confidence), risks would be lower at 1.5°C than at 2°C". [Australia]	
9474	1	8	1	11	Section 3.4.8 (urban areas) and 3.5.5.8 (heat-waves, unprecedented heat and human health) should also be referenced. [Canada]	
242	1	9	1	9	Maybe it could be considered to include the mention about the populations at highest risk (older adults, children, women, those with chronic diseases, and people taking certain medications),- please see Chapter 3.4.7.1. [Finland]	
5928	1	9	1	1	There is a typo. A solution could be : "Risks increasing with warming are particularly high in urban areas" [Belgium]	
244	1	1	1	1	"Risks are with increasing warming are particularly high in urban areas due to..." should read: "Risks with increasing warming are particularly high in urban areas due to...". [Finland]	
2342	1	1	1	1	delete "are" after "Risks" [European Union (EU)]	
3604	1	1	1	1	The meaning of this sentence is not clear. "Risks related with increasing warming …." would concretise the sentence, or delete second "are". [Germany]	
3986	1	1	1	11	As half of global population lives in cities, and this share is expected to increase, this is an important finding. If possible, please elaborate on implications of this increased risk, for example by indicating how many people today live in cities where heat-extremes already pose a significant health risk, and how much this risk is expected to increase in a 2 degree scenario. If no such global risk assesment exist, please consider providing an example from a specific case study that might be relevant to other cities. [Norway]	
3988	1	1	1	1	Delete "are", to end up like this: "Risks with increasing warming are (…)" [Norway]	
4334	1	1	1	1	Typo error needs to be corrected. "Risks are with increasing warming are ..." [Republic of Korea]	
4428	1	1			There is an extra "are" in the sentence (Risks are...) [Czech Republic]	
4532	1	1	1	11	“Risks are with increasing warming are particularly high (...)” should be changed to “Risks with increasing warming are particularly high (...)”. [Japan]	
4784	1	1	1	1	"Risks are with increasing warming are…" is not worded correctly, please rewrite. [United Kingdom (of Great Britain and Northern Ireland)]	
5086	1	1	1	1	Risks are with increasing warming are [Hungary]	
5210	1	1	1	1	delete "are" after "Risks" [Spain]	
5738	1	1	1	1	Delete the first "are". [Sweden]	
6452	1	1	1	1	delete "are"after Risks [Netherlands]	
7806	1	1	1	1	Typo: delete first "are" [United States of America]	
7808	1	1	1	1	Change sentence to read "Increasing warming poses the highest risks, particularly in urban areas due to the urban heat island effect." [United States of America]	
7810	1	1	1	12	As written, the statements are not unique to 1.5°C. [United States of America]	
7812	1	1	1	12	That some areas in the subtropics are likely to become virtually unliveable outdoors for significant parts of the year needs to be made clear. Mention should also be made of how much the discomfort index will be affected because the atmospheric water vapor consentration will be increasing considerably more than just the temperature increase. [United States of America]	
8570	1	1	1	1	"are" repeated twice in this line. Remove first instance. [Ireland]	
8718	1	1	1	1	Delete "are" so it reads "Risks with increasing warming…" [New Zealand]	
8884	1	1	1	1	Suggest clarifying this statement, which appears to suggest the heat island effect is the only cause. Suggest re-phrasing as: "due to additional exacerbation by the heat island effect" [Australia]	
8956	1	1			Suggest replacing: "are" with "associated" [Australia]	
8966	1	1	1	1	Suggest rephrasing from: "Risks are with increasing…" To: "Risks associated with increasing…" [Australia]	
4786	1	11	1	12	The text should read "risks from some vector-borne diseases", not "risks for" them. Additionally, it is not clear from the paragraph as a whole whether the risks increase for 2C relative to 1.5C, or the other way round, for these diseases. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7814	1	11	1	12	It is important to make the point that the risks for vector-borne diseases will not just increase but potentially shift to new areas. This will warrant a different public health response than just an increase in a specific location. [United States of America]	
7816	1	11	1	12	Specify if these risks are higher or lower at 1.5 compared to 2°C. [United States of America]	
366	1	14	1	2	This is an important paragraph that covers risks to food security from climate change impacts, but it should be lengthened to add the projected loss of rangeland livestock (7-10% under 2 deg) and associated "considerable economic consequences for many communities and regions" (see chapter 3 ES, page 10). [Chad]	
4788	1	14	1	14	Change "lower global reduction" to "smaller global reduction" - clearer language. [United Kingdom (of Great Britain and Northern Ireland)]	
5268	1	14	1	2	This is an important paragraph that covers risks to food security from climate change impacts, but it should be lengthened to add the projected loss of rangeland livestock (7-10% under 2 deg) and associated "considerable economic consequences for many communities and regions" (see chapter 3 ES, page 10). [Zambia]	
6604	1	14	1	2	This is an important paragraph that covers risks to food security from climate change impacts, but it should be lengthened to add the projected loss of rangeland livestock (7-10% under 2 deg) and associated "considerable economic consequences for many communities and regions" (see chapter 3 ES, page 10). [Sudan]	
6884	1	14	1	2	This is an important paragraph that covers risks to food security from climate change impacts, but it should be lengthened to add the projected loss of rangeland livestock (7-10% under 2 deg) and associated "considerable economic consequences for many communities and regions" (see chapter 3 ES, page 10). [Gambia]	
7818	1	14	1	15	Clarify that there will be regional differences - i.e., a lengthening of the growing season in the northern latitudes. The use of global is confusing to the reader since it implies that lower crop yeilds will be the case everywhere. [United States of America]	
7820	1	14	1	2	Do these estimates include the effects of CO2 fertilization? What about yields in the mid- to high latitudes? [United States of America]	
7822	1	14	1	27	It would be helpful to more precisely quantify the statements in B5.3 and B5.4: How much is "significantly lower"? How many fewer people would be exposed to water scarcity in a 1.5°C world? See Table 5.1, which provides answers to these questions in a well-organized way, drawing from Table 3.4. Note, however, that the numbers in these two tables rely heavily and perhaps exclusively on a single paper in Environmental Research Letters (Byers et al. 2018). With respect to food security, the claim that certain numbers of people will be exposed to reduced crop yields is potentially very important but also deserves close scrutiny. How is this condition assessed? Is it based on geographic proximity to crop stress? Or does it consider patterns of regional and global trade? [United States of America]	
8398	1	14	1	2	This is an important paragraph that covers risks to food security from climate change impacts, but it should be lengthened to add the projected loss of rangeland livestock (7-10% under 2 deg) and associated "considerable economic consequences for many communities and regions" (see chapter 3 ES, page 10). [Nepal]	
8478	1	14	1	2	Its the other way round. talk of the impacts of a 1.5 global temperature rise on yields and if you want also the impact of 2 degree rather than talk of 1.5 in reference to 2.0 degree [Zimbabwe]	
8696	1	14	1	18	Is it possible to specify whether this statement is true "in the absence of effective adaptation" or "even with adaptation"? [New Zealand]	
9476	1	14	1	2	Paragraph B5.3 on food security lacks mention of Arctic where environmental changes have had a profound impact on food security in many ways (from changes in animals that are traditionally harvested (caribou, whales, seals, etc.), to impacts on hunting routes over land and sea ice). This is an important piece to capture in this section as populations share the threat of food security but for different reasons (e.g. crop production vs hunting routes). [Canada]	
840	1	15	1	15	"reduction in crop yields": this is true only for some crops (maize, millet etc...) As detailed in one the article quoted in chapter 3 (p. 3-103) (Iizumi et al, 2017): "Related impacts on global mean wheat yields with temperature increases of between 1.5 °C and 2.0 °C are not distinguishable. However, global mean maize and soybean yields with a temperature increase of 1.5 °C would stagnate less than those under a temperature increase of 2.0 °C, whereas a temperature increase of 2.0 °C is likely to benefit rice more than a temperature increase of 1.5 °C." Therefore, we suggest to write "maize and soybean yields" instead of "crop yields" [France]	
4790	1	15	1	15	Not clear that "high confidence" can be justified based on Chapter 3 evidence - perhaps moderate down to medium confidence. Please consider reassessing [United Kingdom (of Great Britain and Northern Ireland)]	
5212	1	15	1	2	no level of confidence associated to most of this paragraph. If it doesn't have an associated level of confidence, or if this is lower than "medium confidence", we would like to delete the paragraph. [Spain]	
4792	1	17	1	18	How much lower are the risks? Is it substantial? Not particularly informative to be so vague. What is the confidence statement associated with this? [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5088	1	17	1	18	The relevant parts of Chapter 3 generally deal with food security, which is a more complex issue than food shortages. Therefore we suggest to use the term "food security" instead of "food shortages" and modify the sentence accordingly [Hungary]	
7824	1	17	1	18	What is the confidence of the last clause of this sentence? [United States of America]	
8572	1	17	1	2	Reference to "food shortage" may be inaccurate and should perhaps refer to reduced food production. [Ireland]	
7826	1	18	1	18	Give % lower rather than 'significantly lower.' 1M people saved from food shortage is significant, even if 10M people suffer it. [United States of America]	
7828	1	18	1	19	The statement should focus on ocean ecosystems experiencing large-scale changes with critical thresholds between 1.5 and 2°C. Section 3.4.4 is not structured on the basis of ecosystems, but based on the evidence presented, those with clear thresholds between 1.5 and 2°C include coral reefs (3-87); mangroves, seagrasses, and kelp forests are identified as particularly vulnerable (3-87), but specific thresholds are not listed. Pteropods, low-latitude fin fish, krill, and mid-latitude bivalves are impacted but the report neither identifies which ecosystems they belong to nor which thresholds those ecosystems are projected to cross between 1.5 and 2°C. Similarly, while large changes in sea ice cover are described (3-82), the text does not specify how that would result in ecosystem thresholds exceeded between 1.5 and 2°C. Section 3.4.4 does not describe quantifiable thresholds in hypoxia, storms, ocean circulation, or stratification between 1.5 and 2°C and what ecosystems they would be affected by. Suggest revising the first two sentences of statement B2.3 to read "Ocean ecosystems are experiencing large-scale changes with ADDITIONAL IMPACTS [DELETE: critical thresholds being exceeded] at 1.5°C and above (high confidence). [DELETE: Crossing these thresholds may have irreversible effects.]" [United States of America]	
7830	1	19	1	22	The 70-90% loss finding is based upon Schleussner et al. 2016b (3-101, box 3-5). A single study does not warrant a "very high confidence" rating in an assessment report. "Medium confidence" is appropriate for the statement "The majority of warm water coral reefs, for example, are already experiencing the large scale loss of coral abundance (cover) today." Box 3.4 on page 3-92 makes an important point on the multifactorial nature of coral reef loss. Suggest amending the third and fourth sentences of statement B3.2 to read "[DELETE: The majority of warm water] Coral reefs ARE PARTICULARLY VULNERABLE BECAUSE THEY FACE MULTIPLE STRESSORS IN ADDITION TO CLIMATE CHANGE. THE MAJORITY OF WARM WATER CORAL REEFS [DELETE: for example,] are already experiencing the large scale loss of coral abundance (cover) today (VERY HIGH CONFIDENCE) and would lose a further 70-90% of cover at 1.5°C global warming ([DELETE: very high] MEDIUM confidence). {3.4.4, Box 3.4}" [United States of America]	
7832	1	19	1	27	Section 4.5.3 addresses adaptation responses and does not really provide support for the statements in B5.3 and B5.4. [United States of America]	
368	1	22	1	27	Referenced chapter sections don't seem to fit - 4.4 is governance and institutions; 4.5 is implementation. Topic here is drought [Chad]	
842	1	22	1	24	This statement, also written in the Executive Summary of Chapter 3 (p.9-10) is way too strong and misleading. We guess it is based on Gerten et al. (2013) paper, but actually this paper states that +1.5°C leads to +4% additional people exposed to water scarcity worldwide, and +2°C leads to +8% additional people, and this correct information is given in the Table 3.5 p.3-119. We suggest to modify it as follow : "...would approximately halve the increase of the population expected to suffer water scarcity" [France]	
4794	1	22	1	23	Without knowing the proportion affected by water scarcity, it is hard to understand the significance of this [United Kingdom (of Great Britain and Northern Ireland)]	
5338	1	22	1	27	B5.4: Statement is made “less fresh water stress” recommend rephrasing to read the stress of accessing fresh water will be lessened [Saint Lucia]	
6454	1	22	1	27	Halving the proportion of people experincing water scarcity by limiting warming to 1.5C compared to 2C is extremely unlikely, to the point of being totally misleading. Although climate change plays its role as one contributor to water scarcity, other factors such as population growth in currently water challenged basins and projected increases in human activity strongly outweigh climate change. This renders such a big effect from a relatively small difference in GMST unimaginable. Probably 'water scarcity caused by climate change' is meant instead of climate change in general, but even then the relative large difference warrants more explanation. [Netherlands]	
6886	1	22	1	27	Referenced chapter sections don't seem to fit - 4.4 is governance and institutions; 4.5 is implementation. Topic here is drought [Gambia]	
7106	1	22	1	27	The difference in population projections affected by water scarcity under the 1.5 and 2.0 deg C scenarios has not been tested for the statistical significance. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7110	1	22	1	23	Refer to the underlying report chapter 3, page 67, line 38-39: It can be included that overexploitation of groundwater (GW) in the recent past is a well-known fact for Punjab and Haryana region of India. This decline in GW has resulted in the enforcement of Punjab Preservation of Sub-Soil Water Act 2009, and resulted in change in rice irrigation practices over the study region for more sustainable agricultural practice (Singh et al. 2016, Discerning shifting irrigation practices from passive microwave radiometry over Punjab and Haryana, Journal of Water and Climate Change, DOI: 10.2166/wcc.2016.122). [India]	
7834	1	22	1	24	Key finding B5.4 should be revised to reflect the underlying chapter conclusions in Section 3.4.2.1: "Constraining to 1.5°C instead of 2°C warming can mitigate the risks on water availability although socio-economic drivers could affect the availability more than the risks posed by the variation in warming levels, while the risks found in regions are not homogeneous (medium evidence, medium agreement) (Gerten et al., 2013; Hanasaki et al., 2013; Arnell and Lloyd-Hughes, 2014; Schewe et al., 2014; Karnauskas et al., 2018). Assuming a constant population in these models, Gerten et al. (2013) reveal that an additional 8% of the world population in 2000 will be exposed to new or aggravated water scarcity at 2°C warming. This value is almost halved -- with 50 % larger reliability -- when warming is constrained to 1.5°C." Also, the underlying chapter states twice that socio-economic drivers and differences affect regional water scarcity more than differences in warming levels. To be complete, shouldn't this conclusion be added to the SPM as well? [United States of America]	
7836	1	22	1	27	While 1.5°C is understandably less impactful than 2°C, it really needs to be indicated how significant the effects will be of 1 and 1.5°C. The way this is phrased, it fails to give a good indication of the serious impacts already evident at present. [United States of America]	
7838	1	22	1	27	The authors should provide more specific numbers in this paragraph including the time frame for the conclusions. The discussion is too qualitative. [United States of America]	
7840	1	22	1	27	B5.4 should include the importance of socio-economic drivers which are discussed and well-cited in the underlying text on page 3-64. Suggest that statement be revised to read: "Limiting global warming to 1.5°C compared to 2°C would approximately halve the proportion of the world population expected to suffer water scarcity, although SOCIO-ECONOMIC DRIVERS COULD AFFECT THE AVAILABILITY MORE THAN THE DIFFERENCE IN WARMING, AND there is considerable variability between regions (medium confidence). Many small island developing states would experience substantially less freshwater stress as a result of projected changes in aridity when global warming is limited to 1.5°C, as compared to 2°C (medium confidence)." [United States of America]	
8400	1	22	1	27	Referenced chapter sections don't seem to fit - 4.4 is governance and institutions; 4.5 is implementation. Topic here is drought [Nepal]	
8480	1	22	1	24	What is presented is secondary info. what is critical is to know what will be the impact of 1.5 before we compare it with 2.0 degree? [Zimbabwe]	
3606	1	23	1	24	The AR5 concluded that over the next few decades, and for increases in global mean temperature of less than about 2°C, that changes in population will generally have a greater effect on water resource availability than changes in climate. (ch3, p64). The underlying chapter 3-10, first paragraph provides similar information relevant to the first statement of B5.4 in the SPM on the significance of climate change. This information must please be added to B5.4, because providing such context is key for the credibility of the IPCC: "Socioeconomic drivers, however, are expected to have a greater influence on these risks than the changes in climate (medium confidence).". [Germany]	
370	1	24	1	25	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [Chad]	
2344	1	24	1	24	it is not clear why SIDS are singled out in the discussion on water scarcity. Many regions of the world would be affected (would benefit from limiting temperature increase to 1.5). Please introduce a discussion around geographical distribution of impacts, rather than referring to a rather political category (SIDS). [European Union (EU)]	
3608	1	24	1	24	The current wording could imply that only SIDS are exposed to freshwater stress. Are SIDS particularly prone to water stress? Then please add "Particularly," to the sentence: "Particularly, many small island developing states…". (cf. 3.4.2.1, 3.4.2.2). However, ch3, e.g. on p64 mentions many other regions that are and will be affected by water scarcity. Please highlight those regions in the SPM that are most affected by water stress due to climate change, possibly mentioning other stressors that affect water availability as well. [Germany]	
4336	1	24	1	24	Typo error needs to be corrected in "Many small island developing states" [Republic of Korea]	
5270	1	24	1	25	Referenced chapter sections don't seem to fit - 4.4 is governance and institutions; 4.5 is implementation. Topic here is drought [Zambia]	
6182	1	24	1	25	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [United Republic of Tanzania]	
6606	1	24	1	25	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [Sudan]	
6888	1	24	1	25	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [Gambia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7842	1	24	1	26	While increasing ocean acidification will have adverse impacts on many marine organisms, there is a lack of evidence in the underlying text that specific thresholds will be reached between 1.5 and 2°C scenarios. Suggest rephrasing the statement B3.3 to reflect this: "WHILE SPECIFIC THRESHOLDS HAVE NOT BEEN IDENTIFIED, the level of ocean acidification in a 1.5°C warmer world is expected to amplify the adverse effects of warming, impacting the survival, calcification, growth, development, and abundance of a broad range of taxonomic groups (i.e. from algae to fish) (high confidence). {3.3.10, 3.4.4}" [United States of America]	
8402	1	24	1	25	SIDS mentioned, but applicable to LDCs as well (see Box 4.2, 4.3) [Nepal]	
5740	1	25	1	26	Delete "when global warming is limited to 1.5oC, as compared to 2oC". It is already said at the beginning of the paragraph B5.4. [Sweden]	
7844	1	28	1	31	The meaning of "substantially" in this sentence is unclear. Does it mean "measurable," "statistically significant," a specific percent, or something else? In addition, the underlying text on page 3-97 indicates that wetlands should not be included in the statement: "It remains unclear how wetlands will respond and under what conditions (including other climate parameters) with a rise in 1.5°C and 2°C." Suggest removing the word "wetlands" and replacing the word "substantially" with a clearer term. [United States of America]	
246	1	29	1	32	As this is a text for policymakers more conrete numbers on the scale/magnitude of impacts would be appreciated. Policymakers needs to be communicated also about the monetary impacts (in numbers), if available. [Finland]	
2346	1	29	1	3	What is the actual meaning of this:"Impacts of 1.5°C global warming on global economic growth are larger than those of the present-day"? Present-day economic growth is taking/keeping us on (it is consistent with) a 3.0+ degree warming trajectory. Would a 1.5 degree world have a larger impact than that? In any event, how would economic growth be measured/compared on a multidecade timeframe? Growth measures change in GDP year on year. Assuming (but not allowing) that GDP wouls be a meaningful indicator of well-being, would it not be better to compare GDP as such at a given time, rather than its rate of change? in addition, does it make sense to include low confidence messages (with no clear cut interpretation) in the SPM? [European Union (EU)]	
3610	1	29	1	32	The first line is not quite clear: "Impacts of 1.5°C global warming on global economic growth are larger than those of the present day". it means the warming that we experience today, please clarify this sentence. Therefore we recommend following: "Impact of … are larger than those of the warming of about 1°C experienced today." [Germany]	
3612	1	29	1	32	Both statements in this paragraph are associated with low confidence, and the assessment is limited to economic growth and does not include other economic impacts. This does not seem appropriate given the significant differences in impacts from climate change on human and natural systems for half a degree of less warming, which will also affect economic growth and cause economic losses. We assume that the uncertainty qualifiers refer to the sub-clauses only and not to the full statements? In this case, the sub-clauses must please be skipped. Otherwise we encourage the authors to revisit their assessment of the level of confidence given the many significant economic impacts of climate change that can be avoided by half a degree less temperature increase shown in chapter 3, and the robust recent literature on growth impacts of a warming world. Please see also our second comment on paragraph B5.5. [Germany]	
3614	1	29	1	32	The broader audience of the SPM might link the information on economic aspects related to impacts in B5.5 to the statement on mitigation costs in D2.1. These statements taken together might create the wrong impression that the impacts from climate change avoided when limiting warming to 1.5C instead of 2C has some economic impacts of unknown and possibly small significance, while the additional efforts for climate change mitigation consistent with 1.5C vs 2 are very high. This impression is contrary to the statement on a substantial increase of RFC 4 on Chapter 3 page 3-13: “Global aggregate impacts” (RFC4) a transition from moderate to high levels of risk now occurs between 1.5ºC and 2.5ºC global warming as opposed to at 3ºC warming in AR5, owing to new evidence about global aggregate economic impacts and risks to the earth’s biodiversity (medium confidence)" In addition, the economic benefits from the avoided or reduced climate change hot spots and the avoided tipping points mentioned on page 3-16 are not reflected in the current B5.5 statement. Chapter 3 mentions less economic losses as a consequence of mitigated climate change impacts in many sections, e.g. Cross-Chapter Box 6, 3-109, section 3.4.4, 3.4.9., 3.5.3. We would like to see a clearer statement in B5.5 reflecting the many significant economic impacts of climate change that can be avoided by half a degree less temperature increase shown in the SR1.5. Please add the following information to B5.5.: "Climate change negatively affects many economic sectors including tourism, energy systems, and transportation through direct impacts on operations (e.g., sea level rise) and through impacts on supply and demand, with the risks varying significantly across geographic region, season, time as well as assumptions of other drivers of change. There is considerable evidence that avoiding 2°C will avoid very substantial damage to ecosystem services and ultimately impacts on human livelihoods, food resources, communities and industries. The delay of economic growth increases with the higher warming, with regional and sectoral differences. There is limited information available on economic benefits from avoided or reduced climate change hot spots and from avoided tipping points due to 1.5°C warming instead of 2°C, but new evidence shows significantly increased risks when compared to previous assessments (SPM Figure 2) (3.4.4, 3.4.9, 3.5.2, 3.5.3)." [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3990	1	29	1	32	The use of "present-day" in B5.5. can be misunderstood. E.g is it the impacts we are experience today or the impacts of the present level of global warming (some impacts will come with delay). Please clarify, e.g. like this "Impacts of 1.5C global warming on global economic growth are larger than the impacts the world are experiencing today/imacts of present level of global warming (2018), with the largest impacts expected in the tropics and the Southern Hemisphere subtropics (low confidence)." [Norway]	
4236	1	29	1	32	In B5.5, it is only pointed out in general terms that 'Economic growth is projected to be lower at 2°C than at 1.5°C of global warming for many developed and developing countries', a finding that only considers the impact of direct climate risk on economic growth, without considering the fact that additional climate change mitigation actions also have an impact on economic growth, which tends to mislead policymakers. So it is suggested to reformulate "Economic growth is projected to be lower at 2°C than at 1.5°C of global warming for many developed and developing countries" as "Impact on Economy due to climate risk is projected to be lower at 1.5? than at 2? of global warming for many developed and developing countries". [China]	
4338	1	29	1	31	The confidence level for this sentence is "low". This is an exceptional case throughout the current SPM. It is strongly recommended to delete the sentence which has low confidence. The sentence seems to be very political argument without strong scientific basis. [Republic of Korea]	
4534	1	29	1	31	Request clarifications of why B5.5 is mentioned regardless of its "low confidence" status. This is only sentence of "low confidence" throughout the SPM. It is also unclear which sentence is referred for this low confidence part. Para 2 of 3-142 (section 3.5.3) says "An important reason why developed countries in the tropics and subtropics are to benefit substantially from restricting global warming to 1.5°C, relates to present-day temperatures in these regions being above the threshold thought to be optimal for economic production. "It mentions the situation of the tropics and Southern Hemisphere subtropics, but does not mention the difference of impact between 1.5 degree and present-day warming. In addition to these points, this low confidence part seems to be not consistent with the statement "Petris et al., ... further estimating that projected damages at 1.5 degree remain similar to today's level of economic damage" in para 1 of 3-139. [Japan]	
4536	1	29	1	31	B5.5 mentions that "Economic growth is projected to be lower at 2 C than at 1.5 C of global warming for (…)", but from this sentence it is not clear whether the economic impacts of mitigation are taken into account or not. To avoid misleading readers, this point should be specified. The reason is that mitigating to 1.5°C causes greater burden on economy than to 2°C. [Japan]	
4796	1	29	1	3	It's not entirely clear what this sentence means. Does it mean that the economic impacts of climate change experienced thus far are smaller than those that will be experienced by 1.5C of warming? Please clarify. Additionally, this point would be further strengthened if it were quantified. [United Kingdom (of Great Britain and Northern Ireland)]	
5214	1	29	1	31	delete lines from 29 to first colom in line 31. The SPM shouldn't include "low confidence" findings. [Spain]	
5742	1	29	1	31	This is the only finding in the SPM that has "low confidence" and considering this, it is not clear why it is included. Furthermore, it is not clear which part of the first sentence does the "low confidence" apply to? How large are the "largest"? Suggest, e.g., "Impacts of 1.5oC global warming on global economic growth are larger than those of the present-day [does low confidence apply here?]. Economic growth is projected to be lower at 2°C than at 1.5°C of global warming for many developed and developing countries (medium confidence)." [Sweden]	
7102	1	29	1	32	This section is based on research which does not statistically distinguish between economic growth impacts of 1.5 deg C with current conditions and 1.5 deg C with 2 deg C. Therefore it must be modified to the following: "Impacts of 1.5 deg. C global warming on global economic growth are close to indistinguishable from current conditions, for a large set of countries. Statistically, even though the projected impacts of 1.5°C relative to 2°C are similar, economic growth is projected to be lower at 2°C than at 1.5°C of global warming (low confidence) for many developed and developing countries (low confidence). {3.5.2, 3.5.3}" [India]	
7846	1	29	1	29	Are impacts listed here positive or negative? This should be defined. [United States of America]	
7848	1	29	1	32	Give a number for the change in growth. [United States of America]	
7850	1	29	1	32	Statement B5.5 should include information on whether the projected impacts on economic growth include the cost of mitigation measures required to reach 1.5 and 2°C scenarios. The underlying text is unclear on this point as well. [United States of America]	
7852	1	29	1	32	If nothing quantitative can be said, it should not be elevated to the SPM. If kept, current formulation needs clarification of assumptions. [United States of America]	
7854	1	29	1	32	The entire B5.5 statement needs to clarify the extent to which mitigation efforts to stay within 1.5/2°C are taken into account. Impacts to economic growth from mitigation actions vs. impacts to economic growth from climate change (and their interlinkages) need to be distinguished. [United States of America]	
7856	1	29	1	32	The reader has to pay very close attention to decipher the years to which this comparison refers, which presumably is the time at which global mean temperature reaches 1.5°C compared to present day. However, the comparison could refer to the pathway and time to reach 1.5 vs. 2°C. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8482	1	29	1	32	Need to be bold and where possible include some statistics [Zimbabwe]	
8576	1	29	1	32	Can impacts on economic growth be quantified? [Ireland]	
8578	1	29	1	32	This point could mean that climate change has already impacted on global economic growth - clarify or reword [Ireland]	
8968	1	29	1	3	Suggest clarification: "Impacts are larger than those of the present-day". What are "those"? [Australia]	
9288	1	29	1	32	Quantified estimates of the mentionned economic impacts are necessary in this paragraph. [Switzerland]	
9478	1	29	1	32	It is unclear to which part of the first sentence of B5.5 the "low confidence" qualifier refers to. Also, reccomend deleting the first sentence in B5.5 since it is the only statement in the SPM with a "low confidence" qualifier. The second sentence can be preserved since it recieves a higher confidence qualifier (medium). [Canada]	
5020	1	31	1	32	Please provide more details on the effects on the economic growth. [Italy]	
6834	1	31	1	32	Further elaboration needed. [United Arab Emirates]	
7858	1	31	1	32	The real issue is the amount of economic growth that can be used to improve public well-being and welfare as opposed to being drained off to cover recovery, reconstruction, and relocation. With climate change impacts worsening, there will be plenty of work done in response to impacts that have nothing to do with improving well-being -- and this needs to be clarified. What matters is the effects on productive economic growth. [United States of America]	
8804	1	31	1	31	Before bracket add "especially developing countries, whose economies are particularly dependent on fossil fuel production" [Iran]	
844	1	32	1	32	We suggest to add this, in order to bring quantitative and policy-relevant information to this statement. "Limiting warming to 1.5ºC instead of 2ºC would save 1.5–2.0% of Gross World Product (GWP) by mid-century and 3.5% of GWP by end-of-century. {3.5.2.4}" [France]	
248	1	34	1	34	"...that since AR5 that the…" should read "...that since AR5 the…" [Finland]	
2348	1	34	1	4	The reference to 'since AR5' is ambiguous. Please clarify whether it is the risk itself that has increased since AR5 or the level of evidence (or both). Figure SPM2 refers to an update since AR5 but the figure itself does not indicate changes in risk levels compared to AR5. Also, it is not clear in the Figure that constraining warming to 1.5 degrees would reduce risks associated with RFC2 (same colour as under 2 degrees). [European Union (EU)]	
2350	1	34	1	35	The concept of RFCs have not been properly introduced [European Union (EU)]	
3616	1	34	1	34	delete second "that", levels of risk have [Germany]	
3618	1	34	1	34	The information from the first statement of B5.6 "There are multiple lines of evidence that the levels of risk has increased for four of the five Reasons for Concern (RFCs) for global warming levels of up to 2°C (high confidence)." should be added to the headline message A3 or B5. This information is highly relevant for policy makers. [Germany]	
3620	1	34	1	4	The information about the RFC and how they have been obtained is not sufficient for the many readers who will not be familiar with the IPCC reports. We therefore strongly urge the authors to add a Box with information from AR5 WG2 Assessment Box 1, starting at "Five integrative reasons for concern (RFCs) provide a framework for summarizing key risks across sectors and regions." This information must also indicate the confidence levels for each of the assessed RFCs. Paragraph B5.6 should be added to this box. Please also add more detailed information on the change of the risk levels, beyond noting that risks decrease when limiting global warming to 1.5 instead of 2C, which is quite obvious. [Germany]	
3992	1	34	1	34	Delete "that", to end up like this: "There are multiple lines of evidence since AR5 that the levels.." [Norway]	
4798	1	34	1	34	Minor phrasing error - "that since AR5 that the" should read "that since AR5 the". Additionally, should be "have" not "has increased" [United Kingdom (of Great Britain and Northern Ireland)]	
4800	1	34	1	4	Not all policy makers will be immediately and intuitively familiar with the RFCs. Therefore this paragraph may not be particularly helpful or meaningful to them. They are listed later on in the paragraph (and agree with the concept of having Reasons for Concern!) but the language of this point is somewhat opaque. Could this be rephrased as something along the lines of: "There are multiple lines of evidence that levels of risk across aggregated sectors and regions have icnreased for global wamring levels of up to 2°C. Constraining warming to 1.5°C reduces the risks to unique and threatened ecosystems to a very high/high level; the risk of unevenly distributed impacts to moderate/high level; and the risk of global aggregate impacts to moderate/high levels. Similarly risks associated with extreme weather events and large scale singiular events (like ice sheet collapse) are reduced." [United Kingdom (of Great Britain and Northern Ireland)]	
5744	1	34	1	34	(1) Delete the second "that". (2) Suggest changing "the levels of risk" to "the assessed levels of risk" - as it is not the risks that have increased, but they are assessed to be higher. (3) For increased readability, set the RFCX in parenthesis, and use their full names of them outside parentheses. [Sweden]	
6156	1	34	1	4	B5.6 should present the main messages of the figure SPM2 and not a technical description of that figure. Please correct [Estonia]	
6456	1	34	1	34	delete "that"after AR5 and replace "has"by "have" [Netherlands]	
7104	1	34	1	4	In view of the fact that RFC2 and RFC5 do not match the statements earlier in the SPM, this statement should be removed. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7860	1	34	1	34	Suggested edits: "There are multiple lines of evidence "indicating/suggesting" that since AR5 that the levels of risk have increased..." [United States of America]	
7862	1	34	1	34	Should this have a caveat about 'risk' being author-dependent? [United States of America]	
7864	1	34	1	36	This may need more explanation since the RFCs aren't well-defined. [United States of America]	
7866	1	34	1	4	What has also been learned since AR5 is how much more vulnerable the Greenland and Antarctic ice sheets are, and so the significantly increased likelihood of a significant rise in sea level. Basically, the central estimate for sea level rise by 2100 is up by a factor of 2 or so, and this may well be conservative. [United States of America]	
7868	1	34	1	4	Perhaps instead of stating there are "multiple lines of evidence..." just explain that the risk levels are predicted to be higher... And, instead of using the RFC acronyms, use the titles of the risk and put the acronyms in parentheses to make it easier to read. [United States of America]	
8720	1	34			delete "that" so it reads "There are multiple lines of evidence since AR5..." [New Zealand]	
8722	1	34			Either "levels of risk HAVE…" or "LEVEL of risk has..." [New Zealand]	
8958	1	34			Suggest deleting: "that" after the use of "AR5". [Australia]	
9480	1	34	1	4	This is a very dense paragraph with many parenthetical phrases that make for difficult reading. We would urge simplification, perhaps by retaining only the first sentence. In addition, the phrase 'since the AR5' in first sentence makes it unclear whether the risks have increased in the time since the AR5 was published, or whether it is the assessment of those risks than has changed on the basis of more recent scientific literature. As a consequence, it is also unclear whether the 'high confidence' qualifier applies to the increase in level of risk or to the timing of that increase (i.e. since AR5). [Canada]	
9614	1	34	1	34	Delete that after evidence [Madagascar]	
7870	1	35	1	36	Add parentheses around "see Figure SPM2." [United States of America]	
3622	1	36	1	4	The information provided in the paragraph is highly important, but please improve the language and structure of the text. What is the rationale behind about the ordering of the RFC? [Germany]	
3624	1	36	1	4	Do the confidence levels refer to the increase in assessed risks or to the RFC themselves? [Germany]	
7872	1	39	1	4	In contrast to RFCs 1, 3, and 4, the evidence base does not identify a shift in transition in level of risk between 1.5 and 2°C for RFCs 2 and 5. Suggest adding the word "generally" such that the sentence reads: "It would also GENERALLY reduce risks associated with RFC2 (Extreme weather events) and RFC5 (Large scale singular events) (high confidence)." [United States of America]	
846	1	4	1	4	Add "...compared to a 2°C-global warming" at the end of the sentence [France]	
374	1	42	1	42	This sentence "limits to adaptation and associated losses exist at every level of global warming" should be expanded to show that adaptation limits and losses increase with warming. [Chad]	
848	1	42	1	47	There is no treatment in the SPM of the risks of maladaptation. It may be that the risks are not correlated with the amount of warming, but the conditions for undertaking adaptation (like public involvement). [France]	
1684	1	42	1	47	B6: The statement that "Limits to adaptation and associated losses exist at every level of global warming" falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: "Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C." {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Belize]	
1870	1	42	1	42	"level of global warming" is not a well-known term. [Denmark]	
2352	1	42	1	43	What are limits to adaptation? Do we consider changes in lifestyle (e.g. alternative livelihoods) as beyond the limits? Migration is also an adaptation option, hence one could argue that, e.g., loss of territory would also not be beyond the limits to adaptation. This concept is not clear. [European Union (EU)]	
2354	1	42	1	47	This seems to be the only bold text without any references to specific chapters or sections. Please provide references to chapters that support this important statement. [European Union (EU)]	
3626	1	42	1	42	Please add "context-specific" before "limits of adaptation" (cf. SPM.D.3) and reword "associated losses" to read "associated residual risks" or "risks for associated losses" to reflect the risk framing introduced in AR5 which is absent from the deterministic wording in this headline message. The same applies to Chapter 3, p. 2, line 8; p. 16, line 21; p. 96, line 32; p. 101, line 31. [Germany]	
3628	1	42	1	47	The statement "exist at every level or warming" reads as if the level of warming would not matter. Please add the notion that limits to adaptation and associated losses increase with every level of increased warming. [Germany]	
3630	1	42	1	47	"Further adaptation" in relation to which level? Does this mean that current adaptation is insufficient or that more would be needed for 1.5C? In addition, the last sentence is trivial. It is self-evident that adaptation needs grow with increasing climate change. Please improve, possibly by joining the two sentences, and add more specific information. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3632	1	42	11	2	The definition for 'losses and damages' (lowercase letters) is not consistently used throughout the report. In fact, the cross-chapter box 12 provides a much more comprehensive explanation of the ambiguous usage of the term depending on the context. Throughout the chapters, however, 'loss and damage' is mostly used in singular form which makes unclear, if authors want to point to the political process under the Warsaw International Mechanism or to potential losses or damages. We strongly recommend to instead use either "loss" or "damage" when referring to observed impacts or "residual risks" when referring to projected climate risks in order to (i) avoid the terminological confusion and (ii) achieve consistency with the risk framing introduced by AR5. [Germany]	
3908	1	42	1	42	The SPM deals with adaptation both in this section an in D3-6. We cannot understand the rationale behind this splitting. We would suggest moving both sections together, and/or cross-referencing both sections. Also encore coherence between both sections. [Luxembourg]	
4124	1	42	1	47	B6: The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Saint Kitts and Nevis]	
5216	1	42	1	47	include coastal systems [Spain]	
5274	1	42	1	42	Add "with the potential to also limit economic damages at 1.5°C of global warming" to the end of this point (from 3-11) [Zambia]	
5378	1	42	1	47	B6: The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Saint Lucia]	
5746	1	42	1	47	It is not clear what "further adaptation" refers to (already implemented adaptation?). Consider rephrasing so that the paragraph reads: "Further adaptation is required within the assessed sectors of energy, land and ecosystems, urban, industrial, and transport systems, and within cross-cutting sectors such as disaster risk management, health and education. Limits to adaptation and associated losses exist at every level of global warming (medium confidence) with site-specific implications for vulnerable regions and populations. Adaptation needs will be lower at global of 1.5°C, compared to 2°C". [Sweden]	
6158	1	42	11	21	B6 should instead of mainly listing adaptation options also focus on the feasibility, scale and costs of adaption and the differences between 1.5C and 2C warming for adaptation [Estonia]	
6244	1	42	1	47	The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence). [Fiji]	
6608	1	42	1	42	This sentence "limits to adaptation and associated losses exist at every level of global warming" should be expanded to show that adaptation limits and losses increase with warming. [Sudan]	
6728	1	42	1	47	B6: The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Marshall Islands]	
6892	1	42	1	42	This sentence "limits to adaptation and associated losses exist at every level of global warming" should be expanded to show that adaptation limits and losses increase with warming. [Gambia]	
7874	1	42	1	42	The author style and content has clearly shifted. B6 is very hard to parse and derive what is meant -- e.g., "Limits to adaptation and associated loses..." -- are the losses associated with adaptation? Why combine these two? [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7876	1	42	1	47	There really isn't anything said about the expanding of the subtropics, and so the aridification of the equatorial side of the mid-latitude weather belts. It is not droughts that are affecting these regions as the precipitation systems are not going to return. It is permanent aridification as far as society and constructed water resource systems are concerned. [United States of America]	
7878	1	42	1	47	Policy-prescriptive language should be removed. Also, this finding is awkwardly written with several grammatical problems in the series of "assessed sectors". [United States of America]	
7880	1	42	1	47	The first part of this paragraph is not specific to 1.5°C and should be removed. The focus should be placed on the final part, namely that the adaptation needs are lower for 1.5°C warming than 2°C of warming, though authors should note that this is a low evidence statement given the scant literature on this particular topic (Table 4.13). [United States of America]	
7882	1	42	1	47	Paragraph B6 is missing chapter references. [United States of America]	
7884	1	42	11	21	This section needs serious reworking or should potentially be removed from the SPM altogether. First, the underlying report notes in several places that there is scant literature on adaptation options at 1.5°C, whether there are limits to these adaptation options, and the degree to which transformational approaches can go beyond surpass the limits of other approaches. The lack of an evidence base should be noted throughout this section. Specificly, the finding that adaptation needs would be lessened at 1.5°C of warming may be justified from expert judgement, but there is limited evidence that policymakers target adaptation approaches to specific levels of warming. Instead, adaptation approaches generally attempt to provide the greatest amount of resilient capacity possible. The whole section should instead focus on risks within a particular sector/region/category where there is sufficient eveidence to establish a credible analysis of what limiting warming to 1.5 °C would mean for the development of adaptation capacity. [United States of America]	
8404	1	42	1	42	This sentence "limits to adaptation and associated losses exist at every level of global warming" should be expanded to show that adaptation limits and losses increase with warming. [Nepal]	
8484	1	42	1	46	There is need to include Agriculture even if it has its own Special Report [Zimbabwe]	
8580	1	42	1	47	Clarify the phrase "every level of global warming" or focus on 1.5 and 2 degrees. Paragraph may be unnecessarily long also. [Ireland]	
8582	1	42	1	47	This seems to be the only bold text without references to other Chapters in the Special Report [Ireland]	
8698	1	42	11	21	Section B6 underscores the importance of prioritising climate mitigation and adaptation in national, regional and multilateral development assistance programmes, and of ensuring effective coordination between donors in various regions. We support its inclusion as written. [New Zealand]	
9050	1	42	1	47	B6: The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Solomon Islands]	
9136	1	42	1	47	B6: The statement that “Limits to adaptation and associated losses exist at every level of global warming“ falls short of clarifying relevant information: that limits to adaptation are increasingly reached with increasing warming (Fig. SPM2, or Box 3.5), and that present levels of warming cause considerable risks and inflict losses (CH 03 ES, RFCs). To capture these aspects, it should therefore read: “Limits to adaptation and associated losses exist at current levels of warming and risks of exceeding limits increase with increasing warming. Further adaptation is required in all sectors assessed [could include list in current statement]; adaptation needs will be lower in a 1.5°C warmer world compared to 2°C.” {3.3,3.5, CC Box 12, 5.3} (medium confidence) [Nauru]	
9290	1	42	1	42	Write: "Limits to adaptation and associated irreversible losses exist …" [Switzerland]	
9482	1	42	1	44	Reccomend deleting the first sentence of B6: "Limits to adaptation and associated losses exist at every level of global warming (medium confidence), with site-specific implications for vulnerable regions and populations". We find no basis for this statement in the in the draft report chapters. Pleasy verify. [Canada]	
4538	1	43	1	43	Suggest deleting the word “Further” [Japan]	
4802	1	43	1	44	It is unclear what is meant by "Further adaptation is required within the assessed sectors…" i.e. further adaptation is required in order to achieve what? [United Kingdom (of Great Britain and Northern Ireland)]	
7886	1	43	1	47	It is unclear what "Further adaptation is required within the assessed sectors..." means. Further adaptation at 2 vs 1.5°C? The last sentence indicates higher adaptation needs will be required at 2 vs 1.5°. Consider saying sectors versus "assessed sectors". [United States of America]	
5748	1	44	1	44	It is stated that: "Further adaptation is required within the assessed sectors of energy, land and ecosystems, urban, industrial, and transport systems...". It might seem unclear what is meant by "land and ecosystem ... systems". It could, for clarity, be expressed whether "land and ecosystem ... systems" exclusively refers to "land use activities" such as agriculture, forestry etc, or also includes "natural" ("unmanaged") systems with adaptation requirements. [Sweden]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7888	1	44	1	44	"is required' is prescriptive and should be removed. The statement is missing important context about adaptation efforts ongoing within the stated sectors. Without context, difficult to understand intent of the authors. [United States of America]	
7890	1	44	1	44	"Urban" is not really a sector. Suggest reframing. [United States of America]	
3634	1	46	1	46	add "warming" after "global" [Germany]	
6458	1	46	1	46	Typo: 'warming' is missing after the word 'global' [Netherlands]	
7892	1	46	1	46	The words "a" and "increase" are missing after the word "at" in this phrase "adaptation needs will be lower at global of 1.5°C". Alternatively, insert "warming" after "global". [United States of America]	
7894	1	46	1	46	This is an obvious statement. Explain how/why or delete. [United States of America]	
8724	1	46			Insert "warming" so it reads "…global warming of 1.5 C…" [New Zealand]	
8806	1	46	1	46	After "needs" add "in general" [Iran]	
8960	1	46	1	46	Suggest rephrasing to: "at a global warming of 1.5C" [Australia]	
376	1	49	1	51	SIDS mentioned, but applicable to LDCs as well "in vulnerable regions, including small islands and LDCs, that are ..... [Chad]	
1686	1	49	11	2	The wording of paragraph B6.1 should reflect the corresponding paragraph from the Executive Summary of chapter 3 (page 12) which indicates clearly that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should therefore read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Belize]	
1872	1	49	11	1	This sentence it too long and complicated; it is quite hard to read. Please restructure. [Denmark]	
2356	1	49	11	2	Statement B6.1 is (grammatically) difficult to follow (one very long sentence). Also it seems to add little value (basically saying that all risks are greater when warming is higher). Recommendation: merge B6 & B6.1 and use the extra space to discuss more concrete findings related to adaptation from the underlying report. [European Union (EU)]	
3636	1	49	11	2	Please reformulate this very long sentence and split it into smaller ones to enable easier understanding. [Germany]	
3994	1	49	11	2	Please consider to divide this very long sentence into two sentences [Norway]	
4126	1	49	11	2	The wording of paragraph B6.1 should mirror the relevant paragraph from the Executive Summary of chapter 3 (page 12) which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Saint Kitts and Nevis]	
4340	1	49	1	49	damages increased ? damages will be increased [Republic of Korea]	
4804	1	49	1	5	Does this statement just apply to particularly vulnerable regions? Is there evidence that it would also apply to developed countries with smaller, but still important, adaptation challenges? This would be an important message for policymakers in those countries. [United Kingdom (of Great Britain and Northern Ireland)]	
4806	1	49	1	51	Would break this sentence up (and simplify it) as follows: "Adaptation opportunities will be reduced and the risks of unavoidable damages increased in vulnerable regions (medium confidence). This includes small islands, which are projected to experiuence greater compound climate risks at 1.5°C global warming comapred to today..." [United Kingdom (of Great Britain and Northern Ireland)]	
5276	1	49	1	51	This sentence "limits to adaptation and associated losses exist at every level of global warming" should be expanded to show that adaptation limits and losses increase with warming. [Zambia]	
5380	1	49	11	2	The wording of paragraph B6.1 should mirror the relevant paragraph from the Executive Summary of chapter 3 (page 12) which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Saint Lucia]	
6184	1	49	1	51	SIDS mentioned, but applicable to LDCs as well "in vulnerable regions, including small islands and LDCs, that are ..... [United Republic of Tanzania]	
6246	1	49	11	2	The wording of paragraph B6.1 should reflect the relevant paragraph from the Executive Summary of chapter 3 on page 12, which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Fiji]	
6610	1	49	1	51	SIDS mentioned, but applicable to LDCs as well "in vulnerable regions, including small islands and LDCs, that are ..... [Sudan]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6730	1	49	11	2	The wording of paragraph B6.1 should mirror the relevant paragraph from the Executive Summary of chapter 3 (page 12) which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Marshall Islands]	
6894	1	49	1	51	SIDS mentioned, but applicable to LDCs as well "in vulnerable regions, including small islands and LDCs, that are ..... [Gambia]	
7896	1	49	1	49	Grammar: "damages will increase" [United States of America]	
7898	1	49	11	2	Confusing. Consider rewording. Are all vulnerable regions projected to experience higher multiple inter-related climate risks at 1.5°C global warming compared to today or this is specific to small islands? [United States of America]	
7900	1	49	11	2	Unclear to what the 'medium confidence' is refering. The remaining statements in this paragraph should be given confidence levels. [United States of America]	
8406	1	49	1	51	SIDS mentioned, but applicable to LDCs as well "in vulnerable regions, including small islands and LDCs, that are ..... [Nepal]	
8486	1	49	11	2	All the observations and impacts ought to be written in this format: comparing 1.5 with present day and showing more impacts with 2.0 degree [Zimbabwe]	
8584	1	49	11	2	Could be clearer with rewording [Ireland]	
9052	1	49	11	2	The wording of paragraph B6.1 should mirror the relevant paragraph from the Executive Summary of chapter 3 (page 12) which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Solomon Islands]	
9138	1	49	11	2	The wording of paragraph B6.1 should mirror the relevant paragraph from the Executive Summary of chapter 3 (page 12) which clearly shows that adaptation opportunities for SIDS will not only be reduced (indicating a reduction in scope) but also limited (indicating no scope), with concurrent loss and damage. The first sentence of paragraph B6.1 should thus read "Adaptation opportunities will be limited and the risk of unavoidable loss and damage will increase...". [Nauru]	
9484	1	49	11	2	Reccomend deleting "and the risks of unavoidalbe damages increased" in this sentence. The sentence will now read "Adaptation opportunties will be reduced (medium confidence) in vulnerable regions...". Rational: there is no basis for the the inclusion of "unavoidable damages" based on the contents of draft report chapters. [Canada]	
2358	1	5	1	51	which are the 'vulnerable regions' referred to here? Or, to put it differently: are there any regions not vulnerable to climate change? Some clarification is needed so the statement does not remain generic and with no real added value to policy makers. [European Union (EU)]	
7902	1	5	1	5	Why single out small islands here? This obviously includes others. [United States of America]	
8770	1	5	1	5	to add term "countries in arid and semi-arid areas" after term "…small island" [Iran]	
9486	1	5	1	5	Consider including the Arctic region, if relevant. [Canada]	
5492	11		11		We consider very relevant to mention poverty, but it is necessary include more information about inequalities. [Mexico]	
850	11	1	11	1	Is it possible to give examples ? We suggest to write at the end of the sentence, regarding the information given in Box 3.5 : "...including coastal flooding, coral reef degradation and decreases in freshwater availability." [France]	
7904	11	1	11	1	Not really helpful without quantification. Anyone can say risks increase as warming increases. [United States of America]	
250	11	4	11	6	The claim: "B6.2. ... may alleviate the impacts of climate change at 1.5°C. {4.4.5, 4.5.3} " is obviously equally valid for 2C. Thus either add 2C or modify to state that the demands on investements, transformative change etc to alleviate impacts are easier to fulfill in a 1.5C than a 2 C climate change [Finland]	
378	11	4	11	6	B 6.2 is weaker with 'may' alleviate the impacts of climate change-however in the report of Chapter 4 (page 88) it's stronger with 'can' strengthen. [Chad]	
852	11	4	11	6	This statement is not very clear. It could be understood as : "Maybe, if we take action towards adaptation, it will alleviate impacts..." We suggest to write it as "There is potential to alleviate the impacts of climate change at 1.5°C by infrastructure investments and innovative mechanisms to target finance towards adaptation, including transformational approaches at various scales " [France]	
1828	11	4	11	6	The information value is low. It is suggested to elaborate the statement to include quantitative findings of sections 2.5.2 and 4.2.1 of the science report. [Denmark]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2360	11	4	11	6	This paragraph adds very little to the SPM. Moroever, what is true for 1.5 is also true for 2 (transformational approaches reduce impacts at 1.5 as well as 2). No confidence level is attached to the statement. Suggest removing this paragraph. [European Union (EU)]	
3638	11	4	11	6	Please add "climate-resilient" to read "climate-resilient infrastructure" consistent with the Executive Summary of chapter 4, page 9, line 1. [Germany]	
3640	11	4	11	6	Please reword "innovative mechanisms to target finance towards" as it is unclear what is implied by this term and as support is also needed for technology and capacity development. [Germany]	
3642	11	4	11	6	Please provide specific information on these issues, and about how they relate to 2C in comparison to 1.5C. It would also very useful to provide more specific information. [Germany]	
3644	11	4	11	21	The adaptation options here are mentioned in a qualitative way only. The relevant information would be how adaptation needs to scale with the climate change signal, i.e. how much less adaptation would be required if warming would be limited. [Germany]	
3996	11	4	11	6	B6.2 is mixing two topics. One about what to finance and the other about how to finance. This could be seperated into two sentences (or two paragraphs): "Infrastructure investments may alleviate the impacts of climate change at 1.5°C. {4.4.5, 4.5.3}. Innovative mechanisms to target finance towards adaptation, including transformational approaches, may provide nescessary means to finance adaptation and alleviate the impacts of climate change at 1.5°C. {4.4.5, 4.5.3}" [Norway]	
4238	11	4	11	6	The current B6.2 lacks the characterization of confidence. So it is suggested to make such an addition to be consistent with other paragraphs. [China]	
4342	11	4	11	6	In the case of infrastructure investments that do not take into account regional impacts, there is a risk of exacerbating vulnerability in the surrounding area. Facility-oriented measures that are effective in the short term may increase structural vulnerability at the urban level in the long term. [Republic of Korea]	
4808	11	4	11	6	It would be helpful to give an indication of to what extent they may alleviate the impacts, and the confidence level associated with this. As it stands, this is a very vague statement and not particularly informative/useful [United Kingdom (of Great Britain and Northern Ireland)]	
5218	11	4	11	6	no level of confidence associated to this paragraph. If it doesn't have an associated level of confidence, or if this is lower than "medium confidence", we would like to delete the paragraph. SPM should only include statements with an associated level of confidence. [Spain]	
5278	11	4	11	6	B 6.2 is weaker with 'may' alleviate the impacts of climate change-however in the report of Chapter 4 (page 88) it's stronger with 'can' strengthen. [Zambia]	
5750	11	4	11	6	This is true for any level of warming. Is there something more specific for 1.5oC? Also, financial flows towards some projects enhancing and strengthening climate change adaption can simultaneously contribute to emissions (i.e. investments directed towards securing pipelines of natural gas as the permafrost thaws). Financial investments need to be directed to projects with high overall sustainability prestanda. It might be useful to note also here on the need of minding both adaptation and mitigation dimensions. [Sweden]	
6460	11	4	11	21	a comparison with the impacts of 2 degrees is missing here [Netherlands]	
6612	11	4	11	6	B 6.2 is weaker with 'may' alleviate the impacts of climate change-however in the report of Chapter 4 (page 88) it's stronger with 'can' strengthen. [Sudan]	
6896	11	4	11	6	B 6.2 is weaker with 'may' alleviate the impacts of climate change-however in the report of Chapter 4 (page 88) it's stronger with 'can' strengthen. [Gambia]	
7112	11	4	11	6	The report mentions about stranding of assets and need to redirect the investments away from conventional systems. The point about stranded assets should now be used to argue for including them in any cost-benefit analysis of coal and renewables; rather than being used, as in the report, for reducing investments that lead to stranded assets. That is, the social costs of stranding say coal-related assets (disruption of communities, increasing NPAs and hence government resources for recapitalization) should explicitly be incorporated in cost-benefit analysis. [India]	
7116	11	4	11	6	Also add comparison with 2 deg. C warming. [India]	
7906	11	4	11	6	B6.2 lacks a confidence statement. [United States of America]	
7908	11	4	11	6	The phrase ""some of"" should be inserted before the words ""the impacts"" in the following sentence if everything else up to this point in the SPM is true: ""B6.2. Infrastructure investments and innovative mechanisms to target finance towards adaptation, including transformational approaches, at various scales may alleviate the impacts of climate change at 1.5°C."" This finding could be deleted because it applies to 2.0°C as well as 1.5°C warming. [United States of America]	
7910	11	4	11	6	The B6 bullets are hardly useful in understanding the 1.5 vs. 2.0°C difference. If authors meant to say that current adaptation is not working, and further infrastructure and innovation needed to adapt to 1.5°C, then explicitly make the point. "transformational" means what? "innovative" is not transformational? Much of this framing is jargon and the terms need to be defined. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7912	11	4	11	6	This statement is too vague to convey any concrete information; use of phrases like "innovative mechanisms" and "transformational approaches" are essentially meaningless without examples. Suggest deleting statement. [United States of America]	
7914	11	4	11	6	This paragraph is confusing and should be heavily revised or removed. [United States of America]	
7916	11	4	11	6	A level of confidence is likely needed for this statement. [United States of America]	
7918	11	4	11	6	B6.2 seems to imply that infrastructure and finance are all that are needed to alleviate climate impacts. Clarify that these are specific needs in a larger context. [United States of America]	
7920	11	4	11	21	The adaptation discussion in paragraphs B6.2 - B6.4 is out of place with the focus of SPM section B ("Projected climatic changes, their potential impacts and associated risks at 1.5°C global warming"). These paragraphs should be moved to Section D. [United States of America]	
8408	11	4	11	6	B 6.2 is weaker with 'may' alleviate the impacts of climate change-however in the report of Chapter 4 (page 88) it's stronger with 'can' strengthen. [Nepal]	
8586	11	4	11	5	Could benefit from rewording to increase clarity [Ireland]	
9488	11	4	11	6	Recommend restating the bullet to allow for an assessment of confidence. [Canada]	
2362	11	5	11	5	Please replace "at various scales may alleviate the impacts of climate change" with "at various scales may alleviate some of the impacts of climate change". Otherwise the sentence may be understood as if all of the impacts could be alleviated through the mentioned actions, which is certainly not the case. [European Union (EU)]	
7922	11	5	11	5	"transformational approaches" is a vague. Define or give examples. [United States of America]	
7924	11	5	11	6	The phrase "including transformational approaches, at various scales" should be deleted. It results in awkward syntax and is not essential to the core point of the paragraph, especially since it is not obvious what "transformational approaches" even means. Also, the phrase "at various scales" does not limit the point. [United States of America]	
5930	11	6	11	6	This paragraph is difficult to read, we suggest deleting it because most of the information is already provided in the following paragraphs (finance would be better covered in section C). [Belgium]	
2364	11	8	11	16	Explain to what extent B6.3 is true for any mitigation scenario, or specific to 1.5. [European Union (EU)]	
2366	11	8	11	16	Are these options different at 2 degrees? Please introduce a comparative assessment. Otherwise, this paragraph provides no new information. [European Union (EU)]	
3646	11	8	11	8	What is meant with "options considered feasible …are...", does this relate to the feasibility considerations in chapter 1? Are the other options in the paragraph not "feasible"? In order to avoid confusion, we suggest writing "options include". Please check all references, e.g. we do not find the first statement assessed in chapter 4. [Germany]	
4810	11	8	11	16	This is a long and complex paragraph. Could be rewritten to give it greater clarity and become easier to read. [United Kingdom (of Great Britain and Northern Ireland)]	
4988	11	8	11	16	Are these adaptation options unique to global warming of 1.5C? Are they also possibilities for 2C or higher? Also, on a more general point, from a practitioners point of view, and taking into consideration, a 1.5C pathway still means a chance of exceeding 1.5C, does it make sense to only be talking about adapatation to 1.5C? Under a risk management approach, it's prudent to adapt to a higher level of warming. [United Kingdom (of Great Britain and Northern Ireland)]	
5932	11	8	11	21	B6.3 and B6.4 are very good and useful paragraphs [Belgium]	
6462	11	8	11	16	Point B.6.3: These adaptation options also hold for 2 degrees I would guess. It should be explained where the differences are with 2 degrees. [Netherlands]	
6836	11	8	11	16	How would the adaptation options for 2degrees celcius differ? [United Arab Emirates]	
7118	11	8	11	16	Also add comparison with 2 deg. C warming. [India]	
7926	11	8	11	16	Are these cost-effective? Or just feasible? Is there any information that can be provided on costs and benefits? [United States of America]	
7928	11	8	11	16	This is not specific to 1.5°C and should be removed. The first sentence is poorly drafted and confusing. [United States of America]	
7930	11	8	11	16	Consider leading with a sentence stating adaptation options exist for different sectors. Then, go through the sectors, but no need to list all of the options; give clear examples. "efficient livestock" is not clear, nor is "adapting buildings and land use through regulation and planning." [United States of America]	
7932	11	8	11	16	Some of the ideas referenced in Section 4.3.3, page 4-27, have a profound influence on our ability to limit warming to 1.5°C and could be brought forward into the SPM. The text reads: "There will be approximately 70 million additional urban residents every year through to the mid part of this century (UN, 2014). The majority of these new urban citizens will reside in small and medium sized cities in low- and middle-income countries (Cross-Chapter Box13 in Chapter 5). The combination of urbanisation and economic and infrastructure development could account for an additional 226 GtCO2 by 2050 (Bai et al. 2018). However, urban systems can harness the mega-trends of urbanisation, digitalisation, financialisation and growing sub-national commitment to smart cities, green cities, resilient cities, sustainable cities and adaptive cities, for the type of transformative change required by 1.5C-consistent pathways (Revi and Rosenzweig, 2013; Parag and Sovacool, 2016; Roberts, 2016; Wachsmuth et al., 2016; Revi, 2017; Solecki et al., 2018)." [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8588	11	8	11	16	The co-benefits associated with land mitigation measures and climate resilience should be highlighted [Ireland]	
9292	11	8	11	16	Bullet too long and mixing several issues. [Switzerland]	
3648	11	9	11	9	Please change "resilience of existing infrastructure" into "resilience of existing and new infrastructure" as new infrastructure with more climate-resilient water management and cooling strategies requirements will be built even if not consistent with far-reaching transformations required in the energy sector (cf. Chapter 4, p. 107, lines 5-10). [Germany]	
4540	11	9	11	9	The text is not clear: "water management and cooling strategies, and resilience of existing infrastructure" or "water management, cooling strategies, and resilience of existing infrastructure". We may want to remove the first "and," i.e., "water management, cooling strategies, and resilience of existing infrastructure. [Japan]	
7934	11	9	11	9	The word "enhancing" should be inserted before the word "resilience" for this line to make sense. [United States of America]	
2368	11	1	11	11	add: …community based and ecosystem-based adaptation … (CBD, UN language) [European Union (EU)]	
2370	11	1	11	13	Most of the listed "Adaptation options for land and ecosystems" are non-specific and sometimes not even clear how they are linked to adaptation. How should "Efficient livestock" be interpreted? If it is production efficiency, then it assumes highly specialised breeds that are likely to be more sensitive to environmental changes and less resilient to changing conditions. Resilient/diverese livestock farming would seem more relevant to mention. "Ecosystem restoration" raises the question of restoring to what: just restoring pre-existing ecosystems, if feasible at all, may very well lead to maladapted systems if the climate and related environmental factors have changed. See, e.g., Matzek V, Gornish ES, and Hulvey KB, 2017. Emerging approaches to successful ecological restoration: five imperatives to guide innovation. Restoration Ecology 25: S110- S113. Avoided deforestation is not an adaptation measure as such. It is aimed at reducing further harm, and would be needed without regard to climate change (lest all forests would be lost). "Adaptations options" should have some specificity to adaptation, so they should indicate actions that are different from those that would be needed in the absence of climate change. One could argue that the imperative to avoid deforestation is higher with climate change than it is without, but then it would be more correct to name conservation measures (in general) and the diversification of farming and land management systems (in general) as priorities that gain importance in light of adaptation needs. [European Union (EU)]	
4344	11	1	11	16	Through implementation of Conservetion agriculture, mentioned in this section B6.3, one can reduce soil erosion and sequester more carbon in the soil in the form of soil organic matters. These strategies need to be included in climate change adaption technologies. It has been known that 0.4% of total carbon stored in upper 2m of earth is comparable with that (8.9Gt C) coming from fossil fuel emission worldwide. 30% of carbon is stored in upper top 30cm of soil, thus sustainable topsoil management is important for climate change adaption. These should be included in Carbon budget (section C1.2). In particular, it is necessary to specify in detail which region and season. [Republic of Korea]	
5752	11	1	11	1	It is a bit unclear what is meant by "land and ecosystem ... systems". It could, for clarity, be expressed whether "land and ecosystem ... systems" exclusively refers to "land use activities" such as agriculture, forestry etc, or also includes "natural" ("unmanaged") systems with adaptation requirements. [Sweden]	
7936	11	1	11	13	There are many problems in this sentence, which contains an incoherent list of adaptation options. Agriculture is listed separately from efficient irrigation. Agriculture alone is not an adaptation. A comma should be inserted after the word "conservation" because "conservation agriculture" does not make sense. And doesn't one conserve or protect biodiveristy rather than manage it? What is "efficient livestock"? [United States of America]	
7938	11	1	11	13	B6.3 should not lump agricultural related adaptation options with biodiversity/ecosystem related adaptation options given that agriculture is one of the major drivers of biodiversity loss, habitat degradation, and habitat fragmentation. Suggest one sentence on adaptation options for productive landscapes/food production and a second sentence on the needs around biodiversity conservation/ecosystems. The text could also acknowledge that it is very useful to seek approaches to agriculture and development that complement rather than compete with habitats and landscapes that provide multiple services upon which people depend. [United States of America]	
7940	11	1	11	13	Consider using words and concepts such as "climate smart agriculture" that are used commonly across developing countries to encompass statements like "Adaptation options for land and ecosystems at global warming of 1.5°C include conservation agriculture, efficient irrigation, efficient livestock, agroforestry, community-based adaptation, ecosystem restoration and avoided deforestation, biodiversity management and coastal defence and hardening (high confidence)." It is language frequently used by most partners and an IPCC document that references the language will be attractive to policymakers from many countries. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7942	11	1	11	13	This description of adaptation options in agriculture omits some of the clearest options in which authors can express the most confidence, such as switching to crops (or mixes of crops) that tolerate higher temperatures and produce more reliable yields even if maximum yields are lower than those of the highest-yielding cultivars under optimal climate conditions. Crop switching can refer to switching cultivars, species, or, e.g., from small mammals to poultry. Those options have much clearer differences in the system's response to climate variability and extremes than do most management practices applied to a single crop (e.g., conservation agriculture, listed in the text). [United States of America]	
8590	11	1	11	21	This section should highlight the multiple benefits and synergies associated with these actions [Ireland]	
8726	11	1	11	13	"afforestation" could be added to this list [New Zealand]	
854	11	11	11	11	Agro-ecology should be mentioned, as an example of agriculture practices with benefits on mitigation, adaptation, biodiversity, water quality, etc. Add : "agro-ecology including agroforestry" and add the reference to {4.3.5.5} [France]	
4542	11	11	11	13	The text is not clear: biodiversity management and coastal defence and hardening ==> biodiversity management, and coastal defence and hardening [Japan]	
8970	11	11	11	11	Suggest clarification: what is "efficient livestock" as an adaptaiton measure? [Australia]	
856	11	12	11	13	Replace "coastal defence and hardening" by "coastal management and nature-based options", and add the references {3.4.5.4, 4.3.7} Because adaptation options for coast are wider than "defence and hardening", and because nature-based solutions are not present enough in the SPM, while they are efficient adaptation options. [France]	
5754	11	12	11	12	Consider adding "...and land degradation" after "...avoided deforestation". [Sweden]	
8772	11	12	11	12	to add "combating of dust storm& drought" [Iran]	
5220	11	13	11	13	besides coastal defence and hardening include other options such as re-establishment of coastal ecosystems such as mangroves, also mentioned in 4.3.2.3. [Spain]	
7114	11	13	11	15	Refer to underlying report, Chapter 4, Strengthening and implementing the global response:The Report states that enabling green infrastructure, water and urban eco system services, adapting buildings and land use through regulation and planning are feasible. However, the Report falls short of giving any concrete reference and analysis for financial and technological needs. [India]	
7944	11	13	11	15	To better reflect the underlying chapters, green infrastructure and building codes in particular should be strengthened here, with Chapter 4 documentation. Looking at the supporting material in Section 4.3.3.7 (page 4-32) reveals a disconnect between the paragraph and the table. The first paragraph in this section is negative and suggests that green infrastructure is too costly to be effective, while Table 4.2 provides more than ample demonstration of the benefits. Which is it? There is great value in green infrastructure, which should be touted, along with some caution about cost. Readjusting the framing would help. [United States of America]	
7946	11	13	11	15	Discussion of green infrastructure and (implicit discussion of) building codes would benefit from greater Chapter 4 documentation. [United States of America]	
7948	11	13	11	16	Looking to the supporting sections, 4.3.3.3 (page 4-30) reads: "The application of building codes and standards for 1.5°C-consistent pathways will require improved enforcement, which can be a challenge in developing countries where inspection resources are often limited and codes are poorly tailored to local conditions (Ford et al., 2015c; Chandel et al., 2016; Eisenberg, 2016; Shapiro, 2016; Hess and Kelman, 2017; Mavhura et al., 2017)." This paragraph should offer solutions of how building codes can be enforced; as it stands this paragraph only points out constraints while supporting an assertion echoed (appropriately) in the SPM that improved enforcement of appropriate building codes is needed. [United States of America]	
4544	11	14	11	14	The meaning of “green infrastructure” is obscure. More specific description is desirable. For example, the text should be changed to "(...) include green infrastructure (e.g., urban trees planting, urban parks, permeable surfaces), (...)" [Japan]	
5840	11	14	11	14	Instead of green infrastructure, we suggest "resilient infrastructure" as enshrined in the 2030 Agenda for Sustainable Development. [Brazil]	

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7950	11	14	11	16	The underlying text on page 3-102/103 and 3-106 implies a greater degree of certainty for global yields than is conveyed by this sentence. The findings for globally reduced maize yields are more robust than for other crops. Given the variation in crop and regional responses at 1.5 vs 2°C, suggest reformulating the statement to read "Limiting global warming to 1.5°C compared to 2°C would result in a lower global reduction in SOME crop yields and nutritional quality (high confidence), and lower risks to crop production ESPECIALLY FOR MAIZE, AND in Sub-Saharan Africa (particularly West Africa, southern Africa), South-East Asia, and Central and South America." [United States of America]	
7952	11	17	11	18	The underlying text in Chapter 3 (Box 6) does not use the term "food shortages". Suggest replacing "food shortages" with the term "food insecurity." A confidence level should be assigned to this statement. [United States of America]	
858	11	18	11	18	Add : "Several overarching adaptation options that are closely linked to sustainable development, including taking into account Indigenous knowledge, can be…" [France]	
3650	11	18	11	21	The overarching adaption options can not only be implemented across rural landscapes, but also in urban areas (c.f. Executive Summary Chapter 4, 4.3.5, 4.5.3). Please add this aspect. [Germany]	
4346	11	18	11	21	Delete. Or it would be better to change "can' to 'should' and delete the second sentence (There are being implementated today and can also be scaled up for 1.5? of global warming.). [Republic of Korea]	
5222	11	18	11	21	no level of confidence associated to this paragraph. If it doesn't have an associated level of confidence, or if this is lower than "medium confidence", we would like to delete the paragraph. SPM should only include statements with an associated level of confidence. [Spain]	
5756	11	18	11	21	The first part is true for any level of warming. As to the second sentence, what happens beyond 1.5oC? [Sweden]	
7120	11	18	11	21	Also add comparison with 2 deg. C warming. [India]	
7954	11	18	11	2	This list of adaptation options should not be confined to "rural landscapes". They all work in urban areas as well. [United States of America]	
9490	11	18	11	21	Recommending providing rational for listing the specific investment options and add confidence qualifiers to the statements in B6.4. [Canada]	
3652	11	19	11	19	Please reword "insurance for risk management" to read "climate risk insurance for risk transfer" or "market-based (re)insurance that spreads risk and provides a financial buffer against the impacts of climate hazards" consistent with chapter 4, page 37, lines 1-2. [Germany]	
5224	11	19	11	19	we understand this statement also applies to urban landscapes, not only rural [Spain]	
7956	11	19	11	2	As written, paragraph B6.4 is confusing. Suggest deleting text to leave a more concise phrase to streamline the point: ". . . such as investing in health, social safety nets, insurance, and education-based adaptation options. . . ." [United States of America]	
4812	11	21	11	21	"…and can also be scaled up for 1.5C of global warming" is not a particularly insightful statement. An indication of how their implementation would be helpful to counter the effects of warming would be more helpful? [United Kingdom (of Great Britain and Northern Ireland)]	
252	12		13		Please, clarify relationship between the two panels. i.e. "Risks associated with the reasons for Concerns (RFCs)" and "Risks for spesific natural, managed and human systems". [Finland]	
424	12				The chapter 4 executive summary provides an important statement on the fact that adaptation finance is not adequate and will have to be scaled up: "While adaptation finance has increased quantitatively, significant further expansion would be needed to adapt to 1.5°C" (Chapter 4, page 4-5). This should be incorporated into the SPM, perhaps under D6, [Chad]	
434	12				Reference is to Fig. 2.28, but that figure has illegible legends [Chad]	
860	12		13	11	This figure is very interesting and should be kept in the future version of the SPM. However, it is still hard for someone who never read AR5 to understand what are these 5 RFCs, Further explanations could help. We also suggest to write "selected elements" instead of "key elements". This graph doesn't reflect the disparities of levels of risks between countries (for tourism, feasibility of SDGs...), maybe the headline could remind this to the reader. As no quantitative information is given by this figure, there could be a little "conclusion text" added below, in order to summarize the main information of the figure, for instance by highlighting the high risks on coral reefs and artic. [France]	

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2376	12		12		Figure SPM 2 is key. In addition, in the bottom chart, the "Ability to achieve SDGs" should be dropped. It does not fit the description of the chart "specific natural, managed and human systems". Also, given the wide range of SDGs, capturing them under une metric is questionable and cannot be objectively defended. The relatively mild risk it indicates may be applicable to some SDGs, but certainly not to others. [European Union (EU)]	
3910	12				The statement “Assessment of risk at 2°C or higher…” seems not correct. The Figures indicates also risk at 2°C, which we support. And the outline of the report stated that a comparison of risk at 1.5°C and 2°C should be given. So recommend to change to “Assessment of risk at higher than 2°C are beyond…” [Luxembourg]	
4092	12		12		Fig SPM2: The compilation of key findings of the report into updated Reasons for Concern is a major achievement of this report and will provide itself extremely useful in communicating the impacts at 1.5°C, a key part of the mandate of the special report. [Saint Kitts and Nevis]	
4348	12				This Figure should be felt more seriously from the readers' point of view. The main structure of the Figure need to be changed. The elements at the lower panel for ‘Risk for specific natural, managed and human systems’ should be equal level. For example, Mangrove is not the same scale as Crop Yield. In addition, the risk for ‘Ability to achieve SDGs’ is obviously under estimated. What is the rationale in determining the color intensity for risk (both upper and lower panels)? There are so many diverse cases. It is hard to generalize. SPM should provide enough references and figures should be convincable and intuitive. Just mentioning ‘The selection of risks to key elements of the Earth system in the lower panel is illustrative and is not intended to fully comprehensive’ does not provide indulgence. Figures in SPM usually cited quite a lot. Therefore, it is necessary to be extremely cautious when inserting figures. [Republic of Korea]	
4430	12				Change "Artic" by "Arctic" [Czech Republic]	
5014	12		12		The category 'Ability to achieve Sustainable Development Goals (SDGs)' is very broad and parially overlaps with many of the other elements mentioned. [Italy]	
5226	12		12		The key elements are presented here as a function of the risk level assessed between 1.5 and 2°C...add OF GLOBAL WARMING. [Spain]	
5328	12				Consider adding an indication of adaptive capacity to the risk category of "red" in the Reasons for Concern. Examples of the sectors shown in the lower panel of the figure indicate that limits to adaptation are reached or approached under "high" risks (red), for example coral reefs and small-scale fisheries. [Zambia]	
5464	12		12		Fig SPM2: The compilation of key findings of the report into updated Reasons for Concern is a major achievement of this report and will provide itself extremely useful in communicating the impacts at 1.5°C, a key part of the mandate of the special report. [Saint Lucia]	
5494	12		12		We suggest to explain why the authors chose the period (1988-2017) to do the comparison in the analysis? [Mexico]	
5532	12		12		It's not clear which of the four will increase, the discription seems to mention the five without any distiction: Constraining warming to 1.5°C rather than 2°C avoids risk reaching a "very high" level in RFC1 (Unique and Threatened Systems) (high confidence), and avoid risk reaching a "high" level in RFC3 (Distribution of Impacts) (high confidence) and RFC4 (Global Aggregate Impacts)(medium confidence). It also reduce risks associated with RFC2 (Extreme Weather Events) and RFC5 (Large scale singular events) (high confidence). [Mexico]	
5534	12		12		Change In "unique and Threatened Systems" (RFC1) the transition from high… to 1. In "unique and Threatened Systems" (RFC1) the transition from high…It is not numbered [Mexico]	
6664	12				Consider adding an indication of adaptive capacity to the risk category of "red" in the Reasons for Concern. Examples of the sectors shown in the lower panel of the figure indicate that limits to adaptation are reached or approached under "high" risks (red), for example coral reefs and small-scale fisheries. [Sudan]	
6814	12		12		Fig SPM2: The compilation of key findings of the report into updated Reasons for Concern is a major achievement of this report and will provide itself extremely useful in communicating the impacts at 1.5°C, a key part of the mandate of the special report. [Marshall Islands]	
6948	12				Consider adding an indication of adaptive capacity to the risk category of "red" in the Reasons for Concern. Examples of the sectors shown in the lower panel of the figure indicate that limits to adaptation are reached or approached under "high" risks (red), for example coral reefs and small-scale fisheries. [Gambia]	
8452	12				Consider adding an indication of adaptive capacity to the risk category of "red" in the Reasons for Concern. Examples of the sectors shown in the lower panel of the figure indicate that limits to adaptation are reached or approached under "high" risks (red), for example coral reefs and small-scale fisheries. [Nepal]	
9094	12		12		Fig SPM2: The compilation of key findings of the report into updated Reasons for Concern is a major achievement of this report and will provide itself extremely useful in communicating the impacts at 1.5°C, a key part of the mandate of the special report. [Solomon Islands]	
9222	12		12		Fig SPM2: The compilation of key findings of the report into updated Reasons for Concern is a major achievement of this report and will provide itself extremely useful in communicating the impacts at 1.5°C, a key part of the mandate of the special report. [Nauru]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4814	12		12		The index ("level of additional risk due to climate change") is oddly constructed. The lower levels are about detection and attribution, the higher ones are about severity. These things are not the same and shouldn't be presented as a continuum. By conflating a number of issues (1) whether an impact is detectable, 2) whether it is attributable to climate change, 3) the severity of the impact, 4) its reversibility and 5) the ability to adapt to such an impact), many of which are separate and not necessarily related, makes it difficult to derive robust conclusions from the figure. [United Kingdom (of Great Britain and Northern Ireland)]	
4816	12		12		The risks for specific natural, managed and human systems is a collection of not particularly comparable things and putting them side by side could lead to confusion. For example, all sustainable development goals are presented next to mangroves. [United Kingdom (of Great Britain and Northern Ireland)]	
4818	12		12		It may not be clear to many readers what "global aggregate impact" actually means. Could you define. [United Kingdom (of Great Britain and Northern Ireland)]	
4990	12		12		Typo in bottom figure. Should read "Arctic" not "Artic" [United Kingdom (of Great Britain and Northern Ireland)]	
8978	12		12		Suggest clarification: what is the distinction between managed and human systems? [Australia]	
2372	12	1	12	51	the last caption (assessment of risks at 2 degrees) seems to contradict both information in the graph, and in the body of the report (meaning that 1.5 and 2 degrees are actually compared) [European Union (EU)]	
2374	12	1	12	51	The title talks about limits to adaptation for people and economies - yet, it is unlikely that all possible adaptation options are considered in the analysis, in particular when considering future socio-economic developments. Limits to ecosystems may be more clear to identify in this context, but not limits to societies and economies. For instance, estimated impacts of heatwaves are likely to assume no adaptation options (in most of the literature) hence they may overestimate the "limits" [European Union (EU)]	
3654	12	1	12	1	Figure SPM.2, lower panel: column "Ability to achieve SDGs": We are a bit surprised that the level of risk has been assessed for the all SDGs together. The SDGs are so diverse that it does not seem possible to provide a reasonable and credible expert judgement based on the available science to summarize the associated diverse risk levels in one RCF bar. In addition, this RFC does not relate to a specific system as indicated by the title. We therefore suggest deleting or at least separating this bar from the other columns by a vertical dashed line. [Germany]	
3656	12	1	12	1	Figure SPM.2: Please make sure that the colours are the same as in AR5, and that they distinguishable, both on the screen and in print. In the current draft, the "purple" colour is hardly distinguishable from "dark red" (screen and print). [Germany]	
3658	12	1	12	1	Figure SPM.2: The explanation about the RFC and how they have been obtained is not sufficient for the many readers who will not be familiar with the IPCC reports. We therefore strongly urge the authors to add a Box with information from AR5 WG2 Assessment Box 1, please see our comment on SPM 10-34. [Germany]	
3660	12	1	12	1	Figure SPM.2: The subtitle states "the focus is … between 0 and 2C" but the graphics show warming up to 2.5C. While it is useful not to cut-off the graphs at 2C - which is highly relevant to this report - it might be useful to cut a bit below 2.5C and to delete the label "2.5" at the y-axis and , in order to avoid confusion. In addition, it would be sufficient to mention the temperature range under consideration only once, preferably in the caption, and not three times as in the current draft. [Germany]	
3662	12	1	12	1	Figure SPM.2: It would be useful to add the important information on increased risk levels to the subtitle of this figure "The assessed levels of risk have increased for four of the five Reasons for Concern (RFCs) for global warming levels of up to 2°C (high confidence) based on multiple lines of evidence that became available since the previous IPCC assessment report in published in 2014." [Germany]	
3664	12	1	12	1	Figure SPM.2: The description of the levels of risk indicated by the colour scale on the right hand side of the figure should be identical to the one in AR5 WG2 to allow for comparison. This is however not the case for the red and purple risk levels. In addition, the word "index:" below the colour scale should be removed. Please amend the text accordingly. [Germany]	
3666	12	1	12	1	Figure SPM.2, lower panel: The subtitle under the header "Risks for specific natural, …" is not necessary, please delete. [Germany]	
3668	12	1	12	1	We very much support the inclusion of Figure SPM.2 in this report and would like to thank the authors for their efforts to update the RFC with the latest science available for the SR1.5. We strongly urge the authors to make sure that wherever possible relevant information from the lower panel is also provided in a more specific or even quantitative way in the suitable paragraphs in section B. [Germany]	
3670	12	1	12	1	Figure SPM.2, lower panel: Columns should please be ordered either according to severity of risks or alphabetically. Please correct "Arctic". [Germany]	
3998	12	1	12	1	Spelling error in bottom figure: "Artic" should be spelled "Arctic" [Norway]	
4000	12	1	12	1	In the text to the right in this figure it is stated that "assessment of risks at 2C or higher are beyond the scope of the present assessment", but all RFCs goes to 2.5C. Does this mean that risks related to temperatures above 1.5 are assessed after all? Please explain. [Norway]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4002	12	1	12	1	It is somewhat difficult to relate this figure to rest of the SPM due to different use of words. e.g. in B2.2 it is used "terrestrial areas affected by ecosystem transformation", while in Figure SPM3 you use "terrestrial ecosystems". Does B2.2 refer to the RFC "terrestrial ecosystem"? [Norway]	
4004	12	1	12	1	Figure SPM2 lower panel: please consider to include a bar on the risk of multimeter sea-level rise. Also, include a note that some risks occur later (with a delay) than the others. [Norway]	
4006	12	1	12	1	It is somewhat difficult to understand how the 11 RFCs in the lower part of the figure relates to the RFC1-RFC5 established in AR5. What does "key elements" mean in this context? [Norway]	
4008	12	1	12	1	Since this figure concerns risks, please consider to rephrase in the bottom figure, second to the right: "Ability to achieve SDGs" should be renamed to "Risk of not achieving SDGs" [Norway]	
5758	12	1			Figure SPM-2: (1) The text on the top of the page states "between 0 and 2C" while the y-axis on the two panels show the interval between 0 and 2.5C. Please adjust. (2) Legend, top part of the figure, "Red: indicates severe…" -> "Red: indicates risks of severe…". (3) Top, bottom half of the figure: The text states that "… as a function of the risk level assessed between 1.5oC and 2oC". The figure itself would seem to show results from 0 to 2.5oC." This should be resolved. [Sweden]	
5934	12	1			figure SPM-2 : The statement that "Assessment of risks at 2C or higher are beyond the scope of the present assessment" is at odds with the figure because the figure indicate risks up to 2.5°C. In addition, does it mean that the report never compares risk at 1.5 or 2°C with risks above 2°C ? [Belgium]	
5936	12	1			figure SPM-2 : The RFCs needs to be explained. Their names are not sufficiently explicit for the readers to correctly understand what they mean (for example regarding RFC3). [Belgium]	
5938	12	1			figure SPM-2 : We are concerned that some risk indicators in the bottom row could be inconsistent with others. In particular, we have concerns regarding the SDG indicator : 1) it is a highly integrated indicator, so it seems odd to have it under the "risk for (...) specific systems" title; 2) the level of risk indicated for this SDG indicator is difficult to understand because it suggests a moderate risk at 1.5°C, while some specific risks that would influence SDGs are already high at 1.5°C (for example re fisheries). We have the same concern for the "Tourism" indicator, which indicates at most a moderate risk at 1.5°C : does it mean that tourism affected by reduced mountain snow and degraded ecosystems such as coral reefs is not important for tourism? [Belgium]	
5940	12	1	12	1	Figure SPM-2 Please consider adding water scarcity as an additional sectoral risk indicator. [Belgium]	
6464	12	1	13	11	Figure SPM-2 states that 'The figure is updated since AR5…' but it is not clear whether it has changed significantly. I don't think so. At least indicate the most important updates, if any. [Netherlands]	
7122	12	1	12	1	Fig. 2: Level of risk of global monsoon rainfall, mountain glaciers such Himalayan Glaciers, and Greenland Ice Sheet may also be included. [India]	
7124	12	1	12	1	While defining the global average temperature, the definition of SAT needs to be specified as the near surface air temperature at 2 m or 10 m height. [India]	
7958	12	1	12	1	Risk figure is confusing. The opening bullet of the SPM says 1.0°C global warming and this adds an extra line at 0.87°C. Also, the title says the risks are evaluated at warming from 0 to 2.0°C, yet the table legend says risks "AT 2°C or higher are beyond this scope". It seems as though risk at 2.0°C is evaluated, but >2.0C is not -- fix and make consistent. [United States of America]	
7960	12	1	12	1	Arctic is misspelled in bottom panel, second element. [United States of America]	
7962	12	1	12	1	The draft SPM does not provide policymakers with an understanding of the projected regional differences in temperature and precipitation change (or changes in extremes) at 1.5° and 2.0°C of global warming. This important oversight can be easily addressed with the addition of Figure 3.3 or 3.4 to the SPM, either of which depict regional changes in the physical climate system and provide important context for comparing impacts of 1.5°C versus 2.0°C. These global maps of temperature and precipitation change are more important than several other figures (e.g., SPM-2) in the draft SPM that are difficult to understand and less important to policymakers. [United States of America]	
7964	12	1	12	1	For Figure SPM-2, bottom panel: It's not clear that the line beneath the title (Risks for specific natural, managed and human systems) is necessary or accurate; the heading at the top of the page seems to be a better description, stating "the focus is on levels of global warming between 0 and 2°C." The inclusion of "Ability to achieve SDGs" stands out as odd and distracting. Suggest removing. The others are fairly specific and amenable to some quantification and offer much more tangible information. The Arctic category in the bottom panel is confusing. If it's meant to be Arctic sea ice, it should simply state that. [United States of America]	
7966	12	1	12	1	There is no basis for this figure in the text and, as such, it is confusing to the reader as there is no explanation of what the RFCs are, and how they were developed. The lower section has a very diverse and specific list of impacts. It is unclear what methodology was applied to choose these impacts. Are these the most certain? The ones that are affected most significantly? To the reader this figure presents more questions than answers, therefore should not be included in the SPM. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7968	12	1	12	1	Following the figure, it would be useful to highlight the systems and reasons for concern for which there is the greatest difference between 1.5 and 2°C. This would be helpful in highlighting the most salient differences in impacts between the two temperature thresholds. [United States of America]	
7970	12	1	12	1	Each sentence should have a confidence statement. [United States of America]	
8592	12	1	12	5	Some risks for specific systems are clearly defined but some e.g. ability to achieve SDGs, are very vague. Focus on specific and easily-defined risks for greater clarity [Ireland]	
8972	12	1	12	5	Suggest adjusting the y-axis labels for the two figures so they don't extend beyond the side of the figures. [Australia]	
8974	12	1	12	5	Suggest rephrasing to: "Warm water corals and Coral reefs" to be more consistent with other x-axis labels in this figure. [Australia]	
8976	12	1	13	5	Suggest relocating the Figure SPM 2 to the previous page to enhance clarity of the figure describing RFCs [Australia]	
9492	12	1	12	1	Figure SPM.2: Text above the figures states: "the focus is on levels of global warming between 0 and 2C". Text in the right column states: "Assessment of risks at 2C or higher are beyond the scope of this assessment". The figures have y-axes that extend to 2.5C. Please correct these inconsistencies. In chaper 3, section 3.5.2, text states: "Since the focus of the assessment is on warming of 1.5C to 2.0C, no assessment for global warming of 3C or more are included and the embers here (i.e. in the Figure) are discontinued at 2.5C." Consider using this language to describe Figure SPM.2. [Canada]	
4576	13		13		Footnote 6 describes that "new literature shows larger remaining 1.5°C and 2°C carbon budgets compared to those reported in AR5" and "expresses the remaining carbon budget relative to a recent period that reflects the observational record". The differences in carbon budget estimate between AR5 and SR1.5 have significant implications for future mitigation actions. In this context, we would propose for consideration the inclusion of the Figure 2.3 of Chapter2 with its relevant explanation in the SPM, to indicate uncertainty in the temperature/cumulative emissions relationship, the differences between estimations from models and the observed records for surface temperature, as well as those between estimates arising from changing the reference period. For your reference, this Figure 2.3 and similar figures in AR5 were posted both in the SPM of WG1 and the Synthesis Report. As the relevant explanation, the followings are suggested based on descriptions in Section 2.2.2.1 in Chapter 2:"This report cannot give a simple remaining carbon budget for 1.5- and 2.0-consistent pathways due to remaining uncertainties. Since the AR5, many estimates of the remaining carbon budget for 1.5°C have been published, but these estimates cover a wide range as a result of differences in the models used, and of methodological choices, as well as physical uncertainties. Some estimates are exclusively model-based while others are based on observations or on a combination of both." [Japan]	
254	13	1	13	11	Fig caption could shortened, e.g if: "The dependence of risk on the extent of global warming for five Reasons for Concern (RFCs) together with a range of key elements of the Earth system, on the level of global warming" would be removed and instead the text would start with "Comparison of the increase in risk across reasons for concern (RFCs) or earth system elements, indicates the relative sensitivity to increases in global mean temperature above pre-industrial levels." Other parts of the text could follow in the order they are now. [Finland]	
344	13	1	13	1	Page 12, agenda (at the right side of the page): 'Yellow indicates that associated impacts are both detectable and attributable to climate change with at least medium confidence.' Graphs are very impressive, but may be a bit misleading. Yes, impacts can be detectable and attributable, BUT VERY SMALL! Application of the burning embers approach is disputable in this particular case. [Russian Federation]	
3672	13	1	13	11	Please provide information on the 0.87 °C line. [Germany]	
3674	13	1	13	11	Please provide more background to the "expert judgement" and add to the current text "The levels of risk illustrated here reflect the expert judgment of the report authors.", e.g. from AR5 WG II: "... using the following specific criteria: large magnitude, high probability, or irreversibility of impacts; timing of impacts; persistent vulnerability or exposure contributing to risks; or limited potential to reduce risks through adaptation or mitigation. Key risks are integrated into five complementary and overarching reasons for concern (RFCs)." Providing such information is key for the credibility and integrity of the assessment. It would also be useful to add the important information on increased risk levels from paragraph B5.6 "The assessed levels of risk have increased for four of the five Reasons for Concern (RFCs) for global warming levels of up to 2°C (high confidence) based on multiple lines of evidence that became available since the previous IPCC assessment report in published in 2014." This information could also be added to the box on the RFC we are suggestion, please see our comment on page 10 line 24 and on figure SPM.2. [Germany]	
3676	13	1	13	11	The caption is difficult to understand, please improve language and focus. E.g., the first sentence contains twice the expression "global warming." Please exchange "extent" by "level" as elsewhere in the SPM. The second and the third sentence provide very similar information. What is an "RFC component"? [Germany]	
6466	13	1	13	11	Please repeat the description what is meant by RFC1 to 5 from the figure caption in WGII AR5 [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7972	13	1	13	11	With respect to unique events and their occurrence, at 1°C there are already calls for creating a sixth intensity category for typhoons and hurricanes -- with record events already occurring. This very important change does not seem to be recognized in the revision of the RFCs, but should be. The Arctic would seem to be experiencing impacts worse than indicated by the indicated coloring. Also suggest some major terrestrial ecosystems, such as North American pine forest, are already experiencing more severe impacts than indicated. And fluvial flooding is certainly being exasperated by more and more frequent occurrence of what used to be 1-in-100 year storms. [United States of America]	
7974	13	2	13	3	Suggest deleting "on the level of global warming." [United States of America]	
2378	13	3	13	3	Do the coulour sharing refer to the additional risks due to climate change (i.e. only climate change hazards are included, and the "baseline" climate hazards impacts substracted? [European Union (EU)]	
7976	13	3	13	4	Suggest deleting "due to climate change" and inserting "global" before "temperature". [United States of America]	
3678	13	6	13	6	Please explain the abbreviation AR5 with The Fifth Assessment Report, also in the subtitle of figure SPM.2 on page 12. [Germany]	
7978	13	7	13	7	Suggest deleting the second mention of "global warming" after 2°C. [United States of America]	
9616	13	7	13	7	Delete global warmingafter 2°C [Madagascar]	
4528	13	8	13	8	There are several proposals to the Figure SPM 2. - In the explanation of Figure SPM 2 in the SPM, it is mentioned that "The levels of risk illustrated here reflect the expert judgment of the report authors." For increased clarity, we would appreciate it very much if a footnote could be added to provide relevant information regarding this expert judgement. - As with the RFCs figure used in AR 5, "Global mean temperature change "or "Average global temperature above pre-industrial level" could be increased to 5 degrees, if it is appropriate to do so in light of object of this 1.5 degree special report. - The contents updated from RFCs illustrated in AR5, and their reasons, which are written in the executive summary in Chapter 3 (page 3-12 and 3-13), could be stipulated in SPM too, to promote further understanding. - It would be better to clarify whether the adaptation measures are considered for this risk assessment or not; and if adaptations are considered, the levels and sectors assumed. [Japan]	
5228	13	8	13	8	add OF GLOBAL WARMING after 2ºC [Spain]	
7980	13	8	13	1	The important caveat that this figure is based on expert judgement of the authors, not an assessment of the literature, should be made clear in the figure itself, whether it remains in the SPM or only appears in the underlying report. [United States of America]	
4546	13	11	13	11	It is unclear whether it means that references are entire subsection 3.5, or only 3.5.2.1 through 3.5.2.5. [Japan]	
7982	13	11	13	11	This key statement (also in WGII AR5) needs to be noted, particularly in the opening definitions. [United States of America]	
862	13	14	15	29	This section is a little over-optimistic in comparison to the chapter material. It tends to highlight more the (questionable) feasibility and somewhat downplay the challenges, constraints, and barriers. [France]	
1688	13	14	13	14	Suggest adding to title: "and the requirements for urgent action" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Belize]	
1690	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Belize]	
2380	13	14	13	14	QUESTION: are natural solutions/ecosystems embedded in these emission pathways. As ecosystems play a key role for mitigation (see Griscom et al, PNAS October 31, 2017; vol 114 no 44; 11645-11650), it needs to be clearly stated whether the proposed emission pathways include the natural solutions [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3680	13	14	15	3	Paragraphs and subparagraphs of C should be reordered to highlight most policy-relevant findings and achieve a more balanced representation of the key results. Please move current C3 forward to become C2, so the section C2 starts with "rapid and far reaching system transformation", where a second sentence should be added along the following lines "The majority of 1.5C pathways require net-zero carbon emissions around mid-century and reach GHG-neutrality in the 2060ies or 2070ies, compared to 2C pathways in this report that reach CO2 neutrality after 2060, and GHG-neutrality towards the end of the century (please cf. Table 2.4 for exact numbers and formulation). This puts the emphasis on the necessary whole system transformation and would counter the current bias towards focusing almost exclusively on CO2-mitigation. Also, re-order and revise the subsections of C1 to include more detail on conditionality and key mitigation measures, and reduce focus on carbon dioxide budgets (see our comments on subparagraphs of C for more detailed suggestions). [Germany]	
3682	13	14	15	32	Section C mentions 2030, 2050 or mid-century as mile stones for emission reductions or deployment of certain technologies. The current formulations do not convey the fact that these are goal years, and that urgent action is needed from now on. In addition, timeframes are associated with uncertainties. Please reformulate throughout the text "from now on and by around 2050 at the latest" and "from now on and by around mid-century at the latest". [Germany]	
3684	13	14	17	9	This section uses a lot of acronyms (BECCS, AFOLU, SDGs, CCS, CDR, ...) which impedes the understanding of the text. We urge the authors to revise the language and to remove scientific jargon from section C. For example, SPM-13-47 mentions an "interquartile range" or SPM-14-19 talks about "geophysical understanding". Please revise to improve readability for a broader audience. [Germany]	
3686	13	14			Please add in Section C2 the following findings from Chapter 3 ES: "Land use and land-use change emerge as a critical feature of virtually all mitigation pathways that seek to limit global warming to 1.5°C (robust evidence, high agreement).", "Large-scale, deployment of BECCS and/or AR would have a far-reaching land and water footprint (medium evidence, high agreement)." " The impacts of large-scale CDR deployment can be greatly reduced if a wider portfolio of CDR options is deployed, a holistic policy for sustainable land management is adopted and if increased mitigation effort strongly limits demand for land, energy and material resources, including through lifestyle and dietary change (medium agreement, medium evidence)." Rationale: These findings point out the risks of CDR and should be an integral part of an integrative assessment of CDR. [Germany]	
3688	13	14			As relative uncertainties for any carbon (CO2-) budget become very large for small temperature targets, and even more so for pathways that imply significant overshoot and subsequent carbon dioxide removal, we strongly suggest to put less focus on the carbon budget approach in Section C (beyond its general message of bringing CO2 to zero, cf. our comments below on p13 ln 31-44, general and revision C.1.3); Comparing revised C budgets to the 2100 Carbon budgets of archetype pathways (cf. Fig 2.10) it seems that those are roughly compatible, hence the revised budgets do not substantially affect the timing of emission pathways and of net-zero emissions. Key findings of this section should highlight the most robust findings, such as early peaking, very steep curbing of emissions, and net zero CO2 around 2050. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3690	13	14			While we do understand that limiting (cumulative) CO2 emissions is key for 1.5C pathways, we find the treatment of mitigation options for non-CO2 forcing underrepresented in the SPM. Apart from general statements about parallel and stringent reductions in non-CO2 GHGs, there is no detail given about options or policy instruments to reach those reductions, or the benefits of stringent mitigation of SLCFs and NOx. As many mitigation options for NOx and CH4 concern AFOLU and industry, this also creates an imbalance in treatment across sectors. Drawing from ES of Chapter 2, we recommend to at least include the main messages. Currently, only the statement about N-emissions rising with bioenergy demand is included in the SPM. Also, the information that non-CO2 mitigation is close to the achievable maximum in most pathways is information that is valuable in the context of framing the overall mitigation challenge. "Non-CO2 emissions contribute to peak warming and thus affect the remaining carbon (dioxide) budget. The evolution of methane and sulphur dioxide emissions strongly influences the chances of limiting warming to 1.5°C. In the near-term, a weakening of aerosol cooling would add to future warming, but can be tempered by reductions in methane emissions (high confidence). Uncertainty in radiative forcing estimates (particularly aerosol) affects carbon (dioxide) budgets and the certainty of pathway categorizations. Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence). In many cases, non-CO2 emissions reductions are similar in 2°C pathways, indicating reductions near their assumed maximum potential by integrated assessment models. Emissions of N2O and NH3 increase in some pathways with strongly increased bioenergy demand. {2.2.2, 2.3.1, 2.4.2, 2.5.3}" In addition, conclusions from Ch4 ES (4-7, para 3) should be integrated: "Though CO2 dominates long-term warming, the reduction of warming Short-Lived Climate Forcers (SLCFs), such as methane and black carbon, can in the short term contribute significantly to limiting warming to 1.5°C. Reductions of black carbon and methane would have substantial co-benefits (high confidence), including improved health due to reduced air pollution. This, in turn, enhances the institutional and socio-cultural feasibility of such actions. Reductions of several warming SLCFs are constrained by economic and social feasibility (low evidence, high agreement). As they are often co-emitted with CO2, achieving the energy, land and urban transitions necessary to limit warming to 1.5°C would see emissions of warming SLCFs greatly reduced. {2.3.3.2, 4.3.6}" [Germany]	
3912	13	14	13	14	We would recommend including more quantified information on the difference between 1.5°C & 2°C pathways as well as the importance of reductions in non-CO2 we would thus recommend to the simplest insert a simplified version of Table 2.4 into the SPM. [Luxembourg]	
4012	13	14			Paragraph C1.4 contains a very important and policy relevant message. Please consider to lift paragraph C1.4 up to become C1.1, the first paragraph after the bold C1. [Norway]	
4128	13	14	13	14	Suggest adding to title: "and the requirements for urgent action" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Saint Kitts and Nevis]	
4130	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Saint Kitts and Nevis]	
4206	13	14	13	14	Suggest adding to title: "and the requirements for urgent action" (see ES chapter 2 2-4). [Saint Kitts and Nevis]	
4208	13	14	13	14	A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4240	13	14	15	32	The current C, which describes the three aspects of emission pathways, key technologies (CDR, especially BECCS) and energy transition for 1.5°C warming respectively?lacks the elaboration of costs associated with 1.5°C-consistent pathways as found in the underlying report. So it is suggested to relocate the cost-related texts in D2.1 and D2.3 to here (page 15) as an additional section C4, which consists of C4.1, C4.2 and C4.3. The proposed additions are as follows: C4.Limiting global warming to 1.5°C would require much higher cost and investment than 2? C4.1. Price for carbon for 1.5? pathways could be significantly higher than those in 2? pathways. For instance, 135-5500 US$2010/tCO2eq in 1.5? compared to 10-200 US$2010/tCO2eq in 2? for the year 2030, and 245-13000 US$2010/tCO2eq in 1.5? compared 45-960 US$ 2010/tCO2eq in 1.5?for the year 2050?2.5.2.1?. Source: As stated on page 79, Chapter 2 of the underlying report, specifically in “2.5.2.1 Economic and financial implication of 1.5? pathways”, in 2?-consistent pathways, the carbon price in 2030 will stand at 10-200 US$2010/tCO2eq, that in 2050 at 45-960 US$2010/tCO2eq, while in 1.5°C-consistent pathways, the carbon price in 2030 will stand at 135-5500 US$2010/tCO2eq, that in 2050 at 245-13000 US$2010/tCO2eq. These data indicate that 1.5? may have to claim a higher economic cost than 2?. C4.2. Abatement costs resulting in 1.5°C-consistent pathway modeling are 3-4 times higher, on average, compared to holding warming to 2?. Source: Considering that the costs of abatement are directly related to the pathways given in C, the information on which is all derived from Chapter 2 of the underlying report, it is suggested to relocate the textual D2.1 in SPM (line 36-37, page 19) to here as C4.2. C4.3 Limiting warming to 1.5°C requires a marked shift in investment patterns, and energy system supply-side investments between now and mid-century, reaching levels of between 1.6-3.8 trillion USD2010yr–1 globally on average over the 2016-2050 timeframe?2.5.2.2?? Source: Page 83, Chapter 2 of the underlying report. It is also suggested that part of the text on investment in the original D2.3 (line 45, page 19) be relocated to here to be consolidated with the current C4.3. The texts that have been relocated from the original D2.1 and D2.3 forward to here are no longer repeated in D. [China]	
4440	13	14	13	49	The segments on risks and impacts clearly distinguishes between warming at 1.5 and 2 degree celsius. While the pathways and global carbon budgets associated with 1.5 degree celsius warming are central to this report, it is also important to state what are the pathways and carbon budgets associated with 2 degree celsius warming, based on the new literature. Footnote 6 recognises that there are now higher carbon budgets for both 1.5 and 2 degree celsius scenarios. It is not clear quantitatively the differences between 1.5 and 2 degree celsius with the information presented here. Authors may also wish to elaborate in the SPM what are the developments and updates in findings on global carbon budgets and pathways since the publication of the AR5, and how these new figures compare with the AR5 findings. This is done for the impacts segment (Paragraph B5.6, page 10, lines 34-40) but in terms of pathways, reflected only very broadly in Paragraph C1.2. [Singapore]	
4548	13	14	15	49	Section C describes no explanation how 1.5°C-consistent pathways are given. This information is necessary for Policy Makers to understand the assessment. Should add descriptions on methods to give 1.5°C-consistent pathways just like AR5WGIII SPM4.1 (p 10). [Japan]	
4820	13	14	15	29	Regarding the overall discussion on emission pathways in the SPM, it would be very helpful when providing numbers and characteristics of 1.5C pathways to also provide the same for 2C pathways. This would be very helpful for policymakers in order to enable them to better understand the effort required for 1.5C. Moreover, this would provide important detail in terms of "strengthening the global reponse" as per the IPCC remit for the report, and would be consistent with the approach adopted in Section B on impacts. [United Kingdom (of Great Britain and Northern Ireland)]	
5382	13	14	13	14	Suggest adding to title: "and the requirements for urgent action" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Saint Lucia]	
5384	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5760	13	14	13	14	Section C discusses synergies and trade-offs with sustainable development. It would seem that synergies also with air quality policy (a policy area of high concern in many key greenhouse gas emitting countries) should be expressed, in quantantive terms e.g. number of avoided premature deaths or economial benefits (see Chapter 2.5.3). Another possible improvement could be to explicitly mention the connections with ecosystem-based approaches to adapatation and disaster risk reduction and how such measures are connected to and can contribute to the realization of emission pathways and system transitions consistent with 1.5°C global warming. [Sweden]	
6248	13	14	13	14	Suggest to consider adding to title: "and the requirements for urgent action" (refer to ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section, that is, “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions pathways over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Fiji]	
6732	13	14	13	14	Suggest adding to title: "and the requirements for urgent action" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Marshall Islands]	
6734	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Marshall Islands]	
7984	13	14	15	32	The discussion of emissions pathways to 1.5C (Section C) is much improved from the previous draft. One of the most important observations that is made by the Special Report is buried in the last line of a sub-bullet to the third finding, namely: "There is no documented historic precedent for the scale [of energy, land, urban and industrial system changes] found in 1.5°C-consistent pathways. (C3.1)" This very important finding is buried deep in the document. Along similar lines, the issue of stranded assets does not occur. This is another issue that has received significant attention in the literature, but which is not mentioned in the SPM. [United States of America]	
8650	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Grenada]	
9054	13	14	13	14	Suggest adding to title: ""and the requirements for urgent action"" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Solomon Islands]	
9140	13	14	13	14	Suggest adding to title: ""and the requirements for urgent action"" (see ES chapter 2 2-4). A relevant point from C2 ES seems to be missing in this section: “Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of peak warming being kept to 1.5°C (high confidence).” [Nauru]	
9142	13	14	15	29	The report fails to adequately outline the implications of the very rapid developments in RE and costs and its implications for global pathways. The AR5 finding that fossil fuels would be the cheapest source of energy for decades is outdated already today. This has been shown to fundamentally affect the assessments of future cost-effective pathways including the prospects of near term action (see e.g. Creutzig et al. 2017). This very significant development is insufficiently reflected in the current SPM and in the underlying ES. An assessment of these implications on key AR5 findings as well as the implications for cost-effective 2030 1.5°C GHGeq levels should be included. [Nauru]	
9294	13	14			In section C a statement should be added on the timing when emissions need to fall (as shown in Fig SPM3), i.e. in most 1.5°C consistent pathways around 2020, latest by 2030 but then with massive negative emissions in the second half of the century. This is a key (policy) message that should be explicitly made in this report. [Switzerland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9296	13	14	22	1	This comments refers to both sections C and D: a perspective on the implications of 1.5°C for national-scale emission reduction is missing (except for the NDC assessment). This results in a reduced tangibility (and specificity) because the national scale is fundamental for emission reduction (e.g. considering different levels of development and capacities). Why is this missing? can it be found elsewhere in the report? Can it be added? Political sensitivity of this issue does not justify ignorance/non mentioning, especially in view of the responsibilities of IPCC to assess existing science. Related to this are questions of justice and responsibility. There is a rich literature on how global and national emission reductions can be achieved, considering different justice and responsibility approaches, with developed and developing country perspectives. Is this reflected in the main report but not in the SPM? It is of fundamental importante and again, political sensitivity of the issue should not be a reason for not mentioning it. [Switzerland]	
866	13	16	13	49	C1 : This whole paragraph is very important and policy-relevant. It should be kept in the future version of the SPM, particularly C1.4. [France]	
1830	13	16	13	2	C1. Suggested additions in italics: "All 1.5°C-consistent pathways imply rapid reductions in net global anthropogenic CO2 emissions to reach net-zero around mid-century, together with rapid reductions in other anthropogenic emissions, particularly methane. All 1.5°C-consistent pathways also include CO2 removal from the atmosphere. [insert double lineshift] Greater emissions reductions by 2030 lead to a higher chance of limiting global warming to 1.5°C without, or with only limited overshoot and less reliance on atmospheric carbon dioxide removal. (high confidence) (Figures SPM1 and SPM3) {1.3, 1.2, 2.2, 2.4, 2.3, 2.5}" [Denmark]	
3692	13	16	13	2	We would encourage authors to revise the headline statement of section C1 in a way that expresses more clearly that to hold global warming, unprecedented rates of emissions reductions are required, starting immediately, and accompanied by varying but substantial amounts of carbon dioxide removal. The second sentence of the current headline statement could be read as saying that it is possible to limit warming to 1.5C without ambitious reductions beyond current NDCs (before 2030), and emission reductions now just make it a little easier. That would be a very difficult message to convey, and also not in line with the underlying literature, or the conclusions of Cross-Chapter Box 11 in Chapter 4. cf. our comment to section D2.1 on p 19 ln 13-30. [Germany]	
3694	13	16	13	49	We strongly suggest a thorough revision of section C1 in order to better reflect the policy-relevant information provided in the report. Please consider reordering the entire section C1 according to the following overview (based on further, more detailed comments listed below): In para C1.1 remove text on SRM, and add information on CDR requirements and general conditions, (see our comment on p13 ln 22-29). After that, add a new para as suggested in our comment on p 13 ln 30; This should be followed by what is now C1.4 which should additionally be extended (see our comment p13 ln 46-49); Finally we suggest following with a revised new para on carbon dioxide budgets (see our comment on p 13 ln 31 - 44), followed by short (new) paragraph C1.5 containing the information on SRM currently in C1.1. However as SRM does not form an important part of the analysis in this report, the lines on SRM could also be deleted entirely to save space. [Germany]	
4132	13	16	13	29	Statement C1 is important. However it is currently missing that multi-gas emissions must also reach zero and reference to the concurrency of non-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)” Note that the stabilization reference is wrong so added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)” [cont'd below] [Saint Kitts and Nevis]	
4134	13	16	13	29	[cont'd] On concurrency C2 ES states “Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” [cont'd below] [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4136	13	16	13	29	[cont'd]: Further, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. Our suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Saint Kitts and Nevis]	
4550	13	16	13	16	Although the remaining carbon budget is closely connected to the CO2 emissions pathway, the methodology to relate the temperature to the carbon budget is not necessarily consistent with that to the emissions pathway in SR1.5, which we believe results in substantial increases in the carbon budget in SR1.5 compared to that in AR5. Therefore, the following notes should be given for the term "1.5-consistent pathways": "Consistency with 1.5 degree is assessed by the same method as in AR5, but it is not consistent with the method to estimate the remaining carbon budget in SR1.5. Geophysical uncertainties are being recognized such that the former presumes higher non-CO2 radiative forcing than the latter {2.1.3, 2.2.1, 2.6.1}." [Japan]	
4552	13	16	15	29	In SPM of AR5WGIII, the phrase "be characterized by" is used in fourteen times to recall that this describes only characteristics of pathways. The same representation should be used as follows: "Pathways that aim for no or limited (zero to 0.2°C) overshoot of 1.5°C are characterized to have substantial emission reductions by 2030" [C1.4.], "1.5°C-consistent pathways are characterized to have different levels of carbon dioxide removal (CDR)" [C2] and "1.5°C-consistent pathways are characterized by about 70 – 90% lower emissions from industry in 2050 compared to 2010" [C3.4]. [Japan]	
4554	13	16	13	16	If "All 1.5°C-consistent pathways" means pathways which are grey lines, "ALL" should be changed to "Many" or "Most". Because, in the Figure SPM3, NOT "ALL" pathways become nearly net-zero around 2050, and still many pathways become nearly net-zero after 2060. [Japan]	
4558	13	16	13	2	This paragraph should be changed as follows by utilizing the expression in page 2-23 in 2.3.1 of Chapter2 and Figure SPM3. "Although there is no single pathway to achieve a specific climate objective, many 1.5°C-consistent pathways imply rapid reduction in net global anthropogenic CO2 emissions to reach nearly net-zero around mid-century, together with rapid reductions in other anthropogenic emissions, particularly methane. Many 1.5°C-consistent pathways also imply that global CO2 emissions are halved in 2030 from the present global emission". The reason is that the quantitative level of emission reductions in 2030 should be also conveyed clearly to readers (and policymakers) as well as that in 2050 for the 1.5°C pathways. [Japan]	
4824	13	16	13	2	It would be extremely useful in this headline message to talk about when emissions need to peak to give a clear idea of what is required in the near term. [United Kingdom (of Great Britain and Northern Ireland)]	
5090	13	16	13	18	What is missing in his paragraph is a statement about the net zero GHG emissions date. That is important as many countries use the overall GHG emissions for setting targets. Table 2.4 has the data. What is alo missing here is a statement that almost all available scenarios require CDR from the atmosphere (that is a key message that should be made upfront and can then be elaboarated in section C2. [Hungary]	
5092	13	16	13	49	This section of the SPM does not provide information about the required pathways for different levels of probability of meeting the 1.5 limit, while there is a significant difference in the carbon budgets for a fifty percent chance and a 67 percent chance. This is an important omission as pathways differ significantly. Unfortunately chapter 2 no longer has the relevant information, probably because of the decision to increase the remaining budget compared to AR5. A solution would be to group the different scenarios according to their assumed remaining carbon budget (<450 is 67% chance of staying below 1.5; >450 en <650 is a 50-67% chance of staying below 1.5; and also a 67% chance of "well below 2C" (a 50% chance of <1.5 is equivalent to about a 67% chance of staying below 1.75C). That also solves the problem that nothing is said about "well below 2 in the current SPM draft. Then for each of these categories provide the 2030 and 2050 emission levels for CO2 and GHG required . [Hungary]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5386	13	16	13	29	Statement C1 is important. However it is currently missing that multi-gas emissions must also reach zero and reference to the concurrency of non-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)” Note that the stabilization reference is wrong so added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)” [cont'd below] [Saint Lucia]	
5388	13	16	13	29	[cont'd] On concurrency C2 ES states “Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” [cont'd below] [Saint Lucia]	
5390	13	16	13	29	[cont'd]: Further, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. Our suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Saint Lucia]	
6250	13	16	13	29	Statement C1 is important in the SIDS context. It is noted that the multi-gas emissions must also reach zero; and thus reference to on-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)”. Note that the stabilization reference is a mis-match, thus added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)"...continued below. [Fiji]	
6252	13	16	13	29	“Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent large reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent large reductions in emissions of non-CO2 forcings, particularly methane (high confidence).” ...continued below. [Fiji]	
6254	13	16	13	29	Further to above, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. The suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Fiji]	
6468	13	16	13	2	it is important to indicate that global emissions need to go down immediately and there is no room for a further increase; thus add after "rapid": "and immediate" [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6470	13	16	13	18	What is missing in his paragraph is a statement about the net zero GHG emissions date. That is important as many countries use the overall GHG emissions for setting targets. Table 2.4 has the data. What is alo missing here is a statement that almost all available scenarios require CDR from the atmosphere (that is a key message that should be made upfront and can then be elaboarated in section C2. [Netherlands]	
6472	13	16	13	49	This section of the SPM does not provide information about the required pathways for different levels of probability of meeting the 1.5 limit, while there is a significant difference in the carbon budgets for a fifty percent chance and a 67 percent chance. This is an important omission as pathways differ significantly. Unfortunately chapter 2 no longer has the relevant information, probably because of the decision to increase the remaining budget compared to AR5. A solution would be to group the different scenarios according to their assumed remaining carbon budget (<450 is 67% chance of staying below 1.5; >450 en <650 is a 50-67% chance of staying below 1.5; and also a 67% chsnce of "well below 2C" (a 50% chance of <1.5 is equivalent to about a 67% chance of staying below 1.75C). That also solves the problem that nothing is said about "well below 2 in the current SPM draft. Then for each of these categories provide the 2030 and 2050 emission levels for CO2 and GHG required . [Netherlands]	
6736	13	16	13	29	Statement C1 is important. However it is currently missing that multi-gas emissions must also reach zero and reference to the concurrency of non-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)” Note that the stabilization reference is wrong so added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)” [cont'd below] [Marshall Islands]	
6738	13	16	13	29	[cont'd] On concurrency C2 ES states “Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” [cont'd below] [Marshall Islands]	
6740	13	16	13	29	[cont'd]: Further, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. Our suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Marshall Islands]	
7128	13	16	13	2	Refer to the underlying report: Chapter 4 (14,50,14,51), (10,40,10,41) - The report states that global emissions need to become net zero by middle of the century. However, the report should also include information as to how the pursuit of this goal will be acheived while safeguarding the principle of equity in sharing of carbon space in view of the historical emissions. [India]	
7986	13	16	13	16	The pathways 'assume' rather than 'imply'. [United States of America]	
7988	13	16	13	18	This sentence should have a confidence statement. [United States of America]	
7990	13	16	13	2	The Chapter 2 Executive Summary presents a far more sober message regarding the challenges associated with 1.5°C development pathways, and the SPM has chosen findings from the caveated sub-bullets that provides a far more optimistic picture than warranted. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7992	13	16	13	2	C1 makes the crucially important point that all 1.5°C pathways reach net-zero around mid-century. The second sentence of C1, "Greater emissions reductions by 2030 lead to a higher chance of limiting global warming to 1.5°C without, or with only limited overshoot," makes an obvious point that, given emissions reach net-zero around mid-century, greater emissions reductions in 2030 lead to a higher chance of limiting warming to 1.5°C. The more important point to make here is that 1.5°C pathways require 2030 emissions lower than levels that are in line with current NDCs. From the Chapter 2 Executive Summary: "Under emissions in line with current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs), global warming is expected to surpass 1.5°C, even if they are supplemented with very challenging increases in the scale and ambition of mitigation after 2030." Even this does not fully convey the scale of the challenge. Of the four scenarios highlighted in the SPM (LED, S1, S2, and S5) three of them involve cutting global emissions roughly in half by 2030, and the fourth requires even more rapid decarbonization than the others starting in 2030 to reach net zero before the others and far greater net-negative emissions in the second half of the century. Much of the variation and flexibility in different ways that 1.5°C can be achieved that are discussed in this report are predicated upon this massive increase starting in 2020 to reduce global emissions in half by 2030. Outside of this herculean increase in ambition in the next few years, only a very narrow path remains to achieve 1.5°C. This message does not come across strongly enough in this report. [United States of America]	
8594	13	16	13	2	Introduction of limited temperature overshoot might not be beneficial to this point [Ireland]	
8596	13	16	13	2	Unclear why methane emissions in particular are highlighted here. Explain reasoning and context [Ireland]	
8652	13	16	13	29	Statement C1 is important. However it is currently missing that multi-gas emissions must also reach zero and reference to the concurrency of non-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)” Note that the stabilization reference is wrong so added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)” [cont'd below] [Grenada]	
8654	13	16	13	29	[cont'd] On concurrency C2 ES states “Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” [cont'd below] [Grenada]	
8656	13	16	13	29	[cont'd]: Further, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. Our suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Grenada]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9144	13	16	13	29	Statement C1 is important. However it is currently missing that multi-gas emissions must also reach zero and reference to the concurrency of non-CO2 reductions with CO2 reductions needs to be added, both of which are important policy relevant points. A key point from Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C could be added here “Hence all 1.5°C stabilization scenarios require both net CO2 emissions and multi-gas CO2-forcing-equivalent emissions to be zero at some point (Chapter 2, Section 2.2 Scenarios)” Note that the stabilization reference is wrong so added after the first sentence: “All 1.5°C consistent pathways also require multi-gas CO2-forcing-equivalent emissions to be zero at some point following time at which the net-zero emissions of CO2 are reached (Chapter 2, Section 2.2 Scenarios)” [cont'd below] [Nauru]	
9146	13	16	13	29	[cont'd] On concurrency C2 ES states “Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” The text in C.1 “together with rapid reductions in other anthropogenic emissions, particularly methane” could be strengthened by replacing with “together with concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence).” [cont'd below] [Nauru]	
9148	13	16	13	29	[cont'd]: Further, there is a missing link between the overarching message of C1 regarding the reductions needed, and the following paras that focus on SRM, carbon budget, and transitions. It is important to first describe the key and robust features of 1.5°C pathways, as well as how these compare to 2°C pathways. Our suggestion is to include the following text from ES chapter 2: 2-4 last para: Such mitigation pathways are characterized by energy-demand reductions, decarbonization of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to 1.5°C." and move C3.1 here (comparison to 2°C pathways/rates of change) - as this is an overarching statement. [Nauru]	
9298	13	16	13	16	Introduce a footnote for: "All 1.5°C-consistent pathways"(footnote:"Integrated Assessment Models (IAMs) lie at the basis of the assessment of mitigation pathways in this report. IAMs combine insights from various disciplines in a single framework resulting in a dynamic description of the coupled energy-economy-land-climate system that cover the largest sources of anthropogenic greenhouse gas (GHG) emissions from different sectors. Many of the IAMs that contributed mitigation scenarios to this assessment include a process-based description of the land system in addition to the energy system, and several have been extended to cover air pollutants and water use. Such integrated pathways hence allow the exploration of the whole-system transformation, as well as the interactions, synergies, and trade-offs between sectors, and increasing with questions beyond climate mitigation. The models do not, however, fully account for all constraints that could affect realization of pathways.") [Switzerland]	
9494	13	16	15	29	Section C is long and highly technical for a summary for policy makers. As such, we suggest limiting the number of sub-bullets for each section. [Canada]	
4556	13	17	13	17	"net-zero" should be changed to "nearly net-zero" [Japan]	
5094	13	17	13	17	emissions to reach net-zero emissions around [Hungary]	
6866	13	17	13	17	Remove "to net-zero around mid-century". [United Arab Emirates]	
864	13	18	13	18	Add some words to justify the specification of methane. For instance : "particularly methane, the most impacting non-CO2 driver" [France]	
4822	13	18	13	18	Greater emission reductions than what? Very vague statement and could be improved by being more precise. [United Kingdom (of Great Britain and Northern Ireland)]	
5096	13	18	13	2	The sentence "Greater emission reductions …" is unclear as there is no reference 2030 level mentioned. The wording "higher chance" is also unclear, because a reference level is missing. This can be resolved by adding the required global CO2 emission levels in 2030 for a specified probability level. Then the "greater" and "higher" make sense. [Hungary]	
5762	13	18	13	18	"Greater" than what? Than all 1.5oC-consistent pathways? Possibly: "The greater the emission reductions by 2030, the higher the chance…" [Sweden]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6474	13	18	13	2	The sentence "Greater emission reductions …" is unclear as there is no reference 2030 level mentioned. The wording "higher chance" is also unclear, because a reference level is missing. This can be solved by adding the required global CO2 emission levels in 2030 for a specified probability level. Then the "greater" and "higher" make sense. [Netherlands]	
3696	13	19	13	19	The literature distinguishes two kinds of overshoot (CO2 concentration or temperature). Therefore, and since this report considers "overshoot" only as a temporary phenomenon, the SPM to the SR1.5°C should provide more clarity to policy makers by adding "temporary temperature" before the word "overshoot". To avoid confusion, we suggest specifying "temperature overshoot" already in the definition of "overshoot", see our comment on page 3. [Germany]	
4014	13	19	13	19	Please consider to include "temperature" before "overshoot", specially when the term overshoot is used in head line statements. This also applies to other statements than C1. [Norway]	
5098	13	19	13	2	overshoot (not exceeding 0.2°C). ((or: limited to 0.2°C .. explanation: zero is not an overshoot)) [Hungary]	
7994	13	19	13	19	This is a bad use of "chance" here. Rephrase as: "Greater emissions reductions prior to 2030 increase the likelihood (XX%) of ..." [United States of America]	
7996	13	19	13	19	Suggest adding "overshoot" to improve the readability of the sentence: "without overshoot, or with only limited overshoot" [United States of America]	
4350	13	2	13	2	Make the sentence more clear. [Republic of Korea]	
256	13	22	13	29	Current C1.1. could be separated to two points C1.1. and a new C1.5. A break should be between "reducing inequalities." and "Solar radiation modification". RATIONEL: The section on SRM is relevant but it fits better at the end of the section C. [Finland]	
380	13	22	13	28	Instead of the focus on SRM not being in models, increased emphasis should be made at this crucial paragraph C1.1 on the fact that renewable energy and storage technologies have been underestimated in models, and actual developments have been much faster than expected, and costs have dropped much more quickly than expected, as, for example in Sec. 4.3.1.1 "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" [Chad]	
1724	13	22	13	29	Some of SRM barriers are also true for other technologies including some CDR options. Hence, that is not strong reason to exclude them from the analysis. Some literature is readily available from the CMIP5 modeling experiment, see cross-chapter Box 10. [Saudi Arabia]	
1782	13	22	13	24	Add "The appropriateness of a pathway ultimately depends on national development priorities and local circumstances. As such, there is no single pathway to achieve a climate objective." [Saudi Arabia]	
2382	13	22	13	29	Measures to achieve a 1.5 degree C consistent pathway do involve synergies and trade-offs for sustainable development. This is an uncontroversial and generic statement of little value unless it is specified, what are the synergies and trade-offs at what level of decision-making and/or implementation. Yet, to know the opportunities and barriers for a paradigm shift to achieve a 1.5 pathway, insights on how sustainability transitions happen - or what hinder them - coming from more well established socio-technical perspectives are missing. [European Union (EU)]	
2384	13	22	13	24	Sentence of generic nature with little added value to policy makers. [European Union (EU)]	
3698	13	22	13	29	In C1., with the exception of C1.1, all points seem to consider emissions budgets and characteristics of emissions development within the pathways. C1.1 deals with 2 other topics: 1) synergies and trade-offs of different measures in the portfolio of the scenarios and 2) Clarifying solar radiation modification is outside the scope. We support an introduction into scenario characteristics at this point, but would suggest to focus on key conditionalities through the following revision: Remove the information about solar radiation management, as it is out of place here (to a revised subsection C1.5, see our general comment on p 13 ln 16-49). Instead, continue as follows: "All 1.5C consistent pathways rely on carbon dioxide removal (CDR) to compensate for residual non_CO2 emissions or to bring temperatures down after a temporary overshoot." Then continue with the following information from Chapter 2 ES to clarify the conditionality of 1.5C pathways: "1.5°C-consistent pathways can be identified under a range of assumptions about economic growth, technology developments and lifestyles. However, lack of global cooperation, lack of governance of the energy and land transformation, and growing resource-intensive consumption are key impediments for achieving 1.5°C-consistent pathways. Governance challenges have been related to scenarios with high inequality and high population growth in the 1.5°C pathway literature." {2.3.1, 2.3.2, 2.5} Rationale: Conditions under which 1.5C are not feasible are valuable information that needs to be conveyed. Note that in the high inequality and high population scenario family SSP3 it is impossible for models to find a solution leading towards 1.5C. Also, with these edits, C1.1 gives a more nuanced and balanced introduction into characteristics of 1.5C pathways, and explicitly states that 1.5C pathways are feasible under different assumptions and policy choices. [Germany]	
4010	13	22	13	29	We believe that the information about SRM could be shortened and moved to the end of section C1. There are also many other factors than SRM which are not included in the assessed pathways. [Norway]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4560	13	22	13	23	It should be clearly stated that there are multiple pathways for achieving 1.5 degrees goal and each pathway is dependent on many factors and assumptions. Utilizing the expression in page 2-23 in 2.3.1 of Chapter 2, the text should be amended as follows. C1.1. There is no single pathway to achieve a specific climate objective. Pathways depend on the underlying development processes and societal choices which affect future baseline emissions, technology deployment and its scale and global coordination. 1.5°C-consistent pathways differ under considerable range of assumptions in the portfolio of measures deployed to achieve reductions. .... [Japan]	
4826	13	22	13	23	This sentence could better be phrased as "There is no single path to 1.5C - emissions reductions can be achieved through a variety of different 1.5C-consistent pathways, each comprising a different selection of mitigation options". [United Kingdom (of Great Britain and Northern Ireland)]	
4828	13	22	13	29	The strong focus on SRM here seems odd. For it to be the first thing discussed under emission pathways seemes somewhat skewed. To reduce length, this section could simply be removed. If it's kept, then it needs to be strengthened and, we suggest, moved to later in the section - currently this point reads a bit like the concerns around ethics and sustainable development are less pressing than the lack of understanding, whereas these are all extremely concerning aspects of an unproven technology. It may also be worth making clear that SRM deployment does nothing to mitigate against ocean acidifcation. [United Kingdom (of Great Britain and Northern Ireland)]	
5100	13	22	13	29	The SRM-related text should not be here (3rd and 4th sentences), but at the end of the listing, that is under an additional C1.5. [Hungary]	
5280	13	22	13	28	Instead of the focus on SRM not being in models, increased emphasis should be made at this crucial paragraph C1.1 on the fact that renewable energy and storage technologies have been underestimated in models, and actual developments have been much faster than expected, and costs have dropped much more quickly than expected, as, for example in Sec. 4.3.1.1 "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" [Zambia]	
5942	13	22	13	29	We suggest to move paragrapnC1.1 at the end of the C1.x section, i.e. after C1.4. Justification : actual C1.1 is about measures, while C1.2, C1.3 and C1.4 are about physical aspects of carbon budget. It is more logical to have physical aspects of carbon budget before measures. This would also make a better transition with C2 and C3 that are also about measures. [Belgium]	
6476	13	22	13	29	This paragrapgh does not fit in here; delete here and move to end of section C; it wil suffice to indicate that the carbon budgets stated do not include any possible SRM measures and then refer to para at the end of section C. Please make a separate paragraph on SRM. Now point C1.1 combines two issues that have nothing to do with each other. [Netherlands]	
6614	13	22	13	28	Instead of the focus on SRM not being in models, increased emphasis should be made at this crucial paragraph C1.1 on the fact that renewable energy and storage technologies have been underestimated in models, and actual developments have been much faster than expected, and costs have dropped much more quickly than expected, as, for example in Sec. 4.3.1.1 "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" [Sudan]	
6898	13	22	13	28	Instead of the focus on SRM not being in models, increased emphasis should be made at this crucial paragraph C1.1 on the fact that renewable energy and storage technologies have been underestimated in models, and actual developments have been much faster than expected, and costs have dropped much more quickly than expected, as, for example in Sec. 4.3.1.1 "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" [Gambia]	
7130	13	22	13	28	Linking 1.5 deg C pathways with sustainable development , poverty eradication and inequalities provides an erroneous impression that such reduction is primarily to be achieved in developing countries. Further observation attributed to SRM is not linked with cogent analysis and it only takes into account present technology development stage. Further, the existing knlowdge and projects at field does not support the reference relating to SRM. As such references relating to SRM needs to deleted from SPM. [India]	
7132	13	22	13	24	Statement on global 1.5 deg. C mitigation pathways cannot have references to sustainable development and poverty eradication as these are largely associated with developing countries alone. In this section since 1.5 deg. C global pathways are discussed, the comments should be limited to their overall features and not include those that pertain to specific regions and nations, except solely in the context of differentiation. [India]	
7998	13	22	13	29	Each sentence should have a confidence statement. [United States of America]	
8000	13	22	13	29	This bullet could be broken into two points, one focused on differences in synergies and trade-offs and one focused on SRM. For the synergies and trade-offs, it would be helpful to provide some examples. [United States of America]	
8002	13	22	13	29	Make the SRM sentences a separate bullet. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8004	13	22	13	29	It is helpful that the SPM addresses Solar Radiation Management (SRM) measures directly and early in Section C, and the treatment of this strategy is much improved from the previous draft. However, while the report correctly identifies concerns with SRM, in general, the discussion of SRM in Chapter 4.3.8 and Cross-Chapter Box 10 is not precisely worded and, in some cases, appears to betray an unstated bias against these approaches or an effort to close off discussion. For example, the discussion of SRM on p. 4-7, in the Chapter 4 Executive Summary, describes an array of challenges relating to SRM, which are characterized as "uncertainties" in the Executive Summary, and as constraints in Cross-Chapter Box 10. However, some of these, such as "a weak capacity to govern, legitimise and scale such measures" are challenges or concerns rather than uncertainties. Table 4.7 on p. 4-52 does not address the cost or cost-effectiveness of these measures, which would be an important variable in considering them. 4.3.8 makes the policy-prescriptive claim that "Literature only supports SRM as a supplement to deep mitigation, for example in overshoot scenarios" (p. 4-53), which is mirrored in Cross-chapter Box 10, which states in Section E that ". . . SRM can potentially reduce the climate impacts of a temporary temperature overshoot . . . alongside intense mitigation and adaptation efforts" (pp. 4-57 - 4-58). Section 4.3.8.3 contains the odd statement that "The argument that SRM research increases the likelihood of deployment (the 'slippery slope' argument), is also made" -- a statement which is not appropriate for a balanced scientific report. [United States of America]	
8006	13	22	13	29	Perhaps the strongest issue pertaining to the use of SRM as a substitute for mitigation strategies is that it does not address carbon deposition in the ocean and therefore would have no role in managing ocean acidification. However, this is is not expressed in the SPM, and gets very little attention in Chapter 4. [United States of America]	
8410	13	22	13	28	Instead of the focus on SRM not being in models, increased emphasis should be made at this crucial paragraph C1.1 on the fact that renewable energy and storage technologies have been underestimated in models, and actual developments have been much faster than expected, and costs have dropped much more quickly than expected, as, for example in Sec. 4.3.1.1 "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" [Nepal]	
8988	13	22	13	38	Suggest these 2 points be separated and explained in detail as sub points as they are both very important. [Australia]	
8008	13	23	13	23	Suggest 'These pathways have different implications...' [United States of America]	
9496	13	23	13	24	The reference to “sustainable development, poverty eradication and reducing inequalities” is outside the scope of Section C. It should be moved to section D4 which addresses the relationship between mitigation and sustainable development / poverty eradication. [Canada]	
382	13	24	13	24	Wondering why the terminology "Solar radiation modification" is used here. It is seldom used in the literature. An explanation might be helpful. [Chad]	
868	13	24	13	24	The issue of food security and the issue of ecosystems should be added to this list. [France]	
870	13	24	13	28	This should be a separate paragraph to distinguish between general issues related to 1.5°C pathways and the use or not of SRM. It might also be put at the end of the section - this is not the first consideration. It might even form a separate C4 to underline that it is to be considered apart. We suggest : "C4. SRM measures are not included in any of the available assessed pathways. C4.1 Though some may be theoretically effective in reducing an overshoot, SRM measures face large uncertainties and knowledge gaps as well as substantial institutional and social constraints to deployment related to governance, ethics, and impacts on sustainable development." [France]	
2386	13	24	13	25	It is inappropriate to single out SRM specifically. The more important point is that the available pathways limit warming to 1.5°C by reducing emissions (& increasing removals) of GHGs to (from) the atmosphere. [European Union (EU)]	
5282	13	24	13	24	Wondering why the terminology "Solar radiation modification" is used here. It is seldom used in the literature. An explanation might be helpful. [Zambia]	
6178	13	24	13	26	The Terminology "Solar Radiation Modification (SRM)" seems to be not very common. What is the rationale of using it in the SPM. More Clarity needed. [United Republic of Tanzania]	
6616	13	24	13	24	Wondering why the terminology "Solar radiation modification" is used here. It is seldom used in the literature. An explanation might be helpful. [Sudan]	
6900	13	24	13	24	Wondering why the terminology "Solar radiation modification" is used here. It is seldom used in the literature. An explanation might be helpful. [Gambia]	
8010	13	24	13	28	While these are points to be considered, this dismissal of SRM measures gives reasons that are much more applicable to the prospects for moving forward without SRM, and this without any serious analysis of SRM being done. [United States of America]	
8412	13	24	13	24	Wondering why the terminology "Solar radiation modification" is used here. It is seldom used in the literature. An explanation might be helpful. [Nepal]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8598	13	24	13	29	Explanation on SRM is not needed but could be included as a footnote [Ireland]	
8012	13	25	13	25	"SOME" what? [United States of America]	
8014	13	25	13	26	To enhance readability, suggest rephrasing: "Although some SRM measures may be theoretically effective in reducing an overshoot, they face..." [United States of America]	
4562	13	26	13	26	Please remove "theoretically" since modelling studies confirm efficacy of some approaches (e.g., stratospheric aerosol injection) as reviewed in Chapter 4 (Cross-Chapter Box 10), and since uncertainties are emphasized in the latter part of the sentence. [Japan]	
3700	13	27	13	27	The term "Constraints" does not describe the full spectrum of limitations of SRM. Please add "risks". [Germany]	
5944	13	27	13	27	Risks associated to SRM are an important concern, as mentioned in the report, e.a. chapter 4 page 57. We suggest to add the word "risk", for example "knowledge gaps as well as substantial risks, institutional and social constraints" [Belgium]	
6838	13	28	13	28	"Governance, ethics and impacts on sustainable development" do not seem to align. [United Arab Emirates]	
3702	13	3			Please add as C1.2 after C1.1 the following text: "Limiting warming to 1.5°C implies reaching net zero CO2 emissions globally around 2050 and concurrent deep reductions in emissions of non-CO2 forcers, particularly methane (high confidence). Such mitigation pathways are characterized by energy-demand reductions, decarbonisation of electricity and other fuels, electrification of energy end use, deep reductions in agricultural emissions, and some form of CDR with carbon storage on land or sequestration in geological reservoirs. Low energy demand and low demand for land- and GHG-intensive consumption goods facilitate limiting warming to as close as possible to 1.5°C. {2.2.2, 2.3.1, 2.3.5, 2.5.1, Cross-Chapter Box 9 in Chapter 4}." Rationale: This is a direct quote from Chapter 2 executive summary and is an essential piece of information for policy makers when planning long term strategies, which are already being developed, most of which are not aiming towards carbon dioxide neutrality by 2050, but 80-95% reductions instead. These basic characteristics of the scenarios are also very important indices for policy makers. [Germany]	
384	13	31	13	38	The paragraph mentions a bigger remaining carbon budget than was assessed in AR5, which could very well be interpreted as a necessary correction brought by new scientific evidence, although this is not the case. Section 2.2.2 indicates that "the change since AR5 is, in very large part, due to the application of a more recent observed baseline to the historic temperature change and cumulative emissions; here adopting the baseline period of 2006-2015". There are many issues with this methodological choice, including its compatibility with the IPCC definition of global warming (that should be measured over 30-year periods to exclude the effect of short-term variability), which thus questions its scientific value and undermine the comparability of the estimates based on the 2006-2015 reference period with those of the AR5 assessments. Given the strong implications it has for the carbon budget, the adopted reference period should be that of AR5. This would also preserve consistency with the science that was used to derive the Paris Agreement. [Chad]	
872	13	31	13	31	To clarify this sentence, we suggest to add : "Starting from 1st January 2018, the remaining carbon budget ... for a two-in-three chance." as said in {2.2.2.2} [France]	
1776	13	31	13	38	Need to be more specific on the carbon budget: is it CO2 equivalent or only CO2? [Saudi Arabia]	
1832	13	31	13	38	GtCO2-eq ? [Denmark]	
2388	13	31	13	33	"These remaining budgets are larger than those estimated in AR5": This would deserve an explanation at least in the footnote. The current footnote only repeats the statement, but does not elucidate the reasons. [European Union (EU)]	
2390	13	31	13	38	It is somewhat strange that the land carbon balance (management effects, especially those associated with bioenergy) are not listed as a major source of uncertainty. The land sink is poorly constrained and poorly represented in the models. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3704	13	31	13	44	General: Pending revision of section A (see our comment on p4 ln 1-4), we would find it useful to frame the statement on carbon dioxide budgets here in a way that highlights the basic relationship instead of the specific numbers. Those numbers are uncertain and only assessed with medium confidence, but deviate substantially from what was presented in AR5 and are not directly comparable due to differences in methodological approaches. We doubt that in its current form, C1.2 and C1.3 will be of much use for policy makers, but may harm the credibility of the IPCC. According to Chapter 1 and 2 (Annex, SOD), the remaining carbon dioxide budget for 1.5C is subject to considerable uncertainty and recent literature estimates vary between below 0 and more than 1000 Gt CO2. We commend the authors' efforts to reconcile recent literature and also improve upon the AR5 estimates, however we feel that the lack of numbers from the literature in the underlying draft and the change to the methodology that occurred between SOD and FGD carries the risk to weaken the scientific robustness of the result. Numbers for the CO2 budget depend a lot on the choice of base period, observational records vs. modelling results for historic temperature, ways to account for non-CO2 forcing and other factors that are still debated in the scientific community. As these issues have not been resolved, we would caution against a revision of the AR5 results. We also strongly suggest to provide estimates of the remaining CO2 budget applying the suggested new method to the AR5 base period (1986-2005) in order to give policy makers a basis for comparison, and to inform about the contribution of the change of baseline to a shorter and more recent period to the increased estimate. If the current numbers are kept in the SPM, they need to be accompanied by a clear explanation where the difference in the budget numbers come from, and what changes were made to the AR5 method, including a clear rationale for using the observational record instead of the CMIP5 record, and how much this shift in the definition of GMST contributes to the larger budget. Footnote 6 has to be edited to this end as well, substituting for the phrase "rather than relative to the historical record" which is misleading and does not point to the main reason for the size of the change. Also, from the chapter text we cannot conclude that "new literature consistently shows larger budgets", please replace by "...points towards" or "suggests" and delete "consistently". [Germany]	
3706	13	31	13	44	When revising this section, please make sure that if numbers are provided both absolute numbers and percentages are given, and not a mix of either percentages or absolute numbers, in order to ensure comparability. If numbers should not be compared or added this should be made explicit. Currently, adding up the (uncertainty) ranges leads to a negative budget. We would certainly prefer a presentation of the remaining budget median in "x years current emissions (range of years)" instead of absolute emissions in order to make the assessment more tangible for policymakers. [Germany]	
3708	13	31	13	44	Revised section C1.2 (or C.1.3 after our suggested edits to the whole section, see our comment on p13 ln 16-49) could start with a short note along the lines of "Cumulative CO2 emissions determine the long-term temperature commitment. The remaining CO2 budget for 1.5C provides an estimate of the amount of CO2 that can be still deposited in the atmosphere. After the budget is exhausted, all additional CO2 emission (and possibly more to compensate for hysteresis, Earth system feedbacks and residual non-CO2 forcing) will have to be removed from the atmosphere in order to eventually meet the same T-threshold. While this general relationship between cumulative CO2 emissions and temperature remains robust, uncertainties become large compared to the absolute size of the remaining budget for temperature thresholds such as 1.5C that are within close proximity of current temperature levels." and then follow "Recent literature suggests that the remaining C budget from 2018 for 1.5C may be larger than assessed in AR5, and this report provides estimates with a median equivalent to 11-16 (5.5 - 24) years of current CO2-emissions when accounting for permafrost feedbacks, and XX (aa-bb) years from 2018 if calculations are based on the AR5 reference period [please provide numbers for XX]." As you can see from our suggestion, we strongly prefer to subtract the 100 GtCO2 uncertainty from permafrost thawing and potential methane release directly from the estimate, following a precautionary principle. Expressing the remaining budget in terms of "years of current emissions" would convey that these numbers - albeit larger than in AR5 - are still small. We would also suggest to give a median estimate with uncertainty range and list factors contributing to uncertainty separately, but not include numbers for those ranges but rather give the dimension (total uncertainty in the dimension of total budget estimate). Information currently contained in C.1.3 seems very cryptic and selective, therefore we suggest to delete the entire paragraph. [Germany]	
3710	13	31	13	49	The description of the remaining carbon dioxide budget is very much focused on the aspect of uncertainty about the exact calculation. This has the consequence that the main message for policy makers is hidden/ gets lost. Namely: The remaining budget and time for mitigation (or CDR-measures) are very limited. [Germany]	
3914	13	31	13	38	The carbon budget is a very important topic in the interaction between scientists and policymakers. The numbers presented here, although they are robust, would need some further explanation to understand while they are larger than those estimated in AR5. The differences in methodology, definitions and other factors. We would suggest including this discussion in AR6 and not showing the number for this special report. The linear relationship between carbon budget as in AR5 and the associated pathways as explained in C1.4 are the important points in the present discussion. [Luxembourg]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4138	13	31	13	38	C1.2: A central contribution to these bigger budget estimates relates to the introduction of a 2006-2015 reference period and comparisons between model projections and observations over this period. It is highly sensitive to the choice of the warming record and capitalizes on model-observation differences. The underlying assessment of the origins of these differences is not sufficiently well assessed and understood and the choice of a 10 year reference period not established in climate science. The analysis provided in Chapter 01 is not sufficiently comprehensive to warrant such a major update and e.g. misses out on a big body of literature on the warming hiatus and other literature reconciling model projections and observations. [cont'd below] [Saint Kitts and Nevis]	
4140	13	31	13	38	[cont'd] This is also highly relevant for the models used in this context such as MAGICC or the newly introduced FAIR model. It is problematic to introduce a new model into IPCC products at such a late stage. In particular, it seems that the FAIR model has been calibrated to a lower TCRE (Smith et al. 2018) by adjusting ocean heat uptake to match observed warming up to the 2006-2015 period, although this is not made clear in the report (this is being inferred from Smith et al. 2018 Table 7). Such an update is ignoring a literature basis that points towards issues with inferring TCRE from observations alone, while the full literature base does not support such conclusions (Knutti et al. 2017). Effects of rebasing are also affected by a change in modelling protocol with the RCPs starting in 2006 leading to a mismatch in modelled vs. observed forcing potentially to be reconciled in the AR6. [cont'd below] [Saint Kitts and Nevis]	
4142	13	31	13	38	[cont'd] Furthermore, the question on how global mean temperatures should be treated to maintain the integrity of the Paris Agreement needs to be assessed in greater detail. It therefore appears to be premature to draw conclusions out of an updated reference period. To be consistent with the AR5, the reference period should be reverted to the 1986-2005 including for model calibration. The large uncertainties related to carbon budgets compared with the fact that the concept does not account for any CDR that is prevalent in all 1.5°C pathways raises the question of the usefulness of the concept for policy makers and its inclusion in the SPM. Removing C 1.2 and 1.3 should therefore be considered. [Saint Kitts and Nevis]	
4564	13	31	13	32	750 GtCO2 is explained as “a one-in-two chance” of limiting global warming to 1.5°C in the SPM. On the other hand, the relevant parts of the Executive Summary of chapter 2 (page 2-5) explain 750 GtCO2 as “for an even chance”. Table 2-2 gives 33%, 50% and 67% of percentiles of TCRE. The differences between those wording are unclear. It is better to make consistency in descriptions between SPM and ES for chapter 2 and description in SPM seems more understandable. [Japan]	
4566	13	31	13	33	The assessed data for the remaining carbon budgets of limiting global warming to 1.5°C should not be rounded up to 750 (50th TCRE percentile) and 550 (67th TCRE percentile), but should be mentioned as 770 and 570 respectively, as shown in Chapter 2, Table 2.2 to be more accurate and because the policy makers will most likely not refer to the original Table 2.2 and miss the fact that the numbers are rounded to the nearest 50 units. Furthermore, it would be highly appreciated if the assessed data in Table 2.2 could be quoted as it is, rounded to the nearest 10 unit, as was the case in the SPM E.8, Bullet No.2 of the AR5/WG1 report. [Japan]	
4568	13	31	13	38	Request to add information on what climate sensitivities for these carbon budgets are utilized. [Japan]	
4570	13	31	13	33	SR1.5 assesses the remaining carbon budgets of limiting global warming to 1.5°C as being larger than those estimated in AR5. Since this information will have impact on future policies, it would be much appreciated if it could be shown concretely for comparison how the budgets have changed from AR5.The following information provided in Chapter 2, page 21, para. 4, lines 1-5 is suggested to be included in either the text or the footnote: “This assessment finds a larger remaining budget from the 2006 – 2015 reference period than the 1.5°C and 2°C remaining budgets from the start of 2011 inferred in AR5, approximately 1000 GtCO2 for the 2°C (66% of model simulations) and approximately 400 GtCO2 for the 1.5°C budget (66% of model simulations). In contrast, this assessment finds approximately 1600 GtCO2 for the 2°C (66th TCRE percentile) and approximately 860 GtCO2 for the 1.5°C budget (66th TCRE percentile) from 2011.” [Japan]	
4832	13	31	13	32	It would be good to remind readers that this is talking about the remaining carbon budget from 2018. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4998	13	31	13	37	There has been a flurry of papers published on carbon budgets and it's clear that there have been important developments in understanding and that this complex topic requires careful communication to avoid confusion. At present, the key policy-relevant messages around the implications are lost in this paragraph or rely on the reader to make their own interpretations, and a better sense of the significance of the latest developments since AR5 is needed. The estimate of the size of the budget is, in some ways, much less important than the implications. More explicitly, the budget has increased (different studies give different estimates as to how much) but it is somewhat uncertain - what does this actually mean for policy makers? We suggest that this paragraph begins with a recap of implications of the concept (limited amount that can be emitted and requirement for net zero CO2 for any level of warming, plus need for early action), then provide information on implications for time until 1.5C is reached (noting that the new estimates lead to X additional years), near-term action including timing of peak emissions, and timing of net zero emissions for both CO2 and Kyoto gases (drawing on Table 2.2). It could then talk about the implications of the uncertainties (complementing the paras on non-CO2 contributions). All of this would give an indication to policymakers of the speed of response required. [United Kingdom (of Great Britain and Northern Ireland)]	
5000	13	31	13	37	It's not clear how this carbon budget compares with that in the AR5 due to the new estimation method used Is there a way of making this comparison? Perhaps taking the same time period or applying the AR5 approach. Doesn't have to be in the SPM (as long as a discussion of implications is included as mentioned above), but would be useful to at least have this in the underlying chapter. We also note that the type of carbon budget used here is the threshold exceedance budget. It would be useful to note in the SPM that this doesn't work for overshoot scenarios. [United Kingdom (of Great Britain and Northern Ireland)]	
5018	13	31	13	44	Those 2 paragraphs could be redrafted to improve clarity, particularly with reference to the contribution of the different gases. [Italy]	
5102	13	31	13	31	Since it isn't appropriately revealed in section C1.2. what "remaining carbon budget" means, it would be important to define it in detail in the Glossary. [Hungary]	
5104	13	31	13	33	In section C1.2. it is not clear in which period of time the remaining carbon budget must not exceed the limit which restricts global warming to a maximum of 1,5°C. [Hungary]	
5106	13	31	13	38	Section 2.2.2.2 of chapter 2 is quite assertive about the influence of climate feedbacks on the remaining carbon budget (minus 100 Gt CO2), calculated out to 2100. The text of the SPM in this paragraph is however using the word "could". This misleads the message. Suggestion is to change the remaining budget numbers into 650 en 450, including the subtraction for climate feedbacks. This will ensure that the take-away from the SPM is correct. [Hungary]	
5284	13	31	13	38	The paragraph mentions a bigger remaining carbon budget than was assessed in AR5, which could very well be interpreted as a necessary correction brought by new scientific evidence, although this is not the case. Section 2.2.2 indicates that "the change since AR5 is, in very large part, due to the application of a more recent observed baseline to the historic temperature change and cumulative emissions; here adopting the baseline period of 2006-2015". There are many issues with this methodological choice, including its compatibility with the IPCC definition of global warming (that should be measured over 30-year periods to exclude the effect of short-term variability), which thus questions its scientific value and undermine the comparability of the estimates based on the 2006-2015 reference period with those of the AR5 assessments. Given the strong implications it has for the carbon budget, the adopted reference period should be that of AR5. This would also preserve consistency with the science that was used to derive the Paris Agreement. [Zambia]	
5392	13	31	13	38	C1.2: A central contribution to these bigger budget estimates relates to the introduction of a 2006-2015 reference period and comparisons between model projections and observations over this period. It is highly sensitive to the choice of the warming record and capitalizes on model-observation differences. The underlying assessment of the origins of these differences is not sufficiently well assessed and understood and the choice of a 10 year reference period not established in climate science. The analysis provided in Chapter 01 is not sufficiently comprehensive to warrant such a major update and e.g. misses out on a big body of literature on the warming hiatus and other literature reconciling model projections and observations. [cont'd below] [Saint Lucia]	
5394	13	31	13	38	[cont'd] This is also highly relevant for the models used in this context such as MAGICC or the newly introduced FAIR model. It is problematic to introduce a new model into IPCC products at such a late stage. In particular, it seems that the FAIR model has been calibrated to a lower TCRE (Smith et al. 2018) by adjusting ocean heat uptake to match observed warming up to the 2006-2015 period, although this is not made clear in the report (this is being inferred from Smith et al. 2018 Table 7). Such an update is ignoring a literature basis that points towards issues with inferring TCRE from observations alone, while the full literature base does not support such conclusions (Knutti et al. 2017). Effects of rebasing are also affected by a change in modelling protocol with the RCPs starting in 2006 leading to a mismatch in modelled vs. observed forcing potentially to be reconciled in the AR6. [cont'd below] [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5396	13	31	13	38	[cont'd] Furthermore, the question on how global mean temperatures should be treated to maintain the integrity of the Paris Agreement needs to be assessed in greater detail. It therefore appears to be premature to draw conclusions out of an updated reference period. To be consistent with the AR5, the reference period should be reverted to the 1986-2005 including for model calibration. The large uncertainties related to carbon budgets compared with the fact that the concept does not account for any CDR that is prevalent in all 1.5°C pathways raises the question of the usefulness of the concept for policy makers and its inclusion in the SPM. Removing C 1.2 and 1.3 should therefore be considered. [Saint Lucia]	
5764	13	31	13	49	The findings on carbon budgets should be presented with much greater clarity. Now it appears that full information is, for example, 550 GtCO2 +/- 50% +/-250 GtCO2 +/-100 GtCO2 +/-250 GtCO2. It is impossible to derive what this actually means. Should consider use of IPCC AR5-like/comparable expressions. [Sweden]	
5766	13	31	13	33	Expressions such that "one-in-two" would need to be accompanied by percentages or suchlike. Carbon budget estimates should be given in a more comparable fashion compared to AR5. Footnote 6 does not explain comparability. [Sweden]	
5828	13	31	13	38	C1.2 should be deleted in full or redrafted as follows, eliminating the first sentence: C1.2 Estimates of remaining carbon budgets for 1.5°C vary by more than 50% due to assessed uncertainties in the climate response to emissions, and by +-250 GtCO2 due to assessed uncertainties in global warming until the decade 2006-2015. If calculated out to 2100, budgets could be reduced by up to 100 GtCO2 by permafrost thawing and potential methane release from wetlands (medium confidence). [Brazil]	
5946	13	31	13	38	«Estimates of remaining budgets for 1,5°C vary by more than 50 % due to assessed uncertainties in the climate response to emissions » . This refers to paragraph 2 of page 21 in chapter 2 : « The uncertainties presented in Table 2.2 cannot be formally combined, but current understanding of the assessed geophysical uncertainties suggests at least a ±50% possible variation for remaining carbon budgets for 1.5°C-consistent pathways. ». As we understand it, this includes the uncertainty of the assessed global warming until 2006 and the uncertainty around the feedbacks via the permafrost and wetlands mentioned further in the paragraph. This is unclear in the current formulation. In addition we think that there is an error of sign in table 2.2 of chapter 2 : the TCRE distribution uncertainty should probably be -100 to 200 rather than +100 to 200. [Belgium]	
5948	13	31	13	33	For clarity it would be useful to remind AR5 values in a footnote. [Belgium]	
6160	13	31	13	38	C1.2 third sentence. If we take the 550GtCO2 budget and subtract the uncertainties listed in this sentence, then in an extreme case there is no budget left and we have reached 1.5C level of emissions already??! If this is the case then it has to be clearly stated here. It might be better to give budget ranges related to these uncertainties, so there is no confusion [Estonia]	
6256	13	31	13	38	A central contribution to the bigger budget estimates relates to the introduction of a 2006-2015 reference period and its comparisons between model projections and observations over this period. It is highly sensitive to have shorter reference period and this reflects in the model observation differences. The underlying assessment of the origins of these differences is not sufficiently well understood and as the choice of a 10 year reference period is not well established in climate science. The analysis provided in Chapter 01 is not sufficiently comprehensive to and provides an opportunity revisit body of literature whch coulkd have bben missed out to compare and reconcil model projections and observations...continued below. [Fiji]	
6258	13	31	13	38	This is also highly relevant for the models used in this context such as MAGICC or the newly introduced FAIR model. It is problematic to introduce a new model into IPCC products at such a late stage. In particular, it seems that the FAIR model has been calibrated to a lower TCRE (Smith et al. 2018) by adjusting ocean heat uptake to match observed warming up to the 2006-2015 period, although this is not made clear in the report (this is being inferred from Smith et al. 2018 Table 7). Such an update is ignoring a literature basis that points towards issues with inferring TCRE from observations alone, while the full literature base does not support such conclusions (Knutti et al. 2017). Effects of rebasing are also affected by a change in modelling protocol with the RCPs starting in 2006 leading to a mismatch in modelled vs. observed forcing potentially to be reconciled in the AR6...continued below. [Fiji]	
6260	13	31	13	38	We must strive to maintain intergrity of the assessment that is consistent with previous assessments and also addresses the trequirements of the Paris Agreement. Thus, a need for assessment in greater detail. In my opinion, it would ne pre-mature to draw conclusions out of an updated reference period. To be consistent with the AR5, the reference period should be reverted to the 1986-2005 including for model calibration. The large uncertainties related to carbon budgets compared with the fact that the concept does not account for any CDR that is prevalent in all 1.5°C pathways raises the question of the usefulness of the concept for policy makers. In this regard, another consideration is requested to wherther to maintain or remove C 1.2 and 1.3 from SPM. [Fiji]	
6478	13	31	13	32	Indicate year from which remaining budget is calculated. As every year 40 Gt of CO2 is emitted, it makes quite a difference whether 2010, 2015, or 2018 is meant here. [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6480	13	31	13	38	Section 2.2.2.2 of chapter 2 is quite assertive about the influence of climate feedbacks on the remaining carbon budget (minus 100 Gt CO2), calculated out to 2100. The text of the SPM in this paragraph is however using the word "could". This distorts the message. Suuggestion is to change the remaining budget numbers into 650 en 450, including the subtraction for climate feedbacks. This will ensure that the take-away from the SPM is correct and not overly optimistic when readers only look at the first sentence. [Netherlands]	
6618	13	31	13	38	The paragraph mentions a bigger remaining carbon budget than was assessed in AR5, which could very well be interpreted as a necessary correction brought by new scientific evidence, although this is not the case. Section 2.2.2 indicates that "the change since AR5 is, in very large part, due to the application of a more recent observed baseline to the historic temperature change and cumulative emissions; here adopting the baseline period of 2006-2015". There are many issues with this methodological choice, including its compatibility with the IPCC definition of global warming (that should be measured over 30-year periods to exclude the effect of short-term variability), which thus questions its scientific value and undermine the comparability of the estimates based on the 2006-2015 reference period with those of the AR5 assessments. Given the strong implications it has for the carbon budget, the adopted reference period should be that of AR5. This would also preserve consistency with the science that was used to derive the Paris Agreement [Sudan]	
6690	13	31	13	38	This paragraph contains valuable information and is also quite challenging to understand and one reason is that the definition of the remaining carbon budget is not clear in page 4. And that it is compared to a very different carbon budget in AR5 (where the budget also included the negative emissions after mid-century and up to the end of the century). Furthermore, when permafrost is described, it is not clear if it is the carbon budget that is calculated out to 2100 or if it is only the permafrost thawing that is calculated out to 2100. And is it the CO2 from thawing or the methane (not directly in the buget but have impacts on the budget?). The number connected to thawing also gives only the upper limit. Please also consider to include what year the carbon budget starts from (2018?). Regarding the first sentence it would also be helpful to know over what timespan the buget is calculated if possible. In the third sentence it would be beneficial to clarify what is meant by "until the decade 2006-2015", e.g. is it over the whole industrial era and does it also include the decade 2006-2015? If the carbon budget includes only anthropogenic emissions, this may be a reason why permafrost is not included in the estimate. Furthermore, the carbon budget only includes CO2. Therefore it should be clarified if the different numbers in the para are comparable. A better way would be to compare a carbon budget including all gases up to 2100 with the 100 GTCO2 reduction by permafrost thawing. It should also be made clear that permafrost thawing is not included in the carbon budget models, and it seems to us that the reason for not including it in the current carbon budget estimate is not because it is unceartain whether the permafrost will thaw or not. [Norway]	
6742	13	31	13	38	C1.2: A central contribution to these bigger budget estimates relates to the introduction of a 2006-2015 reference period and comparisons between model projections and observations over this period. It is highly sensitive to the choice of the warming record and capitalizes on model-observation differences. The underlying assessment of the origins of these differences is not sufficiently well assessed and understood and the choice of a 10 year reference period not established in climate science. The analysis provided in Chapter 01 is not sufficiently comprehensive to warrant such a major update and e.g. misses out on a big body of literature on the warming hiatus and other literature reconciling model projections and observations. [cont'd below] [Marshall Islands]	
6744	13	31	13	38	[cont'd] This is also highly relevant for the models used in this context such as MAGICC or the newly introduced FAIR model. It is problematic to introduce a new model into IPCC products at such a late stage. In particular, it seems that the FAIR model has been calibrated to a lower TCRE (Smith et al. 2018) by adjusting ocean heat uptake to match observed warming up to the 2006-2015 period, although this is not made clear in the report (this is being inferred from Smith et al. 2018 Table 7). Such an update is ignoring a literature basis that points towards issues with inferring TCRE from observations alone, while the full literature base does not support such conclusions (Knutti et al. 2017). Effects of rebasing are also affected by a change in modelling protocol with the RCPs starting in 2006 leading to a mismatch in modelled vs. observed forcing potentially to be reconciled in the AR6. [cont'd below] [Marshall Islands]	
6746	13	31	13	38	[cont'd] Furthermore, the question on how global mean temperatures should be treated to maintain the integrity of the Paris Agreement needs to be assessed in greater detail. It therefore appears to be premature to draw conclusions out of an updated reference period. To be consistent with the AR5, the reference period should be reverted to the 1986-2005 including for model calibration. The large uncertainties related to carbon budgets compared with the fact that the concept does not account for any CDR that is prevalent in all 1.5°C pathways raises the question of the usefulness of the concept for policy makers and its inclusion in the SPM. Removing C 1.2 and 1.3 should therefore be considered. [Marshall Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6902	13	31	13	38	The paragraph mentions a bigger remaining carbon budget than was assessed in AR5, which could very well be interpreted as a necessary correction brought by new scientific evidence, although this is not the case. Section 2.2.2 indicates that "the change since AR5 is, in very large part, due to the application of a more recent observed baseline to the historic temperature change and cumulative emissions; here adopting the baseline period of 2006-2015". There are many issues with this methodological choice, including its compatibility with the IPCC definition of global warming (that should be measured over 30-year periods to exclude the effect of short-term variability), which thus questions its scientific value and undermine the comparability of the estimates based on the 2006-2015 reference period with those of the AR5 assessments. Given the strong implications it has for the carbon budget, the adopted reference period should be that of AR5. This would also preserve consistency with the science that was used to derive the Paris Agreement. [Gambia]	
7126	13	31	13	34	The following items should be added as para C1.1 as per the format and norms of AR5: 1) The total carbon budget (including past emissions and future projections) as model projections use past emissions as the basis for forecasting future emissions 2) The past emissions – from 1876 to 2017 as mentioned in Chapter 2 of the full report - “Historical CO2 emissions since the middle of the 1850-1900 historical base period (1 January 1876) are estimated at 1930 GtCO 2 (1630-2230 GtCO 2 , 1-? range) until end 2010. Since 1 January 2011, an additional 290 GtCO 2 (270-310 GtCO 2 , 1-? range) has been emitted until the end of 2017 (Le Quéré et al., 2018, Version 1.3 - accessed 22 May 2018).” 3) The remaining carbon budgets for both 1.5 and 2 deg. C for probabilities of >33%, >50%, and >67% of limiting temperature rise to below these temperature rise values. 4) A comparison between the AR5 and SR1.5 budgets. It is mentioned that SR1.5 budgets are higher than AR5 budgets but how much higher is not specified. Other sections should be relabeled accordingly. [India]	
7134	13	31	13	33	" The mandate for the 1.5°C special report stems from Paragraph 21 of Decision 1/CP.21, which states that: “Invites the Intergovernmental Panel on Climate Change to provide a special report in 2018 on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways. On page 13 of the SPM, Lines 31 to 33 seem problematic, especially the footnote (regarding the remaining carbon budget). The footnote points to a “recent period” that reflects the observational record, rather than relative to the pre-industrial period. Clearly, this goes against mandate, as the figures presented have to be relative to the pre-industrial period. Also, what is the “recent period” referred to in the footnote? The issue needs to be viewed in the context of cumulative emissions. The remaining budget cannot be shared by all countries, especially developed countries who have already used up what is their fair share. This is contrary to equitable access to atmospheric space and is an issue that can be a redline. Otherwise, assumption is that all countries have to share the remaining budget together – which is counter to equitable access to atmospheric space. There should be a major message on how the remaining carbon budget is to be shared fairly in the context of historical and cumulative emissions." [India]	
7302	13	31	13	32	Refers to the remaining carbon budget to avoid 1.5 degrees above pre-industrial. This asymmetry in the carbon budget for observed temperature change is left unmentioned while the remaining carbon budget for past and future temperature change is specified which is misleading. It downplays the role of past emissions in the feasibility of reaching the 1.5 degree target. The paragraph should be modified to specify that the amount of past emissions that have gone to reaching 0.87 degree and only then refer to the remaining emissions allowed to avoid breaching the remaining 0.63 degree. [India]	
8016	13	31	13	31	This bullet needs to include the effects on non-CO2 GHG. As is, it could be read and acted on without the key issue of controlling non-CO2. [United States of America]	
8018	13	31	13	32	The stated carbon budget in C1.2 varies somewhat from what is described in Cross-Chapter Box 11 (which should be referenced here). [United States of America]	
8020	13	31	13	33	The quantification about remaining CO2 budget has implicit assumption about decreases in non-CO2 components. Suggest stating that assumption here. Is it the cause of the difference with AR5? [United States of America]	
8022	13	31	13	35	In the interests of clarity, suggest that the first sentence of statement C1.2 either state the uncertainty of the 750 GtCO2 and 550 GtCO2 values, or that if applicable incorporate the ±50 GtCO2 described in the following sentence here. [United States of America]	
8024	13	31	13	37	These amounts seem very high given that in reducing emissions of CO2 from coal-fired power stations there will be substantial reductions in SO2 emissions and sulfate induced cooling. Absent the cooling influence, a GWP analysis gives a CO2-equivalent concentration that is already close to a 50% increase in level above preindustrial, and so quite close to or above an equilibrium warming of 1.5°C with natural fluctuations taking conditions above that level. And separating the statement about the offset that could result from thawing permafrost is located too separately from the first sentence. Also, given the prospective impacts with 1.5°C warming, that an indication should be given of the remaining carbon budget if the choice were to be to want a 9 out of 10 chance to be staying below 1.5°C. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8026	13	31	13	38	The discussion of the range of estimates for the remaining carbon budget for a one-in-two and for a two-in-three chance at limiting warming to 1.5°C would be enhanced by discussing the implications each budget estimate has for the time to reach net-zero. From the Chapter 2 Executive Summary, "Staying within a remaining carbon budget of 750 GtCO2 implies that CO2 emissions reach carbon neutrality in about 35 years, reduced to 25 years for a 550 GtCO2 remaining carbon budget (high confidence). The ±50% geophysical uncertainty range surrounding a carbon budget translates into a variation of this timing of carbon neutrality of roughly ±15-20 years." [United States of America]	
8028	13	31	13	38	It would be helpful for lay readers to put the carbon budgets in context, for example, by comparing them to current emissions rates. [United States of America]	
8414	13	31	13	38	The paragraph mentions a bigger remaining carbon budget than was assessed in AR5, which could very well be interpreted as a necessary correction brought by new scientific evidence, although this is not the case. Section 2.2.2 indicates that "the change since AR5 is, in very large part, due to the application of a more recent observed baseline to the historic temperature change and cumulative emissions; here adopting the baseline period of 2006-2015". There are many issues with this methodological choice, including its compatibility with the IPCC definition of global warming (that should be measured over 30-year periods to exclude the effect of short-term variability), which thus questions its scientific value and undermine the comparability of the estimates based on the 2006-2015 reference period with those of the AR5 assessments. Given the strong implications it has for the carbon budget, the adopted reference period should be that of AR5. This would also preserve consistency with the science that was used to derive the Paris Agreement. [Nepal]	
8600	13	31	13	38	Needs to be clearer. Budget ranges should be provided or their implications for pathways. Longer timeframes may provide a more robust perspective. Is 550 GtCO2 the median value? How do climate sensitivity estimates and feedbacks impact on the analysis or this is for the AR6 to address rather than in an SR, i.e. for an update of the AR5 analysis? [Ireland]	
8602	13	31	13	38	Could break up point and treat issues with non-managed removals and emissions separately to improve clarity [Ireland]	
8980	13	31	13	32	Suggest rephrasing to: "The remaining carbon emissions budget for a one-in-two chance of limiting global warming to 1.5°C is about 750 GtCO2, and about 550 GtCO2 for a two-in-three chance …". Suggest clarification: Is this CO2 or CO2-eq? This is an important distinction as later in C1.2 methane release is mentioned. [Australia]	
9150	13	31	13	38	C1.2: A central contribution to these bigger budget estimates relates to the introduction of a 2006-2015 reference period and comparisons between model projections and observations over this period. It is highly sensitive to the choice of the warming record and capitalizes on model-observation differences. The underlying assessment of the origins of these differences is not sufficiently well assessed and understood and the choice of a 10 year reference period not established in climate science. The analysis provided in Chapter 01 is not sufficiently comprehensive to warrant such a major update and e.g. misses out on a big body of literature on the warming hiatus and other literature reconciling model projections and observations. [cont'd below] [Nauru]	
9152	13	31	13	38	[cont'd] This is also highly relevant for the models used in this context such as MAGICC or the newly introduced FAIR model. It is problematic to introduce a new model into IPCC products at such a late stage. In particular, it seems that the FAIR model has been calibrated to a lower TCRE (Smith et al. 2018) by adjusting ocean heat uptake to match observed warming up to the 2006-2015 period, although this is not made clear in the report (this is being inferred from Smith et al. 2018 Table 7). Such an update is ignoring a literature basis that points towards issues with inferring TCRE from observations alone, while the full literature base does not support such conclusions (Knutti et al. 2017). Effects of rebasing are also affected by a change in modelling protocol with the RCPs starting in 2006 leading to a mismatch in modelled vs. observed forcing potentially to be reconciled in the AR6. [cont'd below] [Nauru]	
9154	13	31	13	38	[cont'd] Furthermore, the question on how global mean temperatures should be treated to maintain the integrity of the Paris Agreement needs to be assessed in greater detail. It therefore appears to be premature to draw conclusions out of an updated reference period. To be consistent with the AR5, the reference period should be reverted to the 1986-2005 including for model calibration. The large uncertainties related to carbon budgets compared with the fact that the concept does not account for any CDR that is prevalent in all 1.5°C pathways raises the question of the usefulness of the concept for policy makers and its inclusion in the SPM. Removing C 1.2 and 1.3 should therefore be considered. [Nauru]	
9300	13	31	13	31	Write: "For scenarios with no overshoot, the remaining carbon budget ..." [Switzerland]	
874	13	32	13	32	Could these figures be also translated in terms of years of emission, based on current emissions ? For example, add : "...which is equivalent to about 13-20 years of emissions at the current rate of emission (around 40GtCO2/yr)" [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2392	13	32	13	33	The issue of budgets being larger than assessed in AR5 requires much clearer explanation since stakeholders are likely to focus on it. Readers also need to know how to interpret carbon budgets and emission pathways. Recommendation: 1) is it possible at this stage to add an FAQ box to Chapter 2 dealing with this issue (and also explaining what is the relationship between the budgets and pathways cited in different places in this report)? Such a box could then be referred to at this point in the SPM. 2) add Table 2.4 to the SPM (potentially instead of parts of Figure SPM-1). This provides a more meaningful explanation of the emissions levels associated with 1.5°C and 2°C, including speed of decline and role of non-CO2, and CO2 from different sources/sinks. [European Union (EU)]	
5950	13	32	13	38	Please consider adding some figures, for example with the following sentence: "Staying within 750 GtCO2 implies that CO2 reach carbon neutrality in 35 years, and 25 years for 550 Gt CO2." (cf summary chapter 2). Please add a sentence to clarify that higher probabilities would result in smaller carbon budgets. [Belgium]	
6482	13	32	13	32	Budgets are larger but can it be indicated by how much? It is mostly unclear and the fomulation of ranges is also intransparent. And if it is true for 1.5C, it will also influence 2C and any other budget. [Netherlands]	
7136	13	32	13	33	After the first sentence in Para C1.2 add the following sentence - “At the current rate of CO2 emissions (around 40 GtCO2/yr), the remaining carbon budgets will be exhausted by year 2036 and year 2032 respectively.” [India]	
4830	13	33	13	35	It's a little unclear which of the two factors drives the uncertainty and how 50% and Gt figure relate. Could you please clarify. [United Kingdom (of Great Britain and Northern Ireland)]	
5022	13	33	13	33	The explanation in footnote 6 referring to why the carbon badgets are larger than those estimated in AR5, is unclear. Should it say something like 'remaining budgets consider differnt periods compared to AR5'? [Italy]	
5768	13	33	13	38	It is not very useful to mix ranges expressed in percentages and in GtCO2. Also, rather than listing various +/- amounts one by one, could something more coherent be expressed on the net range? (see also C1.3)? Possibly not, but in that case a statement on non-linearities should be added. [Sweden]	
6484	13	33	13	35	It is suggested that uncertainties have increased. Please indicate whether that is the case. [Netherlands]	
8030	13	33	13	33	Footnote 6 states that new literature "consistently" shows larger remaining carbon budgets compared to AR5. This does not appear to be the case with Lowe and Bernie (2018) and Rogelj et al (2018). Perhaps these publications did not make the literature cutoff deadlines but it makes it questionable whether such a strong statement ("consistently shows") should be made. [United States of America]	
8032	13	33	13	33	Footnote 6 is an important finding and should be moved into the main text. [United States of America]	
8034	13	33	13	35	This sentence, "Estimates of remaining budgets for 1.5°C vary by more than 50% due to assessed uncertainties in the climate response to emissions, and by ±250 GtCO2 due to assessed uncertainties in global warming until the decade 2006-2015." loosely implies that the estimates vary due to the uncertainties up to 2015 and that new estimates in 2018 should have lower uncertainties. Is that what the authors intend to communicate? Clarify in any case, as the wording is not clear. [United States of America]	
876	13	34	13	35	We suggest to mention that these two uncertainties cannot be combined, as said in Ch2 p. 21 {2.2.2.2} [France]	
4834	13	34	13	35	Different uncertainties in carbon budgets in the same sentence are described as percentages (50%) and in absolute terms (250GtCO2) - these should be expressed in the same units for ease of comparison. [United Kingdom (of Great Britain and Northern Ireland)]	
4836	13	35	13	36	This is an important point (100 GtCO2 is ~14% of of the 50% likelihood carbon budget) that should be made a separate bullet point, e.g. "The remaining carbon budget may be affected by climate impacts; permafrost thawing and methane release from wetlands may reduce budgets by up to 100 GtCO2..). It highlights that carbon cycle/earth system processes exist that may exacerbate the challenge, and therefore that there is still a need for strong and immediate reductions in emissions. [United Kingdom (of Great Britain and Northern Ireland)]	
5016	13	35	13	38	The sentence referring to methane emission could be separated from the previous sentence, or included in the following paragraph where it refers to non-CO2 carbon budget. [Italy]	
5952	13	35	13	37	We suggest clarifying this by inserting the following after "from wetlands" : "if a later end date than 2100 was considered, it is very likely that the decrease in the budget would even be larger" [Belgium]	
8036	13	35	13	35	This statement is not understandable: "… ±250 GtCO2 due to assessed uncertainties in global warming until the decade 2006-2015." Suggest revising to make clearer. [United States of America]	
2394	13	36	13	36	Replace … bugdets 'could' with … budgets will [European Union (EU)]	
3712	13	36	13	38	Does the budget change due to calculation methods? The statement should be turned around, showing that due to commonly used restrictions in calculation methods, the budget may be overestimated by many estimates and may be 100 Gt less. [Germany]	
6486	13	36	13	36	It is not clear whether this 100 GT from permafrost thawing is or is not included in the numbers presented in previous sentences. Please indicate. [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8038	13	36	13	36	This needs clarification. The permafrost thaw releases soil C as CO2 and the wetlands are where? tropical? This projected CH4 release is uncertain (at least in AR5). Is there now sudden agreement on this? [United States of America]	
8986	13	36	13	36	Suggest rephrasing: "… out to 2100, emissions budgets could be reduced by up to 100 GtCO2 by permafrost thawing …" Suggest clarification: Is this CO2 or CO2-eq? [Australia]	
4572	13	37	13	37	Suggest adding some descriptions about the uncertainties of permafrost to be more consistent with Section 2.6.1, which as Section 2.6.1 explains the knowledge gap but Section C1.2 does not clearly summarize the issues of knowledge gaps. [Japan]	
346	13	4	13	44	The item should be rewritten in more clear manner. [Russian Federation]	
1692	13	4	13	44	C1.3: This statement does not adequately reference non-CO2 mitigation needs due to its focus on the budget issues: A key policy relevant point from C2 ES relates the co-reduction of non-CO2 forcers through CO2 mitigation and this needs to be lifted in the SPM, which would otherwise omit this information: “Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence)” [Belize]	
1862	13	4	14	3	Correlation between C1.3 and C2.3: C1.3 states that N2O emissions increase with in some pathways with high demands of bioenergy while C2.3 states that bioenergy still could be substantial due to its cross-sectoral potential to replace fossil fuels. Will the increase in N2O emissions be outweighed by the replacement of fossil fuels? [Denmark]	
2396	13	4	13	44	The issue of non-CO2 emissions scenarios deserves further exploration since non-CO2 emissions pathways have a significant effect on the CO2 pathway/ budget (and unlike the other budget variants are a genuine policy choice rather than scientific uncertainty). Recommendation: mention some of the important insights from Ch 2.2.2 & 2.3.3 in this paragraph. For example, that non-CO2 forcing (and therefore mitigation) becomes increasingly important in relative terms towards the mid-century as CO2 emissions are reduced dramatically in 1.5°C & 2°C scenarios, that current 1.5°C pathways feature on limited mitigation options in CH4 & N2O (as per Ch 2.3.3). Therefore pathways for CO2 reductions and removals are also dependent on CH4 and N2O reduction pathways. [European Union (EU)]	
3714	13	4	13	44	The use of chemical abbreviations, such as "SO2" or "N2O", in a HL-document is rather challenging. We propose to use the term "sulphur dioxide" instead of "SO2", the same is true for "nitrogen dioxide" instead of "N2O". This would also bring more consistency into this para, as the term "methane" is used and not "CH4". Please make they are used consistently. Also, removal of SO2 is confusing - please use reduction of SO2 emissions instead. [Germany]	
4144	13	4	13	44	C1.3: This statement does not adequately reference non-CO2 mitigation needs due to its focus on the budget issues: A key policy relevant point from C2 ES relates the co-reduction of non-CO2 forcers through CO2 mitigation and this needs to be lifted the SPM, which would otherwise omit this information: “Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence)” [Saint Kitts and Nevis]	
4992	13	4	13	44	This para should explain how non-CO2 forcers affect the carbon budget. The second sentence talks about warming from SO2 reductions and how these are compensated by methane reductions, but not what the impact on the carbon budget is. Also, it might be clearer to say: "...add to futrue warming, although this would be partially countered/compensated by reductions in methane emissions". Finally, the last sentence on N2O seems disconnected from the rest of the paragraph. It doesn't mention the resulting warming or the effect on the carbon budget - please explain the consequence of the increase in N2O emissions. [United Kingdom (of Great Britain and Northern Ireland)]	
5108	13	4	13	44	This paragraph lacks an important statement for policy makers that strongly reducing non-CO2 gases an warming aerosols is critical for being able to meet the 1.5 limit, as higher non-CO2 compounds emissions can strongly reduce the remaining carbon budget. In the short term this is particularly relevant for long-lived non-CO2 compounds. [Hungary]	
5398	13	4	13	44	C1.3: This statement does not adequately reference non-CO2 mitigation needs due to its focus on the budget issues: A key policy relevant point from C2 ES relates the co-reduction of non-CO2 forcers through CO2 mitigation and this needs to be lifted the SPM, which would otherwise omit this information: “Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence)” [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5830	13	4	13	44	Chapter 2, 2.3.3.1 of the full report states that "N2O emissions decline to a much lesser extent than CO2 in currently available 1.5°C-consistent pathways [...], reflecting the difficulty of eliminating N2O emission from agriculture (Bodirsky et al., 2014). Moreover, the reliance of some pathways on significant amounts of bioenergy after mid-century (Section 2.4.2) coupled to a substantial use of nitrogen fertilizer (Popp et al., 2017) also makes reducing N2O emissions harder (for example, see pathway S5 in Figure 2.6). As a result, sizeable residual N2O emissions are currently projected to continue throughout the century, and measures to effectively mitigate them will be of continued relevance for 1.5°C societies." Moreover, in Chapter 2, 2.4.4 of the full report, it is highlighted that "N2O emissions decrease due to improved N-efficiency and manure management (Frank et al., 2018). However, high levels of bioenergy production can also result in increased N2O emissions (Kriegler et al., 2017) highlighting the importance of appropriate management approaches (Davis et al., 2013)." Therefore, to more accurately reflect what is expressly stated in the full report regarding the challenges involving the reduction of N2O emissions ("harder"), their potential increase ("can") due to high levels of bioenergy production, and the importance of highlighting the need for appropriate management approaches, we propose the following alternative wording to paragraph C.1.3. of the draft Summary for Policymakers (SPM): "C1.3. Different amounts of non-CO2 mitigation result in variations in the remaining carbon budget consistent with 1.5°C of ±250 GtCO2 (medium confidence). In the next two to three decades, removal of SO2 would add to future warming, but reductions in methane emissions would partially compensate (high confidence). However, emissions of N2O can increase in some pathways with high bioenergy demand, highlighting the importance of appropriate management approaches. (Figures SPM1 and SPM3)". [Brazil]	
6262	13	4	13	44	Suggestion for consideration: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Fiji]	
6488	13	4	13	44	This paragraph lacks an important statement for policy makers that strongly reducing non-CO2 gases and warming aerosols is critical for being able to meet the 1.5 limit, as higher non-CO2 compounds emissions can strongly reduce the remaining carbon budget. In the short term this is particularly relevant for long-lived non-CO2 compounds. [Netherlands]	
6748	13	4	13	44	C1.3: This statement does not adequately reference non-CO2 mitigation needs due to its focus on the budget issues: A key policy relevant point from C2 ES relates the co-reduction of non-CO2 forcers through CO2 mitigation and this needs to be lifted the SPM, which would otherwise omit this information: “Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence)” [Marshall Islands]	
8040	13	4	13	44	Can the authors say something about the implications of N2O from bioenergy on CO2 budgets? [United States of America]	
8604	13	4	13	44	C1.3 is somewhat obscure. Increase clarity on points perhaps through a table with numbers and ranges including details on CO2 and non-CO2 forcers [Ireland]	
9156	13	4	13	44	C1.3: This statement does not adequately reference non-CO2 mitigation needs due to its focus on the budget issues: A key policy relevant point from C2 ES relates the co-reduction of non-CO2 forcers through CO2 mitigation and this needs to be lifted the SPM, which would otherwise omit this information: “Some non-CO2 forcers are emitted alongside CO2, particularly in the energy and transport sectors, and can be largely addressed through CO2 mitigation. Others require specific measures, for example to target agricultural N2O and CH4, some sources of black carbon, or hydrofluorocarbons (high confidence)” [Nauru]	
9498	13	4	13	4	Text on the near-term co-benefits of reducing short-lived climate forcers in 1.5C consistent pathways in the SPM is lacking. As such, consider adding text at the end of this paragraph conveying that early action on short-lived climate forcers is associated with considerable near-term societal co-benefits (consistent with text in Chapter 1, Cross Chapter Box 2 and Chapter 5, section 5.4.2.1). [Canada]	
878	13	41	13	41	"removal" : This word has a particular meaning for CO2, also in the Paris Agreement so we suggest to write "emission reduction" instead. [France]	
880	13	41	13	42	We suggest to replace this sentence by : "In the next decades, emission reductions of SO2 will have the effect of decreasing the remaining carbon budget, while reductions in methane emissions will increase it to a smaller extent." in order to make the link with the first sentence about the remaining carbon budget. [France]	

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4016	13	41	13	44	Please consider the word "would" related to SO2 and methane in this sentence, and the consistency with the weaker phrase "in some pathways" used in the next sentence, as this indicates a difference in the predictability of different measures and we are not sure if this is the intention. Maybe all these measures are related to pathways? [Norway]	
4838	13	41	13	42	It may not be clear to all readers why removal of SO2 would add to warming or how it could be removed. Consider adding a clarifying remark. Also suggest spelling out "sulphur dioxide" in full at some point. [United Kingdom (of Great Britain and Northern Ireland)]	
5770	13	41	13	42	Would the removal of SO2 (and CH4) during the next few decades add to the carbon budget and the final warming / stabilised temperature level? How does this compare to the 1.5oC-consistent pathways in the long term? [Sweden]	
8042	13	41	13	41	Can this be made clearer and NOT listed as an uncertainty but rather a range based on scenarios: "… that range from -250 to +250 GtCO2". [United States of America]	
4840	13	42	13	42	Referring to the methane reductions mentioned here, it would be helpful if somewhere in section C that there could be a discussion of how and where these might be achieved. The section is (understandably) heavily focused on CO2 and how decarbonisation might proceed, but it would also be useful to have a little more specific information on methane. [United Kingdom (of Great Britain and Northern Ireland)]	
8044	13	42	13	42	The reference to methane offsets is confusing here. Is it understood that methane reductions will occur with SO2 reductions? [United States of America]	
258	13	43	13	44	Are the N2O emissions due to the draining of wetlands? It would be useful to include the reason for increase in N20, as it is not widely known to public. [Finland]	
882	13	43	13	44	We suggest to write : "Emissions of N2O decrease in some pathways and increase in other ones with high bioenergy demand, thereby decreasing the remaining carbon budget {2.4.4}" to keep on doing the link with the carbon budget. [France]	
2398	13	43	13	44	High bioenergy demand will have big impacts (and big uncertainties) on a number of factors other than N2O. Why is only N2O being singled out? Some explanation (or re-drafting) may be neccessary [European Union (EU)]	
4574	13	43	13	44	We want to take into account N2O emissions from agriculture as a source of N2O increase. [Japan]	
5954	13	43	13	44	N2O is a relatively long-lived greenhouse gas, so stable or increasing emissions would result in a long-term increase in concentration, and thus contribute to further global warming. Are N2O emissions finally declining in all 1.5 or 2C scenarios ? if not, how is it possible ? This is counterintuitive, so an explanation would help the readers. [Belgium]	
8982	13	43	13	43	Suggest rephrasing to: "emissions of N2O would increase in some pathways" [Australia]	
260	13	44	13	44	This is the first text reference to Figure SPM 3, where the four archetype pathways are illustrated. It seems that the four pathways (LED, S1, S2, S5) are not described here, or elsewhere in the SPM text. Although they are described in the figure, their overall context may remain somewhat blurred to a reader. Perhaps a short introduction plus a title accompanying each acronym would help. Hence, I suggest a piece of new text: "C1.1 For the purpose of this assessment, a set of four illustrative 1.5°C-consistent pathway archetypes were selected to show the variety of underlying assumptions and characteristics. They comprise three 1.5°C-consistent pathways based on the Shared Socio-economic Pathways (SSPs): a sustainability oriented scenario (S1), a fossil-fuel intensive and high energy demand scenario (S5), and a middle-of-the-road scenario (S2). In addition, a scenario with low energy demand (LED) is included. (Figure SPM 3) {2.3.1.1}" Alternatively, this text could be included in the Figure SPM 3. [Finland]	
6490	13	44	13	44	Does this add another uncertainty of 250 Gt?? To what extent is it independent of the previous uncertainty of 250 Gt in point C1.2? If it adds to the uncertainty the total range becomes very wide: -50 to 1250 GtCo2 and is close to meaningless. Difficult to read and implications unclear [Netherlands]	
386	13	46	13	49	It is useful to have the emissions in 2030 consistent with 1.5dC, so this is a very valuable statement, but it would be helpful to place this in the context of the emissions in 2030 implied by the current NDCs - i.e. the information in point D1.1 - as these two pieces of information together will be essential for the Talanoa Dialogue and it is less easy to compare them when they are in different sections. [Chad]	
884	13	46	13	46	Replace "aim for" by "reach" and "have" by "requires", in order to emphasize the necessity to avoid an overshoot scenario. [France]	
1694	13	46	13	49	C1.4: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Belize]	
2400	13	46	13	46	The SPM and summary in Chapter 2 refer to up to 0.2 degree overshoot of 1.5 degrees for the low overshoot. However, the classification table (table 2.1) in chapter 2 refers to 0.1 degrees 'generally'. Thus i snot very clear where the 0.2 comes from. [European Union (EU)]	
2402	13	46	13	48	The text refers to the an interquartile range of total global emissions of 25-30 Gt for no or limited over shoot of 1.5 degrees. However, Table 2.4 in Chapter 2 seems to indicate a range (building on 25th and 75th percentiles) of 21-31 GTCO2e in 2030, with a median range of 22-28. Where does the 25-30 come from? [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2404	13	46	13	49	Please add also data on where GHG emissions would need to be in 2050 [European Union (EU)]	
3716	13	46	13	49	Please bring C.1.4 forward to directly follow the first two paragraphs (current C1.1, and new C1.2). Please add "and contrasting with median estimates for current NDCs of 50-58 GtCO2eq/yr in 2030." after "a 40% reduction from 2010". Rationale: In the executive summary of Chapter 2 (page 4) the ranges of emissions in the 1.5°C scenarios in 2030 are stated in comparison to the current NDCS. This contrast is important and displaying it in the SPM gives policy makers a better impression of the size of the gap that needs to be closed by 2030 if there is to be a realistic chance of limiting warming to 1.5°C. [Germany]	
4018	13	46	13	49	Please consider to include information about when (which time period) GHG emissions are reduced to net zero. Please also give numbers for 2C pathways. [Norway]	
4146	13	46	13	49	C1.4: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Saint Kitts and Nevis]	
4842	13	46	13	49	It would be helpful here, or somewhere in C1, to talk about the fact that emissions peak in the 2020s and for this to be stated explicitly. This would provide important information on the speed of necessary near-term decarbonisation. [United Kingdom (of Great Britain and Northern Ireland)]	
4844	13	46	13	49	It would also be helpful to more explicitly state the implications of delayed action (i.e. it makes it more difficult to achieve goals, increases the reliance on CDR and locks in high carbon infrastructure that is then costly to retire). This could also be included in C3, but either way it should be more clearly brought out in the text. [United Kingdom (of Great Britain and Northern Ireland)]	
4846	13	46	13	49	It would also be helpful to provide 2030 numbers for 1.5c consistent pathways with overshoot. By only presenting the very most ambitious numbers, the full spectrum of choices, and ultimately their implications, are not provided to policymakers. They need to be informed clearly that if they achieve values of x then they may get no overshoot and values of y then they may get overshoot. [United Kingdom (of Great Britain and Northern Ireland)]	
4848	13	46	14	48	I'm sorry if this is a very basic misunderstanding, but the range of values for no or limited overshoot presented here (25-30gtCO2e in 2030) appear to differ from the range presented in the underlying chapter 2. In table 2.4, kyoto GHG (i.e. co2e) for below 1.5 is a median of 22gt in 2030.and low overshoot is 28gt. Is this range in the SPM an error? [United Kingdom (of Great Britain and Northern Ireland)]	
4850	13	46	13	49	Valuable additional context could be added by noting that these no overshoot scenarios are relatively low probability of staying below 1.5 for the whole century (i.e. no scenarios with greater than 66% of doing so were found). [United Kingdom (of Great Britain and Northern Ireland)]	
5110	13	46	13	49	Missing in this section is a text that gives the 2050 GHG emissions levels required for 1.5 degrees. Many countries are developing their mod-term strategies and would need this information. Table 2. 4 has the data: 3-8 GTCO2e/yr by 2050 if all 1.5 pathways are grouped together. [Hungary]	
5286	13	46	13	49	It is useful to have the emissions in 2030 consistent with 1.5dC, so this is a very valuable statement, but it would be helpful to place this in the context of the emissions in 2030 implied by the current NDCs - i.e. the information in point D1.1 - as these two pieces of information together will be essential for the Talanoa Dialogue and it is less easy to compare them when they are in different sections. [Zambia]	
5400	13	46	13	49	C1.4: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Saint Lucia]	
5832	13	46	13	49	The level of likelihood and of confidence of the finding is missing. [Brazil]	
5956	13	46	13	49	Please consider the following at the end of C1.4 : "delaying GHG emissions reductions over the coming years also leads to economic and institutional lock-in into carbon-intensive infrastructure that is, the continued investment in and use of carbon-intensive technologies that are difficult or costly to phase-out once deployed." (chapter 2, section 2.3.5). This important information is currently missing in the SPM. It could be relevant here because it is another motivation for early action and an important aspect of 1.5°C pathways. [Belgium]	
5958	13	46	13	49	We suggest to delete the last sentence : "Uncertainties in the climate response imply the possibility of lower or higher warming levels being reached by these pathways". This is already said for all 1.5°C patways in BOX SPM 1, as there is 1/2 to 2/3 chances of being below 1.5°C. So this is not at all specific to pathways with no or limited overshoot, and the sentence might confuse the reader by suggesting there is more uncertainties with these pathways than with those that have larger overshoot. [Belgium]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6264	13	46	13	49	It is noted that C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs to be captured well in high confidence text in C2 ES, which could be used at the beginning of C2. Thus the statement could be restructures as:“The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence).” Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: "All analysed 1.5°C consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5°Cfollowing an overshoot (high confidence)." [Fiji]	
6492	13	46	13	49	Missing in this section is a text that gives the 2050 GHG emissions levels required for 1.5 degrees. Many countries are developing their mid-term strategies and would need this information. Table 2. 4 has the data: 3-8 GTCO2e/yr by 2050 if all 1.5 pathways are grouped together. [Netherlands]	
6620	13	46	13	49	It is useful to have the emissions in 2030 consistent with 1.5dC, so this is a very valuable statement, but it would be helpful to place this in the context of the emissions in 2030 implied by the current NDCs - i.e. the information in point D1.1 - as these two pieces of information together will be essential for the Talanoa Dialogue and it is less easy to compare them when they are in different sections. [Sudan]	
6750	13	46	13	49	C1.4: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Marshall Islands]	
6904	13	46	13	49	It is useful to have the emissions in 2030 consistent with 1.5dC, so this is a very valuable statement, but it would be helpful to place this in the context of the emissions in 2030 implied by the current NDCs - i.e. the information in point D1.1 - as these two pieces of information together will be essential for the Talanoa Dialogue and it is less easy to compare them when they are in different sections. [Gambia]	
8046	13	46	13	46	"substantial" reads ambiguously. Instead phrase as: "have rapid emission reductions, keeping..." no need to repeat 2030. At minimum, suggest changing "have substantial" to "would require substantial". [United States of America]	
8416	13	46	13	49	It is useful to have the emissions in 2030 consistent with 1.5dC, so this is a very valuable statement, but it would be helpful to place this in the context of the emissions in 2030 implied by the current NDCs - i.e. the information in point D1.1 - as these two pieces of information together will be essential for the Talanoa Dialogue and it is less easy to compare them when they are in different sections. [Nepal]	
8878	13	46	13	46	Suggest re-phrasing as: "Pathways that aim for no or limited (zero to 0.2°C) overshoot of 1.5°C would require substantial emission reductions" [Australia]	
9158	13	46	13	49	C1.4: Add information about emission levels with NDC (D1.1), as in ES chapter 2, 2-4: "This contrasts with median estimates for current NDCs of 50-54 GtCO2e (conditional) and 52-58 (unconditional) per year in 2030. [Nauru]	
3718	13	47	13	48	"interquartile range": technical term that may have to be explained for some readers. [Germany]	
8048	13	47	13	47	Spell out "GHG" acronym. [United States of America]	
886	13	48	13	48	Wouldn't it be more insightful for the reader to add a sentence after this one, which compares this figure with the expected GHG emissions deriving from the NDCs in 2030? We suggest to add : "...40-50% reduction from 2010, to be compared with the 10-15% increase projected to result from the implementation of current NDCs" [France]	
7138	13	48	13	49	After the first sentence in Para C1.4 add the following sentence - “This rate of reduction assumes effective CDR amounting to approximately 270 GtCO2 by 2100 ” [India]	
8984	13	49	13	49	Suggest rephrasing to: "… warming levels being reached under these scenarios". [Australia]	
6494	13	5	13	5	Footnote 6: Please rephrase the second sentence. Is unclear what point is made here. [Netherlands]	
1860	14	1	14	35	Section C2 does not convey the scale and feasibility of CDR, but rather conveys CDR as adding flexibility to mitigation options. The messages of the underlying report should come through more clearly. Particularly we suggest to add from Ch. 2 p. 6.: CDR deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5C. CDR is needed less in pahtways with particularly strong emphasis on energy efficiency and low demand. The scale and type of CDR deployment varies widely across 1.5C consistenst pathways, with different consequences for achieving sustainable development objectives [Denmark]	
2406	14	1	14	29	It is not clear why the role of nuclear is not discussed in this context, whereas there is a substantial investment on this in certain world regions. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2408	14	1	14	5	The sentence "some limit global warming… without relying on BECCS" is misleading. Fine to say that 1.5°C without BECCS is possible, but readers need to be aware that this an extreme scenario in other ways - not merely a simple choice to opt out of BECCS and expect other 1.5°C conditions to fall into place. As this statement is written, a reader who is not familar with this literature could easily infer that large-scale CDR is not required for 1.5°C - and this is simply not the case. Most (almost all?) 1.5°C consistent pathways require net negative CO2 emissions and substantial deployment of CDR. Those with limited (or no) BECCS require substantial reductions elsewhere - in particular rapid AFOLU mitigation leading to a global net sink (as Figure SPM3 shows). Recommendation - the sentence could be rephrased to say something like: 1.5°C-consistent pathways can have different levels of CDR but all require CO2 emissions to fall below net zero, in addition to substantial reductions in non-CO2 emissions. Pathways with the least reliance on BECCS combine negative emissions from the AFOLU sector with behaviour change, demand-side measures and emissions reductions in the short-term. [European Union (EU)]	
5834	14	1	14	53	We suggest the inversion of the chapters C2 and C3, since mitigation efforts should be prioritized over carbon removal methods for achieving 1.5°C consistent pathways. [Brazil]	
888	14	2	14	5	This paragraph on CDR is policy-relevant. Even if some clarifications can be made to improve the text, this section and the associated sub-section have their rightful place in this SPM. A few ideas to improve the headline : 1) The first sentence does not mention the most important information, which is that most scenarios use CDR at a massive scale. 2) The headline should mention the mutliple feasibility constraints of CDR, by refering to {2.3.4} 3) It would be clearer to put the last sentence before the sentence about the BECCS. 4) mentioning the short-term only could be misunderstood, we suggest to mention also the long-term. 5) A few words mentioning the "nature-based" CCS methods could help the reader to understand the diversity of the CDR methods, and the potential alternative to BECCS, by refering to {4.3.7} Regarding all these remarks, the headline could be as follow (added text in bold characters) : "All 1.5°C-consistent pathways rely on CDR methods, at various scales and speeds which may be affected by multiple feasibility constraints. Behaviour changes, demand-side measures and emission reductions in the short term consistent with a net-zero compatible long-term pathway can limit the dependance on CDR. While reliance on BECCS is usually high on 1.5°C consistent pathways, some limit global warming to 1.5°C without relying on it, but instead on nature-based solutions {2.3, 2.5, 4.3, 3.4.5, 4.3.7}" [France]	
1696	14	2	14	5	C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs is captured well in high confidence text in C2 ES which could be used at the beginning of C2 “The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence).” Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: "All analysed 1.5 consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5 following an overshoot (high confidence)." [Belize]	
1726	14	2	14	5	I wonder whether the analysis of the report can support stronger SPM message on CDR as whether all 1.5 °C consistent pathways use CDR or alternatively how important the CDR option for 1.5 ?C indicating the percentage of studies using CDR for 1.5 °C. [Saudi Arabia]	
1778	14	2	14	5	This statement concludes that 1.5? C can be achieved without relying on Carbon Dioxide Removal technologies such Carbon Capture and Storage (CCS), while previous studies from IPCC emphasized the critical importance of CDRs for achieving the 2.0? C warming. There is need to quantify the number of 1.5? C-consistent pathways not relying on CDRs againt 1.5? C-consistent pathways relying on CDRs for the reader to better appreciate the scientific weight behind these claims. [Saudi Arabia]	
1834	14	2	14	2	Delete "can": All pathways (depicted in figure on page 16 upper panel) imply negative emissions. [Denmark]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2410	14	2	14	2	Regarding Section C2: A definition should be given for "CDR" up front. In addition, the way the term is used should be revisited. Specifically, it is entirely unclear how the mentioned "CDR methods" would be different (and separated from) land sinks. If they are not separated (but all removals by sinks are now rebranded as "CDR"), then that should be emphatically stated, but then the list should include the forest sink (on forest remaining forest), not only A/R and soil sequestration. The current list of CDRs excludes what is currently the biggest part of carbon dioxide removal (forest sink), includes some traditional forms of land use activity (A/R and soil management), and includes some which do not remove carbon (BECCS). BECCS sequesters carbon removed by plants, but the removal part (plant growth) is not part of the technology, and if the land where removals occur (and its carbon stocks and net flows) are assigned to BECCS, then the same land must be transparently removed from the accounting of land sinks, to avoid multiple counting of the same sequestration. This is not the case in the current report, making the claims on BECCS/CDR intransparent. [European Union (EU)]	
2412	14	2	14	13	The SPM summary of CDR issues seems to be more 'positive' than the coverage and summary in Chapter 2 - especially with regard to (a) their feasibility and the associated implications for the 1.5 and 2 degree scenarios with heavy reliance on CDR later in this century, and (b) how effective later introduction of CDR would be in reducing temperatures in OS scenarios. [European Union (EU)]	
3720	14	2	14	4	The second sentence on BECCS does not connect well to the first sentence. If this para is kept as is, in first sentence, the words "different methods and levels" should be added. The second sentence could also be amended or generalized, as those scenarios most likely not only exclude BECCS but also other forms of CDR that are not ready for deployment. [Germany]	
3722	14	2	14	5	We are concerned that the headline statement does not provide an adequate summary of the analysis in chapters 2 and 4 and doesn't fully reflect the important role of CDR for most 1.5C pathways and all overshoot pathways (including 2C pathways), nor the associated risk. As far as we understand the literature summarized in Chapter 2, only 9 out of 90 1.5C scenarios analysed hold warming below 1.5C throughout the 21st century (s. Table 2.1) and would therefore not rely on CDR to bring Temperatures down. Still, even those pathways can have substantial contributions from CDR to counteract residual non_CO2 forcing and limit transitionary warming. Therefore, the first line "can have different levels of CDR" is misleading, as levels are different but mostly substantial. Please revise, using the following slightly abbreviated language from chapter 2 ES: "All analysed 1.5°C-consistent pathways use CDR to some extent to neutralize residual emissions and, in most cases, to achieve net-negative emissions that allow temperature to return to 1.5°C following an overshoot (high confidence)" After the first sentence, please insert the following sentence from the Chapter 2 executive summary: "CDR deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5°C." Please keep the final sentence of C2. C2 should thus read "All analysed 1.5°C-consistent pathways use CDR to some extent to neutralize residual emissions and, in most cases, to achieve net-negative emissions that allow temperature to return to 1.5°C following an overshoot (high confidence) CDR deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5°C. Behaviour change, demand-side measures and emission reductions in the short term can limit the dependence on CDR (high confidence). {2.3, 2.5, 4.3} Rationale: the further points in C2 often refer to what must be done to limit CDR use. Adding this line summarises very briefly why limiting CDR is relevant. We also want to point out that we do not consider the fact that very few pathways exist that do not use BECCS as a key finding, as in modelling, BECCS is actually a proxy and can be replaced by other NET-measures. We would encourage authors to remove this sentence from the headline statement to save space. [Germany]	
3724	14	2			We strongly urge the authors to revise the entire section C2. As pointed out in our comment on p 14 ln 2-5 (headline statement) we would prefer to see a presentation of the extensive information gathered in Chapter 2 and 4 and Cross Chapter Box 7 that is more relevant for decision-making and reflects key findings especially from the ES of Chapter 2. The current language is too neutral and neither addresses the scale of the challenge to develop CDR at the Gt dimension foreseen even in scenarios that make limited use of CDR, nor the risks associated with large scale land based measures, and fails to highlight how failure to develop and deploy CDR may put (both the 2C and) the 1,5C temperature goal in jeopardy. The current section C2 does not provide guidance to policy makers and is not an appropriate summary of the underlying analysis. With this in mind, we'd encourage authors to 1) alter the headline statement as suggested in our comment on Ch2-14-2-5) bring C2.2 forward to directly follow C2; 3) add the line "Limitations on the speed, scale, and societal acceptability of CDR deployment also limit the conceivable extent of temperature overshoot" from Ch2 ES to C2.3 as first line, before continuing "Variation in amount and types of CDR [..] suggest SOME flexibility...", 4) keep and/or expand C2.4, as it is important to highlight CDR options with potential SDG co-benefits. cf. our more detail comments on individual sections [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3916	14	2	14	5	We would like to remove the sentence "Some limit global warming to 1.5°C without relying on bioenergy with carbon capture and storage (BECCS)." It seems strange to single out a single technology in the headline. A sentence in the way of C2.3: “BECCS deployment ranges from 0-16 GtCO2/yr in2100, while agriculture, forestry and land-use (AFOLU) related CDR measures remove 1–5 GtCO2/yr in 2100”, including figures, seems more appropriate. [Luxembourg]	
4020	14	2	14	35	Section C2 is in our view slightly unbalanced between the potential benefits and the adverse effect of extensive use of CDR tecnologies. E.g. there is a lack of information about land area required for CDR, and in particular BECCS. Trade offs with biodiversity should be mentioned, and information on the considerable implementation challenges related to public acceptance, techonological development and missing economic incentives (see executive summary chapter 4, page 7, paragraph 4, and also Chapter 2, section 2.3.4) [Norway]	
4022	14	2	14	5	A key question concerns the trade-off between a more rapid decarbonisation of the economy, vs delayed action, overshoot and the deployment of CDR at a later stage. But risks and availability of CDR is poorly understood, and there is a possibility that models and scenarios that this report builds upon, overestimates the potential for future removals. Thus, please consider including in this paragraph, a sentence indicating that at least some of the CDR options are unproven at a scale assessed in the pathways, and the risk related to reliance on such technologies, e.g as mentioned in Chapter 2, Executive summary. page 6. [Norway]	
4148	14	2	14	5	C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs is captured well in high confidence text in C2 ES which could be used at the beginning of C2 “The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence).” Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: "All analysed 1.5 consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5 following an overshoot (high confidence)." [Saint Kitts and Nevis]	
4578	14	2	14	5	As it would be important information for the reader to know that "all analyzed 1.5°C-consistent pathways use CDR to some extent" as provided in Chapter 2, page 6, as a premise of the findings in section C2, suggest inclusion of this at the beginning of the section. For example, it could read: All analyzed 1.5°C-consistent pathways use carbon dioxide removal (CDR) to some extent, but the levels of CDR used can be varied among these pathways. [Japan]	
4580	14	2	14	35	The information on CDR in the Executive Summary in Chapter 2 that ”reliance on CDR technology is a major risk in the ability to limit warming 1.5°C” is important information for the policymaker but not clearly mentioned in the SPM, so suggest including this information in the SPM as well. [Japan]	
4582	14	2	14	5	Description of "Some limit global warming of 1.5 °C without relying on BECCS" is quite misleading. It is true that this is based on literatures, but these literatures are based on exceptional assumptions, that is drastic energy demand reduction. And even in Chapter 4, the above sentence cannot be found in executive summary. Therefore, remove this sentence from SPM. Instead, necessary volume of BECCS to achieve 1.5°C in 2050 and 2100 (3.7-8GtCO2 and 14GtCO2) as well as differences of bioenergy potentials in 2050 among literatures (one is 1-85GtCO2 and the other 0.5-5GtCO2) should be included to show vast uncertainties on CDR (or BECCS). [Japan]	
4852	14	2	14	5	It should be mentioned, somewhere in the discussion of CDR in section C2, that it is likely that some form of CDR will be required at the very least to offset residual emissions. CDR/BECCS has recently become more prominent in public debate but much of this debate has focused on net negative emissions and the use of CDR to compensate for excess emissions early in the century. However, it's important to communicate to policy makers that CDR has two purposes in models and that even if we decarbonise very rapidly, we will still likely need some to offset residual emissions. Ultimately greater clarity is needed in this section on why CDR exists at all in models - policymakers may not all be aware of this. [United Kingdom (of Great Britain and Northern Ireland)]	
4854	14	2	14	5	This paragraph begins and ends by talking about CDR, but in the middle mentions BECCS, as if it were the only CDR. If in row 3 it said CDR instead of BECCS, would it still be true (for example might you need the same amount of CDR, but had to rely on an alternative to BECCS)? If so, it would be better to say CDR. We shouldn't start the discussion about CDR with an assumption that any 1 CDR is better than others, and as drafted this is inconsistent with the point made in rows 11-12, about a portfolio of options. Or, if you have to make a specific point about BECCS (presumably because its the main one currently modelled), it needs to be clear why you are referring to it in particular and not just CDR. [United Kingdom (of Great Britain and Northern Ireland)]	
4994	14	2	14	2	Couldn't this be true of pathways consistent with almost any level of warming? The key message needs to be more specific to 1.5C here. A more useful statement would be an answer to "do 1.5C pathways require CDR?". [United Kingdom (of Great Britain and Northern Ireland)]	
4996	14	2	14	4	It says that some 1.5C pathways don't rely on BECCS, but do they use other forms of CDR? This should be clarified. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5112	14	2	14	5	Missing in the paragraph on CDR options is a clear statement that Interated Assessment Models that produced the pathways assessed in this report only have afforestation and BECCS as options for CDR and that BECCS usage should therefore be seen as a proxy for a range of CDR options. Then in the sentence "Some limit ..." replace BECCS by non-land use CDR. [Hungary]	
5402	14	2	14	5	C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs is captured well in high confidence text in C2 ES which could be used at the beginning of C2 “The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence).” Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: "All analysed 1.5 consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5 following an overshoot (high confidence)." [Saint Lucia]	
5816	14	2	14	5	If "most scenarios rely on BECCS" applies (as the paragraph seems to suggest), a reformulation would be warranted for improved clarity, for example "In most pathways, BECCS is needed to limit global warming to 1.5oC". However, something along the lines of "BECCS and AFOLU-related measures are crucial..." might also work here (cf. C2.), as this seems to be an important characteristic of the pathways. Robust exceptions to this could also be given, if relevant. [Sweden]	
5836	14	2	14	5	Several sections of chapters 2 and 4 of the full report highlight that substantial increases in bioenergy use will be necessary with or without BECCS, including: - Chapter 2, Executive Summary: "Bioenergy use is substantial in 1.5°C-consistent pathways with or without BECCS due to its multiple roles in decarbonizing energy use." (2.3.1, 2.5.3, 2.6, 4.3.7); - Chapter 2, 2.3.1.2 (Mitigation options in 1.5ºC-consistent pathways): "The configuration of carbon-neutral energy systems projected in mitigation pathways can vary widely, but they all share a substantial reliance on bioenergy under the assumption of effective land-use emissions control. There are other configurations with less reliance on bioenergy that are not yet comprehensively covered by global mitigation pathway modelling"; - Chapter 2, 2.3.4.1, Box 2.1 (Bioenergy and BECCS deployment in integrated assessment modelling): "Bioenergy can be used in various parts of the energy sector of IAMs, including for electricity, liquid fuel, biogas, and hydrogen production. It is this flexibility that makes bioenergy and bioenergy technologies valuable for the decarbonisation of energy use (...) Most bioenergy technologies in IAMs are also available in combination with CCS (BECCS). (...) Most bioenergy use in IAMS is combined with CCS if available (...) If CCS is unavailable, bioenergy use remains largely unchanged or even increases due to the high value of bioenergy for the energy transformation"; - Chapter 2, 2.4.2.1 (Evolution of primary energy contributions over time): "Renewable energy (including biomass, hydro, solar, wind, and geothermal) increases across all 1.5ºC pathways (...). Bioenergy is a major supplier of primary energy, contributing to both electricity and other forms of final energy such as liquid fuels for transportation (Bauer et al., 2018). In 1.5ºC pathways, there is a significant growth in bioenergy used in combination with CCS for pathways where it is included."; - Chapter 2, 2.4.2.2 (Evolution of electricity supply over time): "By 2050, the share of electricity supplied by renewables increases (...) Wind, solar, and biomass together make a major contribution in 2050."; - Chapter 4, 4.3.1.2 (Bioenergy and Biofuels): "Most scenarios find that Bioenergy is combined with Carbon Dioxide Capture and Storage (CCS, BECCS) if it is available but also find robust deployment of bioenergy independent of the availability of CCS". This information should be adequately included in paragraph C2. of the SPM, which synthetizes and highlights the main findings of this chapter of the report. To more accurately reflect the scope of the findings in the report, we propose the following alternative wording to paragraph C2.: "C2. 1.5°C-consistent pathways can have different levels of carbon dioxide removal (CDR). Some limit global warming to 1.5°C without relying on bioenergy with carbon capture and storage (BECCS), though bioenergy use remains largely unchanged or even increases if CCS is unavailable, due to its high value for the energy transformation. Behaviour change, demand-side measures and emission reductions in the short term can limit the dependence on CDR (high confidence). {2.3, 2.5, 4.3}" [Brazil]	
5960	14	2	14	5	The sentence "Behaviour change, demand-side measures and emission reductions in the short term can limit the dependence on CDR" is important and should be reflected and developed in one new subparagraph (C2.5). It should also be made clear that these are quite fundamental means for staying below 1.5°C (not just to limit CDR). [Belgium]	
5962	14	2	14	2	The sentence "Geophysical understanding is limited about the effectiveness of CDR to reduce temperatures after they peak" from C2.2 is very important and should be moved to C.2, right before the words "Behaviour change…". [Belgium]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6266	14	2	14	5	"Pathways that overshoot 1.5°C need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5°C by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement. [Fiji]	
6496	14	2	14	5	Missing in the paragraph on CDR options is a clear statement that Integrated Assessment Models that produced the pathways assessed in this report only have afforestation and BECCS as options for CDR and that BECCS usage should therefore be seen as a proxy for a range of CDR options. Then in the sentence "Some limit ..." replace BECCS by non-land use CDR. Suggest to add there after "(BECCS)" statement in C2.2.: Pathways that overshoot 1,5 C need to rely on CDR to turn global warming to below 1,5 C by 2100". [Netherlands]	
6752	14	2	14	5	C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs is captured well in high confidence text in C2 ES which could be used at the beginning of C2 "The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence)." Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: "All analysed 1.5 consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5 following an overshoot (high confidence)." [Marshall Islands]	
6848	14	2	14	5	CCS technology can play a key role as a mitigation option, particularly in reducing emissions from coal based power plants within the context of national circumstances and priorities. CCS projects face various challenges and barries and it is the obligations of developed countries under the UNFCCC and Paris Agreement to address these challenges and facilitate further deployment of CCS. [United Arab Emirates]	
7156	14	2	14	29	Except bioenergy , no other CDR method has reached even to a viable demonstration stage. Articulation on CDR must bring the present technological stage, trends and cost associated for CDR upfront in SPM. The refrences are neither representatative nor covers the perspective. The articulation should state the limitations of CDR in the present context. [India]	
7162	14	2	14	5	Modify the Para C2 as follows: Modeling simulations of 1.5 deg.-consistent pathways assume different levels of carbon dioxide removal (CDR). Out of all examined scenarios, X% simulate reaching 1.5 without relying on bioenergy with carbon capture and sequestration (BECCS). If behaviour change, demand-side measures and emission reductions in the short term are included in the modeling, the model simulations can limit the recourse to CDR. [India]	
8050	14	2	14	2	Different levels of CDR for what years? Need to specify time frame. [United States of America]	
8052	14	2	14	5	While the top line statement on CDR in 1.5°C pathways (C2) is accurate, the emphasis has been changed compared to the discussion in the Executive Summary of Chapter 2, significantly changing the tone of the conclusion.The three topline points in C2 are: (1) 1.5°C-consistent pathways can have different levels of carbon dioxide removal (CDR); (2) Some limit global warming to 1.5°C without relying on bioenergy with carbon capture and storage (BECCS); and (3) Behaviour change, demand-side measures and emission reductions in the short term can limit the dependence on CDR. This emphasis is strikingly different compared to Chapter 2, where the main points highlighted in the Executive Summary are: (a) All analysed 1.5°C-consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5°C following an overshoot; (b) The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C; (c) CDR deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5°C; (d) CDR is needed less in pathways with particularly strong emphasis on energy efficiency and low demand; and (e) The scale and type of CDR deployment varies widely across 1.5°C-consistent pathways, with different consequences for achieving sustainable development objectives. The Chapter 2 Executive Summary is clear that ALL analyzed 1.5°C pathways rely on CDR to offset emissions from sources that cannot be reduced to zero, and in most cases to achieve net-negative emissions; that this represents a major risk since CDR deployed at scale is unproven; and this risk grows as emissions reductions are delayed requiring greater reliance on CDR to achieve 1.5°C. This message is lost in the SPM discussion of CDR in Section C2. [United States of America]	

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8054	14	2	14	35	Section C2 (and hence the SPM) obscures the key point that all modeled pathways to 1.5°C deploy carbon dioxide removal (CDR) to some degree. Section C2 should give some quantitative sense of how much CDR will be needed -- as a range of values with emphasis on the floor. C2 should also give a sense of how quickly CDR would need to be deployed in order to maintain a realistic chance of achieving 1.5°C. One of the most critical gaps in current technology development and deployment is in CDR; yet that point does not come out in the SPM. As an alternative, strongly recommend condensing the key points in Chapter 2 Executive Summary (p. 2-6): "All analysed 1.5°C-consistent pathways require the use of Carbon Dioxide Removal to neutralize emissions from sources for which no mitigation measures have been identified or to achieve net-negative emissions that allow temperature to return to 1.5°C following an overshoot (high confidence). Because CDR deployed at scale is unproven, reliance on such technology is a major risk in the ability to limit warming to 1.5°C." [United States of America]	
8606	14	2	14	35	Summary of CDR issues in SPM appears more 'positive' than in Chapter 2 of the Report. Messaging on feasibility and reliance, and effectiveness of later introduction differs from later in Special Report [Ireland]	
9160	14	2	14	5	C2 omits an important contextual element on the issue of timing and delay in relation to the scale of CDR needs. The timing and delay link to the scale of CDR needs is captured well in high confidence text in C2 ES which could be used at the beginning of C2 “The longer the delay in reducing CO2 emissions towards zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net-negative emissions after mid-century to return warming to 1.5°C (high confidence).” Furthermore, it does not get across the message that some form of CDR is always needed. The statement in Ch 2 exec sum. page 6 is stronger: ""All analysed 1.5 consistent pathways use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net-negative emissions that allow temperature to return to 1.5 following an overshoot (high confidence)."" [Nauru]	
9500	14	2	14	5	Include text at the end of the paragraph indicating that the "the greater the overshoot, the more CDR is required". The message needs to be clear as in C1, that there is a higher chance of limiting global warming to 1.5C with or without or with limited overshoot and that with larger overshoot, there is a smaller chance of meeting the target and a greater reliance on CDR. Text to convey that larger overshoots require larger CDR could also be added to C2.2. [Canada]	
2414	14	3	14	3	add: "… demand-side mesaures, stepping up development and use of natural climate solutions, ecosystem-based approaches and …" [European Union (EU)]	
3726	14	4	14	4	Please explain or illustrate what is meant by "demand side measures". This sounds rather technical and abstract. [Germany]	
4856	14	4	14	5	Once the above comment (CDR/BECCS) has been resolved, this headine section (C2) needs an extra sentence stating upper limits to CDR, based on geophysical constraints, as opposed to pathways. Working out what this sentence should say is difficult as Chapter 4 is inconsistent on this point, stating variously that there are 4 1.5 pathways without BECCS, yet small-scale BECCS demonstrators are "well below the numbers associated with 1.5 or 2°C-compatible pathways"; literature estimates for BECCS potentials in 2050 are 1-85 GtCO2, and one reference narrows this to 0.5-5 GtCO2. And a total figure for a portfolio of CDRs is not given as they can't be summed, as CDR options would compete for resources, eg land. Suggest add a sentence saying "The potential of BECCS is constrained by the potential for sustainable biomass, for which there will be competition, whether it is used with CCS or not. The potential scale of BECCS could be as low as 0.5-1.0GtCO2 in 2050." [United Kingdom (of Great Britain and Northern Ireland)]	
8056	14	4	14	4	The authors should provide more information on what is refered to as "behavior change, demand-side measures" [United States of America]	
8058	14	4	14	5	"..can limit the dependence on CDR" overall/over the long term, correct? Should be clarified. Also, other important limiting factors for CDR include costs, project risk, and land-use competition. In Chapter 2, how CDR measures are 'uncertain and entail clear risks' is discussed but that is not really highlighted in the SPM. [United States of America]	
2416	14	7	14	7	Replace "exist". This gives the misleading impression that a diverse CDR portfolio is already being deployed at some scale. Use "could be deployed" would be more accurate. [European Union (EU)]	
3728	14	7	14	7	The wording "Different CDR methods exist" gives the wrong impression of technologies being available for use. But a major criterion for CDR is their deployment on large scale. The possibility of CDR-usage on a large scale large scale is absolutely not the case for CDR-methods, as there still are a lot of unsolved questions. Therefore it would be better to write e.g. "Different CDR methods are discussed". [Germany]	
4858	14	7	14	13	This section is weak on feasibility. It simply states that there are feasibility concerns and describes what these concerns relate to. Surely it should go beyond this to state that these sustainability related issues raise serious questions about the real world feasibility of BECCS - for e.g. the range of Fuss et al, presented in 4.3.7.1 isn’t particularly consistent with what the IAMs are assuming. This discrepancy and challenge is an important message for policy makers that isn't clearly communicated in the SPM. Without being clear on this, it is challenging for policy makers to properly contextualise the scale of deployment described in C2.3 [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5114	14	7	14	2	The order of C2.1. and C2.2. should be changed, since the present C2.2. includes the predominant option and it would be reasonable to list the various CDR options. [Hungary]	
7148	14	7	14	12	While CDR is discussed in SPM, there is no discussion of Solar geoengineeirng. An assessment on the effectiveness and feasibility of solar geoengineering is therefore needed in the first place. [India]	
7168	14	7	14	12	the phrase “feasibility of CDR measures relates to their impacts on sustainable development”, should be removed as this refers to feasibility in only certain regions. This section deals with feasibility of CDR in general terms and region-wise feasibility should not be discussed here. [India]	
8060	14	7	14	7	The term 'side-effects' implies/connotes possibly negative impacts, and there isn't another term in this sentence that points at potential co-benefits (as opposed to costs) and trade-offs. Suggest deleting 'side-effects' and insert 'co-benefits and trade-offs'. Trade-offs are discussed in Chapter 2 -- e.g., "However, specific mitigation measures, such as bioenergy, may result in trade-offs that require consideration" -- but not highlighted enough here and should be. [United States of America]	
8062	14	7	14	12	It seems an omission to be leaving out potential ocean-based approaches that are being considered. [United States of America]	
8064	14	7	14	13	Not clear why CCS isn't mentioned as a stand-alone option, unless this paragraph is strictly about negative emissions. [United States of America]	
8066	14	7	14	3	Suggest replacing C2.1 with the more tightly written statement in Chapter 2 Executive Summary: "The scale and type of CDR deployment varies widely across 1.5°C-consistent pathways, with different consequences for achieving sustainable development objectives (high confidence). Some pathways rely more on bioenergy with carbon capture and storage (BECCS), while others rely more on afforestation, which are the two CDR methods most often included in integrated pathways. Trade-offs with other sustainability objectives occur predominantly through increased land, energy, water, and investment demand. Bioenergy use is substantial in 1.5°C-consistent pathways with or without BECCS due to its multiple roles in decarbonizing energy use." {2.3.1, 2.5.3, 2.6, 4.3.7} C2.3 should also be simplified so that it retains the quantitative estimates but does not overlap with C2.1. [United States of America]	
8608	14	7	14	7	The word "exist" could be misleading and should be replaced with "could be deployed" [Ireland]	
8610	14	7	14	13	Could also refer to peatlands [Ireland]	
8612	14	7	14	12	Feasibility issues do not appear to include costs [Ireland]	
9302	14	7	14	7	Write: "Different CDR methods exist, with widely differing maturity, potentials, costs, risks, societal aceptability and side-effects." [Switzerland]	
9304	14	7	14	13	Grouping "afforestation and reforestation" with BECCS could be interpreted as a disregard for the specific forest and land mandates of the UNFCCC, Kyoto Protocol Article 3.4, and Article 5 of the Paris Agreement. At the very least, under "examples", it would be justified to mention "conservation and enhancement of sinks and carbon reservoirs of forests", as well as "forest management". An improvement to the understated treatment of the subject in this report could be made by adding a separate paragraph for forests containing the additions mentioned above. Given the significant short-term mitigation potential of forests.and the much higher uncertainty of the potential of BECCS, this paragraph is comparing apples to oranges and while an in-depth relation with the SDGs is explored, the mandate of the UNFCCC should be strengthened as per the references to its mandates as mentioned above. . [Switzerland]	
890	14	8	14	9	A clear distinction should be made between solutions that are currently mature (afforestation, reforestation, soil carbon sequestration) and solutions that are still immature (BECCS, DACCS). We suggest to change the order of the methods quoted in this sentence, in order to begin with the mature solutions and finish with the more immature ones. We also suggest to add "restoration of wetlands" to this list. "Examples include afforestation, reforestation, restoration of wetlands, soil carbon sequestation, BECCS and direct air carbon capture and storage." [France]	
2418	14	8	14	8	On BECCS in general: BECCS does not remove CO2 from the atmosphere, as neither bioenergy, nor the CCS part captures CO2 form the atmosphere. The carbon is captured by vegetation, which is part of the land use sector and should be accounted there. If the report takes the approach that it assigns the assimilation of carbon by plants to the energy sector (or BECCS in particular), then this should be transparently presented and the corresponding land mass and carbon sequestration should be removed form the calculation of the land sink. Otherwise double counting seems inevitable (or at least very likely). [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2420	14	8	14	9	On soil carbon sequestration: Soils do not remove carbon from the atmosphere. They store carbon transferred to them by plants and release it over time. It is unhelpful to single out the non-photosynthesizing soil pool and assign that to CDR, without mentioning how they relate to the photosynthesizing vegetation and where and how vegetation carbon would be treated. It would be more reasonable to treat ecosystem carbon holistically under LULUCF (land carbon sequestration/management), and not to fragment it according to land use history (e.g., new forests would be part of CDR under A/R, old forest would not be, although they assimilate vastly more carbon), or according to carbon pools (e.g., that soil carbon would go under CDR if the pool is increasing, but but other pools would not be under CDR, unless they are A/R or happen to be used for BECCS, in which case they become part of CDR). [European Union (EU)]	
6498	14	8	14	8	I would also mention biomass-feedstock for chemical sector (combined with CCS at waste incineration plants)? Use of olivine? Biochar (or is that covered here by SCS)? [Netherlands]	
8068	14	8	14	8	Suggest adding 'of CDR measures' before 'include' for clarity. [United States of America]	
4860	14	9	14	1	"feasibility…relates to their impacts on sustainable development" True, but it relates to other things as well. Better to say "The feasibility of CDR measures will be determined by many factors including their costs, social acceptability, the availability of land, water and zero-carbon energy and impacts on sustainable development." [United Kingdom (of Great Britain and Northern Ireland)]	
8070	14	9	14	1	First half of the sentence: The feasibiliy of CDR measures relies on much more than just how they impact sustainable development. It depends also on largely costs and the anticipated returns in the form of carbon but also products/environment and social co-benefits, as well as the degree of additionality and permanence. This text as written omits these very important factors of feasibilty. After 'development', suggest adding something like 'as well as costs and anticipated environmental and economic benefits and trade-offs'. [United States of America]	
9502	14	9	14	1	In order to avoid duplication, the text on feasibility of CDR and impacts to sustainable development should be moved to Section D. Suggest removing the term "sustainable development". [Canada]	
892	14	1	14	1	replace "implications" by "side-effects" to emphazise the potential trade-offs of CCS with SDGs [France]	
894	14	1	14	1	add at the end of the sentence : "…as well as for food-production" [France]	
3730	14	1	14	1	Insert "ability to bring down costs, " before "scale" given that Ch. 4.3.7 stresses the high level of costs for many of these options. [Germany]	
8808	14	1	14	1	After "energy use" add " and cost" [Iran]	
9306	14	1	14	1	Insert a footnote at the end of the sentence. “The feasibility of CDR measures relates to their impacts on sustainable development, and depends on scale, implications for land, water and energy use (high confidence).”: “Large-scale deployment of land-based CDR would have far reaching implications for land and water availability (high agreement, robust evidence). This may impact food production, biodiversity and the provision of other ecosystem services (high agreement, medium evidence) (Cross-Chapter Box 7). The land required for BECCS only would amount to 3 million squared kilometers and the one for Afforestation & Reforestation would be 4 million squared kilometers (Cross-Chapter Box 7, Table 1).” [Switzerland]	
896	14	11	14	12	To be reconsidered, in particular in view of the huge investments required for artifical methods of CDR. The sentence can be modified as follow, with the information given in {4.3.7.1} : "The feasibility of CDR measures relates to the huge investments required for artifical methods such as BECCS (around 120 billion dollar/yr in 2050) and to their impacts on sustainable development, and could be enhanced …" [France]	
898	14	11	14	11	Replace "options" by "methods", to keep a coherence in the whole paragraph. [France]	
3732	14	11	14	11	The formulation "CDR….portfolio of options deployed at smaller scales" gives the wrong impression that CDR could be effective on a small scale. This is not the case. Each CDR method has to be deployed on a large scale to be effective. It would be better to write "…options deployed at varying and substantial, but lesser scale, rather than a single option at a very large scale". [Germany]	
8072	14	11	14	12	Provide a brief example to illustrate an "option deployed at smaller scales, rather than a single option at a large scale." [United States of America]	
8810	14	12	14	12	After "large scale" add "in a manner that is supportive to sustainable development" [Iran]	
900	14	15	14	2	We suggest to add this sentence to C2.2, in order to insist on the difference between a 1.5°C and a 2°C global warming. "Impacts of climate change reduce the potential of the nature-based CDR methods to remove CO2 from the atmosphere." [France]	
902	14	15	14	15	"required for" instead of "associated with" [France]	
1780	14	15	14	2	This statement should be more explicit on the potential benefits of CCUS for the 1.5? C warming. [Saudi Arabia]	
2422	14	15	14	17	These conclusions seem somewhat inconsistent with synthesis presented in Chapter 2 and Figure SPM3. A large part of reductions in CO2 emissions in scenario S2 and S5 are due to CDR. [European Union (EU)]	

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2424	14	15	14	3	This section should also state the quantities (ranges) of CDR consistent with below 2°C. The fact that CDR is needed also <2°C is implied only subtely through the reference to "additional" CDR in line 17. This section could also mention the finding from Ch2 that we have greater confidence in the effectivness of short-term mitigation (including use of CDR to compensate positive emissions elsewhere) than in use of CDR to correct overshoots, because we do not know so well how the atmosphere responds to rapid reductions in CO2 concentration (this is implied in lines 19-20). [European Union (EU)]	
3734	14	15	14	17	Very complicated sentence. Please rephrase. [Germany]	
4024	14	15	14	17	The passage "is predominantly acheived by..." should be rephrased: "relies mostly on…" The original sentence indicates that measures are given (exogeneous), while in reality, they are integrated [Norway]	
4862	14	15	14	2	It should be pointed out here that constraints on BECCS deployment are the same as constraints on bioenergy deployment, as explained in Box 2.1, which says "As land impacts are tied to bioenergy use, the exclusion of BECCS from the mitigation portfolio, will not automatically remove the trade-offs with food, water and other sustainability objectives due to the continued and potentially increased use of bioenergy." This conclusion is so important it should be in the SPM. [United Kingdom (of Great Britain and Northern Ireland)]	
4864	14	15	14	2	The point about "only a smaller degree through additional CDR" is narrowly true but it is HIGHLY MISLEADING to policy makers and needs to be changed/qualified. In absolute terms, 2c down to 1.5c is significant in terms of additional CDR and the subsequent implications for feasibility and sustainability impacts. This really needs to be changed (we made this comment last time as well). [United Kingdom (of Great Britain and Northern Ireland)]	
4866	14	15	14	17	It would help add important context here if you additionally described that is happening to non-Co2 gases here. i.e. is it that the drop from 2C to 15C is mainly about CO2 and that non CO2 pathways are actually quite similar? That would be useful additional information to specify. [United Kingdom (of Great Britain and Northern Ireland)]	
7140	14	15	14	17	The fact that 2 deg. C pathways also rely on CDR and additional reliance on CDR in 1.5 deg. C is less has to be quantified. The proportion of pathways in both 2 and 1.5 deg. C pathways that use CDR should be mentioned in quantitative terms. [India]	
8074	14	15	14	15	"reduction in NET CO2 emissions assoc..." Insert 'net'. [United States of America]	
8076	14	15	14	2	Suggest that C2.2 be revised to state: "The faster reduction in emissions associated with 1.5°C-consistent pathways compared to holding warming below 2°C-consistent pathways is predominantly achieved by measures that result in less CO2 being emitted, and only to a smaller degree through additional CDR. GIVEN THAT THE VAST MAJORITY OF 1.5°C SCENARIOS INCLUDE SOME TEMPERATURE OVERSHOOT (PAGE 2-37), THEY [DELETE: need to] rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5°C by 2100 (high confidence). "[DELETE: Geophysical] Understanding is limited about the effectiveness of CDR to reduce temperatures after they peak. HENCE, THESE 1.5°C-CONSISTENT PATHWAYS MAY NOT BE POSSIBLE TO ACHIEVE." [United States of America]	
8990	14	15	14	16	Suggest rephrasing sentence to: "The faster reduction in emissions associated with 1.5°C-consistent pathways compared to 2°C-consistent pathways would be predominantly achieved …" [Australia]	
4584	14	16	14	17	Basically, the 1.5-consistent pathway requires a large amount of CDR, but this sentence reads the opposite. Please clarify this sentence and rephrase it to a more accurate one. [Japan]	
8078	14	16	14	16	Suggest deleting "holding warming below" for improved clarity and brevity in the sentence. [United States of America]	
904	14	17	14	17	Add some consideration of different time periods. Suggestion "... less CO2 being emitted in the short and the long term" [France]	
1698	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Belize]	
4150	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Saint Kitts and Nevis]	
5404	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Saint Lucia]	
6500	14	17	14	19	Sentence is unclear. Please rephrase. [Netherlands]	
6754	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Marshall Islands]	
8658	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Grenada]	

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9056	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Solomon Islands]	
9162	14	17	14	18	"Pathways that overshoot 1.5 need to rely on CO2 removal exceeding remaining CO2 emissions to return global warming to below 1.5 by 2100" - CO2 removal will likely be needed to compensate for residual non-CO2 emissions, not just CO2 emissions as implied by this statement [Nauru]	
9506	14	17	14	19	At the end of the sentence "Pathways that overshoot 1.5C….by 2100 (high confidence)", add "with larger overshoots requiring greater amounts of CDR". [Canada]	
906	14	18	14	18	Add "remaining CO2 and other GHG emissions to return…" [France]	
8080	14	18	14	18	Suggest inserting "heavily" before "rely on CO2 removal" and inserting "later in the century" thereafter. The rest of the sentence should be edited to read: "that exceeds CO2 emissions to return to..." [United States of America]	
908	14	19	14	2	Unclear. We suggest to reformulate it as follow, "There are large uncertainties about the effectiveness of CDR to reduce temperatures after they peak, mainly because of limited geophysical understanding." [France]	
1852	14	19	14	2	The sentence 'Geophysical understanding is limited about the effectiveness of CDR to reduce temperatures after they peak' is a very important point and thus should also be reflected in C2 (and possibly in high-level statements) [Denmark]	
4868	14	19	14	2	This point about geophysical understanding is somewhat buried in this section on CDR, yet surely it is a very important issue. If IAMs are relying heavily on CDR, but we don't actually know if it can help with overshoot, this needs to be made clearer and more prominent to policy makers. Also, could you please make it clearer that this isn't simply referring to whether or not there is sufficient resource potential, which is what many readers may you assume you are talking about here. Additionally, when tracing this statement back to the underlying chapter, it is not entirely clear how well supported it is by the text there (even though it is probably true, as made clear in Keller et al 2018). None of the referenced sections particularly cover it, rather they are talking more about resource constrains where limits to feasibility is being covered. The only real mention is in the carbon cycle bit of table 4.6. And yet this just lists some papers and refers back to 2.2.2 and 2.6.2, where it isn't properly discussed! So could you please make sure this important statement is adequately justified by the underlying chapters. [United Kingdom (of Great Britain and Northern Ireland)]	
8992	14	19	14	2	Suggest rephrasing sentence to: "Scientifc understanding regarding the effectiveness of CDR to reduce temperatures after they peak is limited." The term "Geophysical" may be misunderstood as concerning solid-earth geophysics rather than the geophysics of the fluid earth referred to here. [Australia]	
9308	14	19	14	19	Write: "Geophysical, including environmental impacts' understanding …". [Switzerland]	
4870	14	2	14	2	Figure SPM3 is cited, but its caption says the only CDRs included are BECCS and AFOLU sector ones. Please add a quick explanation of why other CDRs are not considered here. [United Kingdom (of Great Britain and Northern Ireland)]	
262	14	22	14	3	Could the current contribution of AFOLU be added in the text in order to comprehend how large change is needed to the current situation in 1.5-consistent pathways? [Finland]	
910	14	22	14	3	C2.3 : This paragraph should be supplemented by elements about the following topics : - the competition between the uses of biomass - the consideration of indirect land use changes ; - the risk of non-permanency in the different CDR methods. {2.3.4.2} : -"Measures like afforestation and bioenergy with and without CCS that directly compete with other land uses could have significant impacts on agricultural and food systems" -"Most of the CDR measures currently discussed could have significant impacts on either land, energy, water, or nutrients if deployed at scale" -"An important consideration for CDR which moves carbon from the atmosphere to the geological, oceanic or terrestrial carbon pools is the permanence of carbon stored in these different pools. Terrestrial carbon can be returned to the atmosphere on decadal timescales by a variety of mechanisms such as soil degradation, forest pest outbreaks and forest fires, and therefore requires careful consideration of policy frameworks to manage carbon storage, e.g., in forests" [France]	
2426	14	22	14	3	Very difficult to read. Not appropriate form for an SPM. Please simplify and highlight the conceptual issues in an easily understandable language. [European Union (EU)]	

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3736	14	22	14	3	Please insert in ln 27 before the sentence starting with "Bioenergy…" the following lines "Such pathways would result in significantly reduced pressure on food security, lower food prices, and fewer people at risk of hunger (medium evidence, high agreement)." Quote from Chapter 5, Executive Summary Page 5: „Appropriately designed mitigation actions to reduce energy demand can advance multiple SDGs simultaneously. Pathways compatible with 1.5°C that feature low energy demand show the most pronounced synergies and the lowest number of trade-offs with respect to sustainable development and the SDGs (very high confidence). (…) Low demand pathways, which would reduce or completely avoid the reliance on Bioenergy with Carbon Capture and Storage (BECCS) in 1.5°C pathways, would result in significantly reduced pressure on food security, lower food prices, and fewer people at risk of hunger (medium evidence, high agreement) {5.4.2, Figure 5.4}." These lines make the link between important SDGs and BECCS, providing an example of one of the most relevant SDG trade-offs in ambitious mitigation pathways that are addressed in the line before. [Germany]	
4026	14	22	14	26	Please consider to rephrase the passage "There is variation in the amount and types of CDR used in 1,5C-consistent pathway, suggesting flexibility in addressing implementation challenges" to "1,5C-consistent pathways involve CDR of various types and scales, suggesting a degree of freedom in mitigation approaches", if appropriate. [Norway]	
4874	14	22	14	3	There's an important message here that isn't being bought out clearly enough. Namely that even without BECCS, which attracts most of the negative attention, 1.5 scenarios, potentially through afforestation and/or bioenergy, generally involve huge land use transformations. Even without BECCS, there will be major implications for the sustainability issues involved in land use change. Please strengthen to make this point more clearly. [United Kingdom (of Great Britain and Northern Ireland)]	
5116	14	22	14	3	This paragraph provides numbers for the BECCS and AFOLU CDR potential that are inconsistent with the numbers provided by chapter 2.3.4.1 and 4.3.7. For BECCS the SPM givs 0-9 Gt/yr in 2050 and 0-16 in 2100, consistent with chapter 2.3.4.1 , while chapter 4.3.7 gives 0.5-5 (from a recent literature assessmnt) and 2-11 Gt (from a full literature review) for 2050. It is unclear why the number of chapter 4 have been ignored. It should also be clearly stated in the SPM that the amount of BECCS is skewed by the fact that IAM models have that as the only technological CDR option and have only limited representation of land-based CDR. For AFOLU the SPM gives 0-11 Gt for 2050 and 1-5 for 2100, consistent with chapter 2.3.4.1 that also gives 0-11 GtCO2/yr in 2050 and 1-5 fo 2100. However, chapter 4.3.7 gives for 2050 0.5-3.5/ 0.5-5 for Afforestation, 2-5 Gt for Soil Carbon Sequestration and 0-2/ 1-5 Gt from biochar, i.e much bigger numbers for land-based CDR. This should be reflected in the SPM. The numbers form IAMs are biased by the limited number of CDR options in the models, which should be clearly stated in the SPM as it is stated in chapter 2. On top of the issue of conistency, there is also the issue of the new numbers for the carbon budget and the 1.5 scenarios using much lower budgets. That would justify making a statement that the amount of negative emissions could be reduced and still stay withing the 1.5/ >66% budget. [Hungary]	
6502	14	22	14	3	This paragraph provides numbers for the BECCS and AFOLU CDR potential that are inconsistent with the numbers provided by chapter 2.3.4.1 and 4.3.7. For BECCS the SPM givs 0-9 Gt/yr in 2050 and 0-16 in 2100, consistent with chapter 2.3.4.1 , while chapter 4.3.7 gives 0.5-5 (from a recent literature assessment) and 2-11 Gt (from a full literature review) for 2050. It is unclear why the numbers of chapter 4 have been ignored. It should also be clearly stated in the SPM that the amount of BECCS is skewed by the fact that IAM models have that as the only technological CDR option and have only limited representation of land-based CDR. For AFOLU the SPM gives 0-11 Gt for 2050 and 1-5 for 2100, consistent with chapter 2.3.4.1 that also gives 0-11 GtCO2/yr in 2050 and 1-5 fo 2100. However, chapter 4.3.7 gives for 2050 0.5-3.5/ 0.5-5 for Afforestation, 2-5 Gt for Soil Carbon Sequestration and 0-2/ 1-5 Gt for biochar, i.e much bigger numbers for land-based CDR. This should be reflected in the SPM. The numbers form IAMs are biased by the limited number of CDR options in the models, which should be clearly stated in the SPM as it is stated in chapter 2. On top of the issue of conistency, there is also the issue of the new numbers for the carbon budget and the 1.5 scenarios using much lower budgets. That would justify making a statement that the amount of negative emissions could be reduced and still stay withing the 1.5C >66% budget. [Netherlands]	
8082	14	22	14	3	C2.3 should discuss the costs of CDR strategies, drawing on the information presented in Figure 4.2 (p. 4-46), and noting the relatively low cost per ton of afforestation/reforestation and soil carbon sequestration as discussed in 4.3.7. The paragraph should also reference 4.3.2, which discusses forest restoration, and 4.5.2, which discusses the feasibility of CDR strategies. (Note that some of the cost references in 4.3.7.3 are hard to interpret; they should be expressed in a clearer way.) It would also be helpful to provide some more discussion of the long-term implications on net emissions of saturation of soil and forest carbon pools, and to explain in the underlying report the existing barriers to implementation of soil carbon sequestration. [United States of America]	
8996	14	22	14	22	Suggest rephrasing to avoid using the term "used": "There is variation in the amount and types of CDR assumed in 1.5°C-consistent pathways" [Australia]	
9310	14	22	14	3	Paragraph C.2.3. should mention the confidence level when comparing the mitigation potential of AFOLU versus BECCS. It is unclear which measures and technologies are being referred to under BECCS when mentioning their mitigation potential, and these should have a resulting confidence level. [Switzerland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2428	14	23	14	26	The apparent double-counting (between BECCS and AFOLU) should be removed or its absence should be explained. AFOLU (as defined by IPCC) includes all emissions and removals of CO2 by terrestrial vegetation (or at least "managed land", as a proxy for anthropogenic emissions and removals). That includes all the removals of carbon that ends up being used for bioenergy, including BECCS. That means that all the carbon entering BECCS is (supposedly) accounted for under AFOLU. If so, BECCS cannot be credited with removals, as neither the energy use of biomass, nor the capture and sequestration of the resulting CO2 results in any removal of carbon from the atmosphere. BECCS uses carbon that is captured (and is supposed to be accounted for) under AFOLU. If BECCS is reported to have "negative emissions", it is only possible if it is credited with the removals that happened when the carbon in the biomass was fixed. However, it is not clear how that is taken into account in the AFOLU account. [European Union (EU)]	
3738	14	23	14	26	Presenting BECCS and AFOLU CDR ranges separately gives the impression that total CDR can be at lower range of both which is not true. Please clarify, or add total ranges. [Germany]	
4872	14	23	14	26	Should also include the deployment rate in 2030, to demonstrate that we need to start soon (even if rates relatively low in 2030). Also, is there anything that can be said about development of technologies and rates of scaling up? [United Kingdom (of Great Britain and Northern Ireland)]	
4876	14	24	14	25	In chapter 4 (page 44, last line) we're told BECCS mitigation potentials in the literature range from 1-85 GtCO2 in 2050, but Fuss et al narrow this to 0.5-5, "falling below the upper end of 1.5 pathways" "among other things related to sustainability concerns". So the SPM should not quote a range "0-9" without pointing out that the upper part of this range is probably unfeasible. This point is so important is should be mentioned in C2, page 14 row 2, insert after (CDR) " whose mitigation potential is very uncertain." [United Kingdom (of Great Britain and Northern Ireland)]	
4432	14	25	14	26	Is it OK that removing in 2050 (0-11) may be higher than 2100 (1-5)? [Czech Republic]	
4586	14	25	14	25	Suggest using the defined wording for AFOLU: agriculture, forestry and other land use" (insert "other" before land use and use forestry instead of forest). [Japan]	
8084	14	25	14	25	The quantification is welcome, but need an overall number that these removals can be compared with. [United States of America]	
8728	14	25			insert "other" so it reads "agriculture, forestry and other land-use (AFOLU)" [New Zealand]	
912	14	26	14	26	We suggest to add this sentence after "2100" : "The upper ends of these ranges face specific feasibility constraints due to the speed and scales of their required deployment. Some pathways avoid BECCS deployment…" [France]	
2430	14	27	14	28	The "cross-sectoral potential" of bioenergy should be explained/corrected. "Replacing fossil fuels" is not an argument in favour of bioevergy, as its emissions as a fuel are at least as high as (and often much higher than) those of fossil fuels. Therefore, its "cross-sectoral benefit" cannot come from replacing fossil fuels. Such benefits require that bioenergy comes from "additional" biomass (Searchinger et al. 2009. Fixing a Critical Climate Accounting Error. Science 23 Oct 2009: Vol. 326, Issue 5952, pp. 527-528, Opinion of the EEA Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy, https://www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas/view). [European Union (EU)]	
7142	14	27	14	27	Add the following sentence - “In all the scenarios the use of BECCS for CDR is highly speculative”. {4.3.7}. [India]	
8086	14	27	14	29	To make this sentence clearer in terms of context (emissions reductions) and technical substance, suggest removing 'bioenergy' and replacing with: "Emissions reductions from the deploymet of low-carbon forms of bioenergy". Chapter 2 acknowledges that (in the modeling): "The configuration of carbon-neutral energy systems projected in mitigation pathways can vary widely, but they all share a substantial reliance on bioenergy under the assumption of effective land-use emissions control" which assumes away some of the land use impacts of bioenergy production. Not all forms of biomass are carbon neutral, and some forms are more carbon beneficial than others (e.g., harvest residues vs. energy crops grown on recently deforested lands) and including language to reflect that (e.g., low carbon forms of bioenergy) is important. This important distinction should be carried thoughout the SPM. [United States of America]	
8088	14	28	14	28	"substantial" is not a useful term. Express the fraction in %. [United States of America]	
8812	14	28	14	28	After "fossil fuel" add "however it may have conflict energy poverty eradication" [Iran]	
9312	14	28	14	28	Write: "… without CCS due …" [Switzerland]	
5118	14	31	14	31	A separate additional paragraph is needed on the role of biomass in the deep decarbonisation of the energy system and the limits posed on available biomass volumes by considerations of sutable production and of the degree to which the use of biomass leads to lower emissions than the fossil fuels they replace. Just assuming that biomass has zero emissions is misleading for policy makers. [Hungary]	
6504	14	31	14	31	A separate additional paragrpah is needed on the role of biomass in the deep decarbonisation of the energy system and the limits posed on available biomass volumes by considerations of suitable production and of the degree to which the use of biomass leads to lower emissions than the fossil fuels they replace. [Netherlands]	
264	14	32	14	32	"C2.4. (reorganising the sentences) AFOLU measures, when combined with policies... ...natural ecosystems, have potential other benefits " [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
914	14	32	14	32	In order to be more precise and coherent with the paragraph C2, replace "AFOLU measures" by "AFOLU related CDR measures". We also suggest to mention "nature-based solution" (or "natural climate solution") as follow : "Some AFOLU-related CDR measures, including through nature-based solutions, have potential…" [France]	
916	14	32	14	32	We suggest to add : "have potential benefits on resilience and sustainable development, for example,…" [France]	
1728	14	32	14	35	This statement is unbalanced. Should mention that AFOLU measures also have side effects or trade-offs such emissions from biofuels (see 3.6.2 and cross-chapter box 7) and negative impacts on food, water, biodiversity, and nutrients (section 4.3.1.2). [Saudi Arabia]	
2432	14	32	14	32	Please give examples of the AFOLU measures the statement refers to. Also (editorial) change order of "potential other". [European Union (EU)]	
3740	14	32	14	35	Section C2.4 addresses the important issue of potential co-benefits of land-based CDR measures. Please consider to give some more room to provide specifics here. Please change wording to "Some AFOLU-related CDR measures" for clarity and consistency. You may consider to add "(local) food security" to the list of potential benefits (cf. e.g. Chapter 4, p. 48 "SCS has negligible water and energy requirements (Smith, 2016), affects nutrients and food security favourably (high agreement, robust evidence) and can be applied without changing current land use thus making it socially more acceptable than CDR options with a high land footprint".) Also, please mention potential risks, else the paragraph could be perceived as biased. As the paragraph seems to address both measures that are environmentally benign without additional sustainability frameworks put in place (such as, e.g. soil carbon and restoring natural ecosystems) as well as those that can have co-benefits if managed sustainably, you may consider to rephrase as follows: C2.4. Some AFOLU-related CDR measures such as soil carbon sequestration and restoration of natural ecosystems have small land- and water footprints and can provide substantial co-benefits, for example, improved biodiversity, soil quality or local food security. Other measures that require more resources have potential benefits when combined with effective policies to conserve and restore land carbon stocks and protect natural ecosystems, but also carry substantial risks if not managed sustainably (medium confidence). (Figure SPM 4) {2.3.3, 2.3.4, 2.4.2, 3.6.2, 5.4.1, Cross-35 Chapter Box 7 in Chapter 3, 4.3.2, 4.3.7, 4.5.2, Table 2.4} [Germany]	
4588	14	32	14	35	Please add “2.4.4.” as the reference. Because it is described in the section* that the land system can play an important role for overall CDR efforts and the AFOLU sector also provides further potential. *See Chapter 2 Page 72 from line22 to 24?besides CO2 reductions, the land system can play an important role for overall CDR efforts (Rogelj et al., 2018) via BECCS, afforestation and reforestation, or a combination of options. The AFOLU sector also provides further potential for active terrestrial carbon sequestration, e.g., via land restoration, improved management of forest and agricultural land (Griscom et al., 2017), or biochar applications (Smith, 2016) (see also Section 4.3.7) [Japan]	
5028	14	32	14	35	Besides the cobenefits, potential trade offs should be mentioned as reported in figure SPM 4 and in the Executive summary of chapter 4 (page 6), where it is stated that: "Alterations of agriculture and forest systems to achieve mitigation goals could affect current ecosystems and their services and potentially threaten food, water and livelihood security. While this could limit the social and environmental feasibility of land-based mitigation options, careful design and implementation could enhance their acceptability and support sustainable development objectives (medium evidence, medium agreement). {4.3.2, 4.5.3}" [Italy]	
5230	14	32	14	32	should be OTHER POTENTIAL BENEFITS [Spain]	
5964	14	32	14	35	Proposition to start C2.4 with these extracts from Cross-chapter box 7 : "The technical, political, and social feasibility of scaling up and implementing land-intensive CDR technologies is recognised to present considerable potential barriers to future deployment. Large-scale deployment of land-based CDR would have far reaching implications for land and water availability (high agreement, robust evidence)." [Belgium]	
7150	14	32	14	35	Refer to the underlying report chapter 4, page 47, line 26: Beside the native, multipurpose species selection for A/R activites should also be highlighted. [India]	
7152	14	32	14	35	Refer to the underlying report chapter 4, page 47, line 26-29: Suitable site selection for the success of A/R programme should be highlighted. Advance planting for species facing threats of extinction due to climate change should also be taken up in climate refugia habitats. [India]	

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7154	14	32	14	35	Refer to the underlying report: Chapter 4: Strengthening and implementing the global response to the threat of climate change. The significant progress on conservation, management and expansion of forest in India through REDD should be highlighted suitably under the section section 4.3.2.2 of Final Government Draft. Reducing Emissions from Deforestation and forest Degradation (REDD+) a climate mitigation mechanism negotiated under the auspices of the UNFCC finds no mention of REDD+ activity reference for India in the Chapter-2: Mitigation...) REDD is included in the Bali Action Plan (decision 1/CP.13) as a component of enhanced action on mitigation. Parties to the UNFCCC have agreed to consider policy approaches and positive incentives on issues relating to REDD in developing countries and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. It is this last clause on the role of conservation and sustainable management that has added the '+' to the REDD discussion. The scope of the original REDD concept is limited to deforestation and forest degradation; REDD-plus (REDD+) goes beyond and includes the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks. At 21st session of the Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, REDD+ was confirmed as a core element of a new international climate change regime. Global Forest Resources Assessment 2015 (FRA 2015) of the UN's Food and Agriculture Organization (FAO) indicated that total forest area of the world declined by 3%, from 1990 to 2015. The annual rate of net forest loss halved from 7.3 M ha y?1 in the 1990s to 3.3 M ha y?1 between 2010 and 2015. Natural forest area declined from 3961 M ha to 3721 M ha between 1990 and 2015, while planted forest increased from 168 M ha to 278 M ha. From 2010 to 2015, tropical forest area declined at a rate of 5.5 M ha y?1 – only 58% of the rate in the 1990s – while temperate forest area expanded at a rate of 2.2 M ha y?1. Boreal and sub-tropical forest areas showed little net change but forest area expanded in Europe, North America, the Caribbean, East Asia, and Western-Central Asia and declined in Central America, South America, South and Southeast Asia and all three regions in Africa. Analysis indicates that, between 1990 and 2015, 13 tropical countries may have either passed through their forest transitions from net forest loss to net forest expansion, or continued along the path of forest expansion that follows these transitions. Following may be added in the second para of section 4.3.2.2 Forests and Other Ecosystems: REDD+ helps developing countries to reduce greenhouse gas (GHG) emissions by reversing forest loss and degradation, and by removing carbon from the atmosphere through the conservation, management and expansion of forests. (Vijge and Gupta, 2014). Vijge, M J., & Gupta, A (2014). Framing REDD+ in India: carbonizing and centralizing Indian forest governance? Environmental Science and Policy, 38, 17–27. [India]	
7166	14	32	14	32	"other benefits" - You could call it as co-benefits. [India]	
7172	14	32	14	35	Refer to the underlying report Chapter 5 Page 24 Line 6-16: Following may be added in Section 5.4.1.3 of Final Government Draft: "There is robust evidence and high agreement that in the AFOLU sector, behavioural change leading to dietary change toward global healthy diets and waste reduction could reduce emissions " to be changed to Medium evidence medium agreement", as changing individual behaviour by themselves are not adequate to reduce emissions. Fuchs et al. (2016) argues that "sustainable consumption and absolute reductions research and action need to consider who or what sets the agenda, defines the rules and the narratives, selects the instruments of governance and their targets, and thus influences peoples behavior, options, and their impacts Fuchs, Doris, Antonietta Di Giulio, Katharina Glaab, Sylvia Lorek, Michael Maniates, Thomas Princen, and Inge Røpke. 2016. "Power: The Missing Element in Sustainable Consumption and Absolute Reductions Research and Action." Journal of Cleaner Production 132 (September): 298–307. https://doi.org/10.1016/j.jclepro.2015.02.006. [India]	
8090	14	32	14	32	Reword: "Some AFOLU measures have potential other benefits" to "Some AFOLU measures have other potential benefits" [United States of America]	
8092	14	32	14	33	The statement and level of confidence in current formulation are suspect. Consider revising sentence to read: "Many AFOLU conservation measures have co-benefits and ancillary benefits, for example, improved biodiversity and soil quality, when combined with policies to conserve and restore land carbon stocks and protect natural ecosystems (high confidence)." [United States of America]	
8094	14	32	14	34	Why are AFOLU co-benefits only medium confidence? Is that because of issues related to potential additionality, permanance, etc.? Seems like the co-benefits of such projects would be high confidence, when they are actually carried out, which would be medium confidence. Doesn't seem correct to assign the potential co-benefits with confidence level associated with project risk. [United States of America]	
8614	14	32	14	35	Could also refer to peatlands [Ireland]	
8616	14	32	14	35	C2.4 should be linked to adaptation section B6.3 [Ireland]	
8814	14	32	14	32	Delete: other [Iran]	
9000	14	32			Suggest rephrasing from: "measures have potential other benefits" To: "measures have other potential benefits" or "measures potentially have other benefits". [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9314	14	32	14	32	Write: "Some AFOLU measures may have potential other benefits is proprely designed in view to include other environmental priorities… " [Switzerland]	
2434	14	37	14	37	Replace 'would require' by with 'requires' [European Union (EU)]	
2436	14	37	14	39	Give some examples of these "rapid and far-reaching systems transitions" required in the next 1-2 decades. The need to almost eliminate net emissions AFOLU appears the most obvious (from Figure SPM 3). If there are equally dramatic transitions needed in other sectors, these need to be spelled out here as they constitute important information. [European Union (EU)]	
3742	14	37	15	29	"Waste and wastewater" is missing from system transitions. In the AR5, this has been included as a crucial mitigation sector. Low-emission wastewater management and water treatment provides high potential for reduction in methane and nitrous oxide emissions and should be mentioned in an additional point C3.6 or be integrated in C3.4. (p.15 l. 13-21). (cf. 4.3.3.8, 4.3.6 Table 4.5) [Germany]	
3744	14	37	15	45	Please specify in ln 42: "one or two decades" (as in headline statement) in order to clarify and for consistency with the headline statement [Germany]	
4028	14	37	15	29	Section C3: Please include more info on the need for early deployment on key technologies in different sectors, such as CCS in industry, deployment of electric vehicles in the short term. Please also consider to include more information about implementing the global response in C3. Section C seems unbalanced because it is now much more about CDR than other types of mitigation [Norway]	
4152	14	37	14	39	C3: Move this (C3, bold) up (not bolded) to after C1 as it is a very general and overarching statement. Replace by more focussed statement on 2030 reductions summarising following paragraphs. [Saint Kitts and Nevis]	
4242	14	37	15	29	1) C3.2 (line 47, page 14) proposes a major effort to reduce energy demand by 1.5?-consistent pathways. So it is suggested to add a data-based range that can be reduced after 'demand' in the first sentence "…substantial reductions in energy demand" (line 49) to read: "…substantial reductions in energy demand (to be followed with a reduced range in data)," 2) It is suggested to reformulate "deep" (line 23, page 15) into a specific number (the same as the 'industry' above). [China]	
4246	14	37	15	29	Considering the differences between developed and developing countries in development stage, the emission reduction pathways will differ substantially for land use, energy and end-use sectors like industry, transport and construction, with developing countries faced with greater difficulties and challenges. As stated in 4.3.4, Chapter 4 of the underlying report, "In the context of rising demand for construction, an increasing share of industrial production may be based in developing countries, where current efficiencies may be lower than in developed countries, and technical and institutional feasibility may differ.", while as stated in 4.4.3.3, "the application of building codes and standards for 1.5?-consistent pathways will require improved enforcement, which can be challenge in developing countries where inspection resources are often limited and codes are poorly tailored to local conditions", and as stated in 4.4.5.1, "A rise of energy prices has a proportionally greater impact in developing countries that are in a catch-up phase, with strong dependence on energy-intensive sectors". Therefore, it is suggested to add ", with developing countries faced with greater challenges and needs" after "in energy, land, urban, and industrial systems" in C3 (line 38). [China]	
4352	14	37	14	38	C3. Limiting global warming to 1.5? would require rapid and far-reaching systems transitions occurring during the coming one to two decades, in energy, land, urban, and industrial systems. ? C3. Limiting global warming to 1.5? would require rapid and far-reaching systems transitions occurring during the coming one to two decades, in energy, land, urban, industrial, transport and buildings systems. [Republic of Korea]	
4878	14	37	14	37	Somewhere in section C, and this might be the most logical part of the section, it would be very useful to make explicit one of the main conclusions from the development of the SSPs - namely that some future worlds make it easier to achieve 1.5c and in others it is essentially impossible to do so. It's sort of hinted at in places, e.g. discussions of sustainable developments in land use or the mention of lifestyle choices. However a more direct link should be made as was made clear in Rogelj et al. It's very important to understand the implications of the broad decisions that we make about the shape and nature of our society in the future for meeting temperature goals. [United Kingdom (of Great Britain and Northern Ireland)]	
4880	14	37	14	37	This could be strengthened by the inclusion of "unprecedented" [United Kingdom (of Great Britain and Northern Ireland)]	
4882	14	37	14	42	"Over the next decades" - is this the same as the "one to two decades" or is it over a longer time scale? Use of decades here is a bit imprecise and leads to confusion. Could you be clearer about exactly what timescales you are referring to in these points. [United Kingdom (of Great Britain and Northern Ireland)]	
5232	14	37	15	29	this section has some mentions to SDGs. It doesn't look consistent to have this references in relation to some sectors (industri and transport) and not to other sectors (land use, energy). To increase consistency, please add some information on the relation between SDGs in paragraphs that don't include it, or delete the references in paragraphs on industry and transport/buildings [Spain]	

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5406	14	37	14	39	C3: Move this (C3, bold) up (not bolded) to after C1 as it is a very general and overarching statement. Replace by more focussed statement on 2030 reductions summarising following paragraphs. [Saint Lucia]	
5776	14	37	14	39	Along the lines of C3.1, it should be considered of elaborating on the headline statement level (C3) that the scale of change necessary for 1.5oC is without a precedent - to emphasise the magnitude and uniqueness of the challenge. [Sweden]	
5966	14	37			The whole section C3(.x) sould be switched with section C2(.x), as it is relevant to focus first on immediate mitigation, and then after on the discussion of CDR whose impact is more remote in time. [Belgium]	
6756	14	37	14	39	C3: Move this (C3, bold) up (not bolded) to after C1 as it is a very general and overarching statement. Replace by more focussed statement on 2030 reductions summarising following paragraphs. [Marshall Islands]	
7144	14	37	14	39	Add the following at the end of the sentence in C3 - " , there is no documented historic precendent for the scale required even in 1.5 deg. C consistent modeling scenarios. These modeling scenarios are qualitatively similar to those for 2 deg. C, but the system changes are more rapid and pronounced." {2.3, 2.4, 2.5}. [India]	
8096	14	37	14	38	This series is not complete and does not comport with the findings in Chapter 2 regarding systems transitions needed to limit warming to 1.5°C: "...during the coming one to two decades, in energy, land, urban, and industrial systems." The subsequent bullets (C3.1 - C3.5) only partially align with this listing. In the bold-faced key finding, why break out energy use in urban systems and not transportation? [United States of America]	
8098	14	37	14	45	The point in lines 44-45 should be moved to the main finding. It is critical to highlight that the changes proposed by pathways associated with 1.5°C of warming have no historical precedent. [United States of America]	
8100	14	37	15	29	This section discusses "rapid and far-reaching systems transitions" in the coming decade needed for limiting warming to 1.5°C. As discussed elsewhere in the report, it is also important to acknowledge transitions at this scale and pace also require drastic social transformations (policies, governance, and behavior). Suggest to modify this language to something like "rapid and far-reaching systems transitions and societal transformations". [United States of America]	
8488	14	37	14	39	Its inadequate to talk about transitions in energy, land, urban and industry without adding a sentence on the required means of implementations especially provision of accesible funds to enable the transitions by developing countries to at least 100 billion dollars per year by 2020, as well as support to countries to fund technologies for lower carbon development [Zimbabwe]	
8660	14	37	14	39	C3: Move this (C3, bold) up (not bolded) to after C1 as it is a very general and overarching statement. Replace by more focussed statement on 2030 reductions summarising following paragraphs. [Grenada]	
9164	14	37	14	39	C3: Move this (C3, bold) up (not bolded) to after C1 as it is a very general and overarching statement. Replace by more focussed statement on 2030 reductions summarising following paragraphs. [Nauru]	
918	14	38	14	38	add "transportation" before "and industrial systems" [France]	
2438	14	38	14	38	add: … industrial and economic systems [European Union (EU)]	
3746	14	38	14	38	The term "systems" may be too technical/abstract. In the SPM it might be better to speak about "transitions ….in the way we produce and/or consume in energy, land, transport, building and industrial (systems)". [Germany]	
3748	14	38	14	38	"Urban" seems not to be the right term in this context. Changes for "buildings" and "transport" are necessary beyond "urban systems" as well. There please use "transport" and "buildings" instead of "urban" [Germany]	
5968	14	38			We suggest adding "mobility", so that the sentence becomes : "…energy, mobility, land, urban and industrial systems" [Belgium]	
5970	14	4			Proposition to add a new § before C3.1 : "Pathways depend on the underlying development processes, and societal choices, which affect the drivers of projected future emissions (like future population levels, secular trends in economic growth and income convergence, behavioural change and technological progress)". (First and second lines of section 2.3.1 and second and third line of 2.3.1.1). [Belgium]	
2440	14	41	14	45	Please delete: ' there is no documented historic precedent'. See Lester Brown' s Plan B 4.0 http://www.earth-policy.org/images/uploads/book_files/pb4book.pdf: p 256, Three Models of Social Change. [European Union (EU)]	
4030	14	41	14	45	From the SPM we are not sure if all 1.5-consistent pathways leads to temperature overshoot. If this is the case, please consider to clarify and relate it to how qualitatively similar 1.5C and 2C pathways are. [Norway]	
4154	14	41	13	45	C3.1: This para should be moved up to after header of C2 as it is overarching, and not limited to the system transformations [Saint Kitts and Nevis]	
5408	14	41	13	45	C3.1: This para should be moved up to after header of C2 as it is overarching, and not limited to the system transformations [Saint Lucia]	
6758	14	41	13	45	C3.1: This para should be moved up to after header of C2 as it is overarching, and not limited to the system transformations [Marshall Islands]	
8662	14	41	13	45	C3.1: This para should be moved up to after header of C2 as it is overarching, and not limited to the system transformations [Grenada]	
9166	14	41	13	45	C3.1: This para should be moved up to after header of C2 as it is overarching, and not limited to the system transformations [Nauru]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8998	14	42	14	45	Suggest rephrasing: '"...their system changes would be more rapid and pronounced over the next decades (high confidence). Such rates of change have been observed in the past within specific sectors, technologies and regions, but there is no historical precedent for the rates of change implies by 1.5°C-consistent pathways." Grammatical error: change "historic" to "historical" [Australia]	
2442	14	43	14	43	"These rates of change.." What is this referring to. Would be good to list some of the cases, where similar rates of change have been observed. [European Union (EU)]	
4884	14	43	14	43	When referring to rates of change what specifically are you referring to? System change is quite vague? Do you mean decarbonisation rate? Deployment rates? Would be helpful to be more precise [United Kingdom (of Great Britain and Northern Ireland)]	
9504	14	43	14	45	Suggest removing the word "documented" since it is unneccesary. [Canada]	
5120	14	44	14	44	historic precedent for the scale of rate of systems transitions found in [Hungary]	
5778	14	44	14	44	Change "for the scale found" - > "for the scale of change found". [Sweden]	
5122	14	46	14	46	An additional paragraph is needed on the need for fossil fuel phase out, a key implication of aiming at a 1.5 degree limit. Based on the message that global net-zero CO2 emissions should be reached around 2050, the immediate implication is that fossil fuel emisisons from energy and feedstock use should be near zero by 2050 as well. The only room for remaining fossil ful CO2 emissions in 2050 is determined bij the CO2 sink at that moment, which will be limited as it might also be needed for compensating hard to eliminate non-CO2 emissions from agriculture for instance. It also needs to be stated that CCS with fossil fuels can only provide limited relief, as the remaing emissions from CCS (in light of capture efficiencies of 90% or so) can be significant. [Hungary]	
6506	14	46	14	46	An additional paragraph is needed on the need for fossil fuel phase out, a key implication of aiming at a 1.5 degree limit. Based on the message that global net-zero CO2 emissions should be reached around 2050, the immediate implication is that fossil fuel emisisons from energy and feedstock use should be near zero by 2050 as well. The only room for remaining fossil fuel CO2 emissions in 2050 is determined bij the CO2 sink at that moment, which will be limited as it might also be needed for compensating hard to eliminate non-CO2 emissions from agriculture for instance. It also needs to be stated that CCS with fossil fuels can only provide limited relief, as the remaning emissions from CCS (in light of capture efficiencies of 90% or so) can be significant. [Netherlands]	
388	14	47	15	2	Suggest splitting up C3.2 into two pieces, one focusing on reductions in fossil fuel use in 1.5°C-consistent pathways. "By 2030, primary energy from coal decreases by two-thirds, and by 2050 would be expected to supply 1-7%, most of which is combined with CCS. Strong reductions in oil (-75 to -32% interquartile range, depending on amount of CCS) and natural gas (-60% to -13% interquartile range, depending on CCS) are also a common feature" (2.4.2). It is important to note the decline in unabated coal - e.g. as stated in to meet stringent climate targets "models prematurely retire carbon-intensive infrastructure, in particular coal without CCS" (2.3.5, p 2-47). [Chad]	
390	14	47	15	2	This paragraph, C3.2, can be significantly strengthened based on Sec. 4.3.1.1, for example, lift the sentence "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" Comment: this could even better belong in C1.1, [Chad]	
1784	14	47	15	2	The paragraph addresses 1.5? C- consistent pathways through supply and demand approaches that may not accomodate the sustainable development needs of all countries. Furthermore, the paragraph focuses on sources rather than emissions. However, the paragraph should persue neutral approaches focusing on technologies, such as CCUS, that address emissions rather than sources. [Saudi Arabia]	
1850	14	47	15	2	Consider spiltting the paragraph so that primary energy and electricity each get a paragraph, in order to better highlight the positive massage on electricity sector transition [Denmark]	
2444	14	47	15	2	this paragraph should be strengthened and include existing practical solutions as described in 'Drawdown' http://www.drawdown.org and in the IPBES land degradation and restoration assessment [European Union (EU)]	
2446	14	47	15	29	In each of these sectoral paragraphs, please provide some quantitative indication of the scale of action required for 1.5°C and how it compares to 2°C (and ideally to the present day or a BAU scenario). [European Union (EU)]	
2448	14	47	15	29	This section needs major rewriting. Barely a page on the detail of the technologies/actions/changes to deliver rapid emission reduction is not enough. We would expect the report to give much more detail on what happens in sectors, certainly in the short term, and explain if and where notable differences are with well below 2C compatible pathways. [European Union (EU)]	
3750	14	47	15	2	It is unclear if these developments in energy systems are for pathways that overshoot 1.5°C or those that stabilize at 1.5°C without overshooting. From the archetypes it seems these pathways differ strongly from one another and for policy making it would be important to understand what the differences are in 2030 and 2050. In order provide clarity on distinct differences between overshoot and non-overshoot-pathways, we suggest making that differentiation in this paragraph, including for renewables where currently the median is given. Also, please include information for other fossil energy carriers such as gas and oil in addition to that provided for coal. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3752	14	47	15	2	We find the mixing of description of pathways requirements and historical developments in this paragraph not very useful. The last sentence needs to be substantiated, if possible by numbers (accelerating rates of deployment? Drop in costs? What are the dimensions, and what leads to the conclusions that the electricity transition might be underway? If that is the case, it would be helpful to give some more detail and highlight it in a separate paragraph. [Germany]	
4156	14	47	14	53	C3.2: This para needs to be enhanced and split up in two, with bold statements on key message for energy transition, and more information from chapter 2, highlighting role of renewable energy and phase-out of coal. See for example ES chapter 2, 2-6 (bold text): "The share of primary energy from renewables increases while coal usage decrease across 1.5°C consistent pathways." add: "Remaining share of coal by 2050 (1-7%) is mostly with CCS That is, by 2050, unabated coal (without CCS) is phased out globally. " (consistent with same para in 2-6) Possibly add ranges of gas (unabated gas goes down) and oil. see 2-6. Add share of renewables from electricity in 2050 (36-97% (Min-max range)? and" pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in carbon intensity of electricity by 2030 than overshoot pathways. [cont'd below] [Saint Kitts and Nevis]	
4158	14	47	14	53	[cont'd] A reformulation of C3.2 could look like C3.2 “1.5°C-consistent pathways include a rapid decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy use (high confidence) and an increase in electrification of energy end use (high confidence). Pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in the carbon intensity of electricity by 2030 than pathways that temporarily overshoot. By 2050, the share of electricity supplied by renewables increases to 36–97% (minimum-maximum range) across 1.5°C-consistent pathways. The Energy system transition that would be required to limit global warming to 1.5dC is underway in many sectors and regions around the world. The political, economic, social and technical feasibility of solar energy, wind energy, and electricity storage technologies has improved dramatically over the past few years (high confidence), while that of nuclear energy and CCS in the electricity sector have not shown similar improvements {2.4.2, 4.2.1, 4.3.1, 4.5.2, Cross-Chapter Box 6 in Chapter 3}” [cont'd below] [Saint Kitts and Nevis]	
4160	14	47	14	53	[cont'd] C3.2 bis “The share of primary energy from renewables increases while coal usage decreases across 1.5°C consistent pathways (high confidence). By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind and solar) in 1.5°C-consistent pathways increases by 60% compared to 2020, while primary energy from coal decreases by two-thirds. By 2050, renewables are expected to supply 29–67% of primary energy, while coal would be expected to supply 1–7%.. From 2020 to 2050 the primary energy supplied by oil declines in most pathways (–32 to –74% interquartile range). Natural gas changes by –13% to –60% (interquartile range), but some pathways show a marked increase albeit with widespread deployment of CCS. The overall deployment of CCS varies widely across 1.5°C-consistent pathways with cumulative CO2 stored through 2050 ranging from zero up to 460 GtCO2 (minimum-maximum range), of which zero up to 190 GtCO2 stored from biomass. [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4590	14	47	15	2	1. We would appreciate it if you could provide the reason of highlighting only renewable energy and there are no statement about other low carbon-emitting sources in C3.2. - For example in 2.4.2, all low carbon technologies are treated equally as follows; "Several energy supply characteristics are evident in 1.5°C pathways assessed in this section: 1) growth in the share of low carbon-emitting sources (including renewables, nuclear and fossil fuel with CCS)" - 4.3.1 claims that specific technologies including renewable energy have some challenges in terms of feasibility. - We would also appreciate if you could clarify the reference section of the last sentence in C3.2, which states that the only following three technologies, solar energy, wind energy, and electricity storage technologies increased feasibility in terms of political, economic, social and technical and also has high confidence. Without reference section, it is not appropriate to put it in SPM. 2. With respect to the statement "By 2030, the median level.....by 60% compared to 2020", it this number "60%" comes from Table2.6, it is not only renewable energy that increase by 60% by 2030, but also non fossil energy including renewable and nuclear also increase by 60% by 2030. 3. However for nuclear energy, there are descriptions in 2.4.2.1 and Figure 2.15, that "but in some pathways both the absolute capacity and share of power from nuclear generations declines" and "there are large differences in nuclear power between models and across pathways. One of the reasons for this variation is that the future deployment of nuclear can be constrained by societal preferences assumed in narratives underlying the pathways". If these are the reasons of differentiation from renewables in this section in C 3.2, we would appreciate it if you could add this kind of explanation for more clarity. By the same token, we would appreciate it if you could add the reason for focusing specifically on renewables regardless of the remaining challenges in terms of feasibilities of renewables, as is pointed out in 4.3.1. 4. For more balanced description, we would suggest to add, for example, following descriptions to C3.2 using the expression from 2.4.2.1. - "there is a significant growth in bioenergy used in combination with CCS" - "Pathways with higher use of coal and gas tend to deploy CCS to control their carbon emissions." - "Nuclear power increases its share in most 1.5°C pathways by 2050, but in some pathways both the absolute capacity and share of power from nuclear generations declines". [Japan]	
4886	14	47	15	2	This paragraph provides useful information on the decarbonisation of electricity, but it would also be helpful to better understand where the increased deployment of electricity to decarbonise particular sectors is going. The section mentions that generally energy end use is being electrified, but where specifically? Transport? Industry? A bit more detail would be really helpful. [United Kingdom (of Great Britain and Northern Ireland)]	
4888	14	47	14	47	Is it completely accurate to say that they see a substantial reduction in energy demand? In absolute terms energy demand (compared to today) rises in many 1.5 pathways (fig 2.14). It just rises less than in less ambitious pathways. It seems misleading to suggest otherwise. Additionally, how substantial is substantial? The rest of this paragraph provides numbers for the changes in renewables, but no such information is provided for change in energy demand. It would be useful to have this. [United Kingdom (of Great Britain and Northern Ireland)]	
5124	14	47	14	47	The phrase "substantial reduction in energy demand" can inadvertently be interpreted as denying people a decent level of energy services. As that is not what scenarios say, the phrase should be modified by saying "significant reduction in energy demand, while providing adequate global energy services" [Hungary]	
5288	14	47	15	2	Suggest splitting up C3.2 into two pieces, one focusing on reductions in fossil fuel use in 1.5°C-consistent pathways. "By 2030, primary energy from coal decreases by two-thirds, and by 2050 would be expected to supply 1-7%, most of which is combined with CCS. Strong reductions in oil (-75 to -32% interquartile range, depending on amount of CCS) and natural gas (-60% to -13% interquartile range, depending on CCS) are also a common feature" (2.4.2). It is important to note the decline in unabated coal - e.g. as stated in to meet stringent climate targets "models prematurely retire carbon-intensive infrastructure, in particular coal without CCS" (2.3.5, p 2-47). [Zambia]	
5290	14	47	15	2	This paragraph, C3.2, can be significantly strengthened based on Sec. 4.3.1.1, for example, lift the sentence "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" Comment: this could even better belong in C1.1, [Zambia]	
5410	14	47	14	53	C3.2: This para needs to be enhanced and split up in two, with bold statements on key message for energy transition, and more information from chapter 2, highlighting role of renewable energy and phase-out of coal. See for example ES chapter 2, 2-6 (bold text): "The share of primary energy from renewables increases while coal usage decrease across 1.5°C consistent pathways." add: "Remaining share of coal by 2050 (1-7%) is mostly with CCS That is, by 2050, unabated coal (without CCS) is phased out globally. " (consistent with same para in 2-6) Possibly add ranges of gas (unabated gas goes down) and oil. see 2-6. Add share of renewables from electricity in 2050 (36-97% (Min-max range)? and" pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in carbon intensity of electricity by 2030 than overshoot pathways. [cont'd below] [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5412	14	47	14	53	[cont'd] A reformulation of C3.2 could look like C3.2 “1.5°C-consistent pathways include a rapid decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy use (high confidence) and an increase in electrification of energy end use (high confidence). Pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in the carbon intensity of electricity by 2030 than pathways that temporarily overshoot. By 2050, the share of electricity supplied by renewables increases to 36–97% (minimum-maximum range) across 1.5°C-consistent pathways. The Energy system transition that would be required to limit global warming to 1.5dC is underway in many sectors and regions around the world. The political, economic, social and technical feasibility of solar energy, wind energy, and electricity storage technologies has improved dramatically over the past few years (high confidence), while that of nuclear energy and CCS in the electricity sector have not shown similar improvements {2.4.2, 4.2.1, 4.3.1, 4.5.2, Cross-Chapter Box 6 in Chapter 3}” [cont'd below] [Saint Lucia]	
5414	14	47	14	53	[cont'd] C3.2 bis “The share of primary energy from renewables increases while coal usage decreases across 1.5°C consistent pathways (high confidence). By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind and solar) in 1.5°C-consistent pathways increases by 60% compared to 2020, while primary energy from coal decreases by two-thirds. By 2050, renewables are expected to supply 29–67% of primary energy, while coal would be expected to supply 1–7%.. From 2020 to 2050 the primary energy supplied by oil declines in most pathways (–32 to –74% interquartile range). Natural gas changes by –13% to –60% (interquartile range), but some pathways show a marked increase albeit with widespread deployment of CCS. The overall deployment of CCS varies widely across 1.5°C-consistent pathways with cumulative CO2 stored through 2050 ranging from zero up to 460 GtCO2 (minimum-maximum range), of which zero up to 190 GtCO2 stored from biomass. [Saint Lucia]	
5780	14	47	14	53	(1) Median levels do not provide sufficient information. Some range estimates should be provided. It is also unclear how medians compare to the ranges that follow in the text. Are they comparable? (2) Also, while there are numbers for primary energy and mention of carbon intensity of electricity going to zero, none are provided for energy demand reduction. It would be useful to complement the paragraph in this respect and/or add numbers in paragraph C3.5. (3) The sources of primary energy do not add to 100%, how does the use of the other fossile fuels etc evolve in the scenarios? [Sweden]	
6268	14	47	14	53	This para needs to be strenghtened and possibly split up in two, with bold statements on key message for energy transition, and more information from chapter 2, highlighting role of renewable energy and phase-out of coal. See for example ES chapter 2, 2-6 (bold text): "The share of primary energy from renewables increases while coal usage decrease across 1.5°C consistent pathways." suggest to add: "Remaining share of coal by 2050 (1-7%) is mostly with CCS. That is, by 2050, unabated coal (without CCS) is phased out globally. " (consistent with same para in 2-6) Possibly add ranges of gas (unabated gas goes down) and oil. see 2-6. Add share of renewables from electricity in 2050 (36-97% (Min-max range) and" pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in carbon intensity of electricity by 2030 than overshoot pathways...continued below. [Fiji]	
6270	14	47	14	53	[cont'd] A suggestion for re-structure C3.2 could look like: “1.5°C-consistent pathways include a rapid decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy use (high confidence) and an increase in electrification of energy end use (high confidence). Pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in the carbon intensity of electricity by 2030 than pathways that temporarily overshoot. By 2050, the share of electricity supplied by renewables increases to 36–97% (minimum-maximum range) across 1.5°C-consistent pathways. The Energy system transition that would be required to limit global warming to 1.5°C is underway in many sectors and regions around the world. The political, economic, social and technical feasibility of solar energy, wind energy, and electricity storage technologies has improved dramatically over the past few years (high confidence)... [Fiji]	
6508	14	47	14	47	The phrase "substantial reduction in energy demand" can inadvertently be interpreted as denying people a decent level of energy services. As that is not what scenarios say, the phrase should be modified by saying "significant reduction in energy demand, while providing adequate global energy services" [Netherlands]	
6622	14	47	15	2	Suggest splitting up C3.2 into two pieces, one focusing on reductions in fossil fuel use in 1.5°C-consistent pathways. "By 2030, primary energy from coal decreases by two-thirds, and by 2050 would be expected to supply 1-7%, most of which is combined with CCS. Strong reductions in oil (-75 to -32% interquartile range, depending on amount of CCS) and natural gas (-60% to -13% interquartile range, depending on CCS) are also a common feature" (2.4.2). It is important to note the decline in unabated coal - e.g. as stated in to meet stringent climate targets "models prematurely retire carbon-intensive infrastructure, in particular coal without CCS" (2.3.5, p 2-47). [Sudan]	
6624	14	47	15	2	This paragraph, C3.2, can be significantly strengthened based on Sec. 4.3.1.1, for example, lift the sentence "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" Comment: this could even better belong in C1.1, [Sudan]	

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6626	14	47	15	2	Again, paragraph C3.2 should be strengthened, especially with regards to developing countries and the SDGs: "The largest growth driver for renewable energy since AR5 has been the dramatic reduction in the cost of solar PV" (directly from Sec. 4.3.1.1,) or "Small-scale distributed energy projects are being implemented in developed and developing cities where residential and commercial rooftops offer potential for consumers becoming producers (called prosumers)" [Sudan]	
6760	14	47	14	53	C3.2: This para needs to be enhanced and split up in two, with bold statements on key message for energy transition, and more information from chapter 2, highlighting role of renewable energy and phase-out of coal. See for example ES chapter 2, 2-6 (bold text): "The share of primary energy from renewables increases while coal usage decrease across 1.5°C consistent pathways." add: "Remaining share of coal by 2050 (1-7%) is mostly with CCS. That is, by 2050, unabated coal (without CCS) is phased out globally. " (consistent with same para in 2-6) Possibly add ranges of gas (unabated gas goes down) and oil. see 2-6. Add share of renewables from electricity in 2050 (36-97% (Min-max range)? and" pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in carbon intensity of electricity by 2030 than overshoot pathways. [cont'd below] [Marshall Islands]	
6762	14	47	14	53	[cont'd] A reformulation of C3.2 could look like C3.2 "1.5°C-consistent pathways include a rapid decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy use (high confidence) and an increase in electrification of energy end use (high confidence). Pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in the carbon intensity of electricity by 2030 than pathways that temporarily overshoot. By 2050, the share of electricity supplied by renewables increases to 36–97% (minimum-maximum range) across 1.5°C-consistent pathways. The Energy system transition that would be required to limit global warming to 1.5dC is underway in many sectors and regions around the world. The political, economic, social and technical feasibility of solar energy, wind energy, and electricity storage technologies has improved dramatically over the past few years (high confidence), while that of nuclear energy and CCS in the electricity sector have not shown similar improvements {2.4.2, 4.2.1, 4.3.1, 4.5.2, Cross-Chapter Box 6 in Chapter 3}" [cont'd below] [Marshall Islands]	
6764	14	47	14	53	[cont'd] C3.2 bis "The share of primary energy from renewables increases while coal usage decreases across 1.5°C consistent pathways (high confidence). By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind and solar) in 1.5°C-consistent pathways increases by 60% compared to 2020, while primary energy from coal decreases by two-thirds. By 2050, renewables are expected to supply 29–67% of primary energy, while coal would be expected to supply 1–7% (mostly with CCS). From 2020 to 2050 the primary energy supplied by oil declines in most pathways (–32 to –74% interquartile range). Natural gas changes by –13% to –60% (interquartile range), but some pathways show a marked increase albeit with widespread deployment of CCS. The overall deployment of CCS varies widely across 1.5°C-consistent pathways with cumulative CO2 stored through 2050 ranging from zero up to 460 GtCO2 (minimum-maximum range), of which zero up to 190 GtCO2 stored from biomass. [Marshall Islands]	
6824	14	47	14	47	Remove "substantial". [United Arab Emirates]	
6906	14	47	15	2	Suggest splitting up C3.2 into two pieces, one focusing on reductions in fossil fuel use in 1.5°C-consistent pathways. "By 2030, primary energy from coal decreases by two-thirds, and by 2050 would be expected to supply 1-7%, most of which is combined with CCS. Strong reductions in oil (-75 to -32% interquartile range, depending on amount of CCS) and natural gas (-60% to -13% interquartile range, depending on CCS) are also a common feature" (2.4.2). It is important to note the decline in unabated coal - e.g. as stated in to meet stringent climate targets "models prematurely retire carbon-intensive infrastructure, in particular coal without CCS" (2.3.5, p 2-47). [Gambia]	
6908	14	47	15	2	This paragraph, C3.2, can be significantly strengthened based on Sec. 4.3.1.1, for example, lift the sentence "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" Comment: this could even better belong in C1.1, [Gambia]	
6910	14	47	15	2	Again, paragraph C3.2 should be strengthened, especially with regards to developing countries and the SDGs: "The largest growth driver for renewable energy since AR5 has been the dramatic reduction in the cost of solar PV" (directly from Sec. 4.3.1.1,) or "Small-scale distributed energy projects are being implemented in developed and developing cities where residential and commercial rooftops offer potential for consumers becoming producers (called prosumers)" [Gambia]	
7146	14	47	14	52	For 1.5 deg. C model scenarios, the level of CDR that is assumed alongside reduction in energy demand and renewable energy deployment should be mentioned. [India]	
7158	14	47	15	52	Transition to energy systems depend greatly on the assumptions on costs and technological developments, as well as local geographical circumstances. It would best capture the perspective if SPM underlines and states that the energy transition rate will differ from country to country and developed countries having in a better technological situation will take a lead. The pace of sustainable energy transition in the developing countries will depend upon availability of technologies, finance and also for other form of support necessary for such a transition. [India]	

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7164	14	47	15	2	The last sentence, "signalling that such a system transition … may be underway" is insufficiently justified by the first part of the sentence that "… feasibility of solar… increased over the past few years." The issue is that the early part of C3.2 specifies not only that this transition has to occur, but it must do so within a certain time frame. The use of the phrase "such a system transition... may be underway" indicates confidence not just that it will happen but that it will happen within a necessary time frame. This may be over-reach. A simple fix is to delete the word "such". A deeper fix would be to add the phrase "althogh thte time frame is uncertain." [India]	
7174	14	47	14	48	Refer to the underlying report: Chapter 4 (14,28,14,28) - The report cites that economic growth has decopuled absolutely from GHG emissions during 2015 and 2016. While this may be true for global trends in emissions and economy; for several individual countries, the statement fails to capture the reality. For several developing countries, and more so for the least developed ones, economic growth is constrained by affordable energy availability / access. Therefore, despite the advancements in cleaner technologies, GHG emissions remain closely coupled with economic growth. [India]	
8102	14	47	14	47	Authors should explain what is implied by "substantial reduction in energy demand" and how it will impact economic growth and development. [United States of America]	
8104	14	47	14	53	This section explicitly discusses bioenergy, hydro, wind and solar as primary renewable energy. Nuclear energy, as a major potential source of zero-carbon energy, should be discussed as well. [United States of America]	
8106	14	47	15	2	Section 4.3.1 discusses the feasibility of mitigation and adaptation options related to the energy system transition. This is an important base for the discussion in SPM C3.2. However, the underlying discussion is not fully balanced with respect to fossil fuels and renewable energy. For example, the term "as fossil fuels start to be phased out" is used. More recent evidence suggests that fossil fuel use has stabilized or rebounded a bit in the last year or two. It would be helpful to cite evidence that fossil fuels have begun to be phased out. Otherwise, it may be more accurate to say "as fossil fuel use begins to be phased out in some countries", as this phenomena appears to vary across countries. Additionally, the discussion of solar energy in 4.3.1.1 should include a more robust discussion of scale and the portion of new capacity that is currently and is forecast to be wind and solar. It should also provide more (and more recent) discussion of solar PV price trends and forecasts, and address the role of utility-scale solar installations and the role of local, retail power prices and markets, which may be more significant than insolation levels or geography in diffusion of solar PV and declines in its costs. Contrary to the implication made in 4.3.1.1, rooftop solar is increasingly competitive in areas with sufficiently high retail cost of electricity and/or favorable out-of-market support (without reference to a particular latitude range). 4.3.3.1 should also discuss onshore vs. offshore wind. It would also make sense to discuss least cost resources and grid parity for renewable energy. These issues are directly pertinent to the discussion in C3.2 on the scale (and pace) of renewable energy deployment consistent with 1.5°C pathways. [United States of America]	
8418	14	47	15	2	Suggest splitting up C3.2 into two pieces, one focusing on reductions in fossil fuel use in 1.5°C-consistent pathways. "By 2030, primary energy from coal decreases by two-thirds, and by 2050 would be expected to supply 1-7%, most of which is combined with CCS. Strong reductions in oil (-75 to -32% interquartile range, depending on amount of CCS) and natural gas (-60% to -13% interquartile range, depending on CCS) are also a common feature" (2.4.2). It is important to note the decline in unabated coal - e.g. as stated in to meet stringent climate targets "models prematurely retire carbon-intensive infrastructure, in particular coal without CCS" (2.3.5, p 2-47). [Nepal]	
8420	14	47	15	2	This paragraph, C3.2, can be significantly strengthened based on Sec. 4.3.1.1, for example, lift the sentence "All renewable energy options have seen considerable advances over the years since AR5, but solar energy and both onshore and offshore wind energy have had dramatic growth trajectories. They appear well underway to contribute to 1.5°C-consistent pathways" Comment: this could even better belong in C1.1, [Nepal]	
8422	14	47	15	2	Again, paragraph C3.2 should be strengthened, especially with regards to developing countries and the SDGs: "The largest growth driver for renewable energy since AR5 has been the dramatic reduction in the cost of solar PV" (directly from Sec. 4.3.1.1,) or "Small-scale distributed energy projects are being implemented in developed and developing cities where residential and commercial rooftops offer potential for consumers becoming producers (called prosumers)" [Nepal]	
8490	14	47	14	49	There is need for mentioning strategies which are practically possible to developing countries and which would have minimal impact to the developing country economies as they need to and have a right to develop along the CBDRs in order to adapt to climate change. These include improving energy efficiency. [Zimbabwe]	
8618	14	47	14	53	Reference to coal not consistent with earlier carbon neutrality messages. [Ireland]	
8620	14	47	14	53	Timefraomes in C3.2 appear to lack the urgency needed for consistency with 1.5 degree pathways [Ireland]	
8874	14	47	14	47	Suggest re-phrasing as: "In energy systems, 1.5°C-consistent pathways imply a substantial reduction in energy demand" [Australia]	
9002	14	47	14	53	Suggest including current level of global carbon intensity of electricity for context. [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9168	14	47	14	53	C3.2: This para needs to be enhanced and split up in two, with bold statements on key message for energy transition, and more information from chapter 2, highlighting role of renewable energy and phase-out of coal. See for example ES chapter 2, 2-6 (bold text): "The share of primary energy from renewables increases while coal usage decrease across 1.5°C consistent pathways." add: "Remaining share of coal by 2050 (1-7%) is mostly with CCS. That is, by 2050, unabated coal (without CCS) is phased out globally. " (consistent with same para in 2-6) Possibly add ranges of gas (unabated gas goes down) and oil. see 2-6. Add share of renewables from electricity in 2050 (36-97% (Min-max range)? and" pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in carbon intensity of electricity by 2030 than overshoot pathways. [cont'd below] [Nauru]	
9170	14	47	14	53	[cont'd] A reformulation of C3.2 could look like C3.2 “1.5°C-consistent pathways include a rapid decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy use (high confidence) and an increase in electrification of energy end use (high confidence). Pathways with higher chances of holding warming to below 1.5°C generally show a faster decline in the carbon intensity of electricity by 2030 than pathways that temporarily overshoot. By 2050, the share of electricity supplied by renewables increases to 36–97% (minimum-maximum range) across 1.5°C-consistent pathways. The Energy system transition that would be required to limit global warming to 1.5dC is underway in many sectors and regions around the world. The political, economic, social and technical feasibility of solar energy, wind energy, and electricity storage technologies has improved dramatically over the past few years (high confidence), while that of nuclear energy and CCS in the electricity sector have not shown similar improvements {2.4.2, 4.2.1, 4.3.1, 4.5.2, Cross-Chapter Box 6 in Chapter 3}” [cont'd below] [Nauru]	
9172	14	47	14	53	[cont'd] C3.2 bis “The share of primary energy from renewables increases while coal usage decreases across 1.5°C consistent pathways (high confidence). By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind and solar) in 1.5°C-consistent pathways increases by 60% compared to 2020, while primary energy from coal decreases by two-thirds. By 2050, renewables are expected to supply 29–67% of primary energy, while coal would be expected to supply 1–7% (mostly with CCS). From 2020 to 2050 the primary energy supplied by oil declines in most pathways (–32 to –74% interquartile range). Natural gas changes by –13% to –60% (interquartile range), but some pathways show a marked increase albeit with widespread deployment of CCS. The overall deployment of CCS varies widely across 1.5°C-consistent pathways with cumulative CO2 stored through 2050 ranging from zero up to 460 GtCO2 (minimum-maximum range), of which zero up to 190 GtCO2 stored from biomass. [Nauru]	
9316	14	47	15	2	Split C3.2 in two paragraphs: the first one till p. 14 line 52: "… supply 1-7%.", and the second one from p. 14 line 52: "The political, economic, …" till p. 15 line 2. [Switzerland]	
2450	14	48	14	48	Instead of to zero it is better to present the range that has been provided in the chapter. [European Union (EU)]	
5126	14	48	14	49	the reference to increase in electricity usage as a share of total energy use lacks specificity. Please add the following sentence from chapter 2.4.2.2 "From 2020 to 2050, the quantity of electricity supplied in most 1.5°C pathways more than doubles (Table 2.7)." [Hungary]	
6510	14	48	14	49	the reference to increase in electricity usage as a share of total energy use lacks specificity. Please add the following sentence from chapter 2.4.2.2 "From 2020 to 2050, the quantity of electricity supplied in most 1.5°C pathways more than doubles (Table 2.7)." [Netherlands]	
6826	14	48	14	48	Remove "to zero by mid-century". [United Arab Emirates]	
7170	14	48	14	5	Refer to the underlying report chapter 4, page 44, line 4-7: Refers to a case study over India on use of biomass cook stoves instead of cleaner gas stoves. It gives a wrong impression that India is contributing to Black Carbon emissions by using biomass cook stoves which is far from truth. A sentence should be added saying that in India under Pradhan Mantri Ujjwala Yojana, around 49 million new LPG connections have been distributed in record time, demonstrating political will for positive transformative changes. [India]	
2452	14	49	14	52	Please substantiate more the following part 'By 2030, the median level of primary renewable energy ... increases by 60%' be more substantiated. ... By 2050, renewables are expected to supply 49–67% of primary energy, while coal would be expected to supply 1–7%. What does this mean for individual sectors, what are the differences between power, transport and building sector for instance? And to what extent does renewables allow for the penetration of other energy carriers such as hydrogen for instance? Can more information be given on particular risks related to carbon lock in related to fossil fuel energy and potential need for refurbishment (e.g. how many coal plants need to be fitted with CCS to achieve such emission reductions?). What does it mean regarding increased investment needs in this sector. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4356	14	49	15	2	It would be better to mention using of Energy Management System(EMS) combined with ICT. By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind and solar) in 1.5?-consistent pathways increases by 60% compared to 2020, while primary energy from coal decreases by two-thirds. By 2050, renewables are expected to supply 49–67% of primary energy, while coal would be expected to supply 1–7%. The political, economic, social and technical feasibility of solar energy, wind energy and electricity storage technologies. ? By 2030, the median level of primary renewable energy (including bioenergy, hydro, wind, solar, ESS and Energy Management System) in 1.5?-consistent pathways increases by 60% compared to 2020~ ? The political, economic, social and technical feasibility of solar energy, wind energy, ESS and Energy Management System. [Republic of Korea]	
4890	14	49	14	52	Would it not be more informative to also present the increase compared to actual real world, current levels. This would give a clearer sense of the scale of the actual challenge and not just the challenge in the models. [United Kingdom (of Great Britain and Northern Ireland)]	
6512	14	49	14	49	add after "by 2030": "the global" [Netherlands]	
8108	14	49	15	2	No mention of CCS or nuclear here, which are key baseload power sources for realistic deep decarbonization scenarios. CCS is discussed in detail in 2.4.2.3 and 4.3 (4.3.7). Nuclear power is discussed in 4.3.1.3, but even that discussion contains some inaccuracy, understating the number of countries (18, not 13) that have commercial nuclear reactors under construction. (Also note that the use of "building new nuclear capacity" in 4.3.1.3 is vague in that "building" is not actually a term used to describe the status of nuclear reactor construction. The term "under construction" is universally recognized by the nuclear industry and IAEA.) [United States of America]	
920	14	5	14	5	It is not clear why do you take a reference which is in the future (2020). We assume that it refers to the assumptions of the pathways, but it may be more appropriate to a policy maker to compare with real time data, such as 2017 or even 2010. [France]	
8110	14	5	14	53	While power sector technologies like wind and solar are explicitly mentioned, nuclear is not. Some acknowledgement of nuclear technology should be made when other technology options are explicitly mentioned. [United States of America]	
4892	14	51	14	52	Is this unabated coal or with CCS? Would be helpful to know. [United Kingdom (of Great Britain and Northern Ireland)]	
5128	14	51	14	52	The numbers for the share of renewables should be rounded to 50-70%, as 49-67 suggests inaccuracy that is not justified. For the share of coal it would be more appropriate to say that coal will be almost phased out by 2050. That is a much more useful formulation for policy makers. [Hungary]	
6514	14	51	14	52	The numbers for the share of renewables should be rounded to 50-70%, as 49-67 suggests an accuracy that is not justified. For the share of coal it would be more appropriate to say that coal will be almost phased out by 2050. That is a much more useful formulation for policy makers. [Netherlands]	
8112	14	51	14	52	Misleading to say these levels will be "expected" -- there are several technology pathways to get to 1.5°C described in Chapters 2 and 4, but this paragraph implies there's only one pathway. [United States of America]	
8114	14	51	14	52	The statement should clarify that it refers to modeled 1.5°C-consistent pathways. [United States of America]	
922	14	52	14	52	« 49-67 % » : These figures are not coherent with the table chap. 4 p.12, which states that between 47 and 73% of primary energy will be supplied by renewable energy, depending on the IAM pathways considered. [France]	
3754	14	52	14	52	By 2050 we will have to have reached net-zero-CO2-Emissions. With 49-67% renewable energy supply would we need a high amount of CDR (as still a large fraction of energy is produced by fossil fuels)? This should be explained better here. [Germany]	
4244	14	52	14	52	It is suggested to reformulate “The political, economic, social and technical feasibility” as “The application”. [China]	
4354	14	52	14	53	The large system for the storage of energy in the form of electric energy with renewable energy is collevtively referred to as "Energy Storage System(ESS)". The political, economic, social and technical feasibility of solar energy, wind energy and electricity storage technologies ? ~ feasibility of solar energy, wind energy and energy storage technologies [Republic of Korea]	
4894	14	52	15	2	System transformation underway? Think this needs qualifying, at the very least to say that not yet at the rate of changed required by the pathways here. It should also be placed in the context of energy demand. Renewable capacity is rising but its share in overall consumption hasn't shifted as significantly because of rising energy demand. [United Kingdom (of Great Britain and Northern Ireland)]	
7160	14	52	14	52	Add "given the current limitations associated with technology and economy" after "supply 1 - 7%". [India]	
8116	14	52	15	2	C3.2 concludes by noting that a "system transition in electricity generation may be underway" but it does not address whether the transition is at a pace and scale sufficient to achieve 1.5°C. [United States of America]	
9318	14	52	14	52	Oil and gas are not mentionned in this paragraph, which limits the policy-relevance of the message. [Switzerland]	
266	14	53	15	1	Please, note the current challanges in social acceptability of wind energy in some countries. [Finland]	
8994	14	53	15	1	Suggest rephrasing sentence to: "...feasibility of solar energy, wind energy and electricity storage technologies have increased over the past few years…" [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2454	15	1	15	2	a system transition in the electricity generation is underway, but it is currently too slow for the 1.5 degree scenario. This should be spelled out here. [European Union (EU)]	
2456	15	1	15	25	Please compare in absolute amounts how the deployment of renewables in the last few years compared to the needed amount of deployment in 1.5 C and well below 2C scenarios [European Union (EU)]	
4248	15	1	15	2	“signalling that such a system transition in electricity generation may be underway” lacks support from the underlying report. So it is suggested that this sentence be reformulated as “but a breakthrough technological change is required to achieve energy transition needed for 1.5? warming”. [China]	
5782	15	1	15	2	Is this "signalling that…." a result of the assessment or more like speculation? What is the level of confidence? [Sweden]	
7180	15	1	15	2	Remove the phrase “signalling that such a system transition in electricity generation maybe underway”. It is true that rates of deployment have increased but this alone does not justify the use of the term system transition. No evidence is provided to substantiate the claim that current deployment signals the possibility of the kind of system transition that is required for 1.5 deg. C discussed in the previous section especially in view of policy changes in developed countries. Since system transition is expected to require strong political support and will of developed countries who have had to take lead in combating climate change but have not demonstrated the same so far, general landscape disputes over solar and wind energy {4.3.1}, non ratification of second commitment period of the Kyoto Protocol by many developed countries etc., suggest that system transition is as yet far away. [India]	
7192	15	1	15	2	Refer to the Underlying report Chapter 2: Page 53, line 1 to 36: India is making significant progress in the field of Renewable Energy. There is no mention of this in the report. Following can be added in the report in Chapter-2. (Ref.:Draft National Energy Policy NITI Aayog, Government of India, 2017). It should be mentioned in section 2.4.2.1 of Final Draft. Renewable energy accounted for 18.37% of the total power capacity in India in 2017. With rising maturity of renewable energy technologies, aided by decline in their costs and upon environment considerations, the India has already articulated its decision to boost Renewable Energy capacity. While a cumulative capacity target of 175 GW has been declared for the year 2022, by 2040 a likely capacity of 597-710 GW is expected to be achieved. The above capacity will translate into 50%-56% and 29%-36% Renewable Energy (excluding large hydro) capacity in installed capacity and generation from all power generation sources by 2040, in place of 14% and 6.5%, respectively in 2015-16. The period 2017-2040 will, therefore, witness a transformation in the electricity sector of India, calling for policy action across the entire value chain of generation, transmission and distribution. [India]	
9508	15	1	15	2	The statement "….signalling that such a system transition in electricity generation may be underway" implies low confidence with the use of [may be] and is not based on contents of the draft report chapters since there is no confidence qualifier. End the sentence after "(high confidence)". [Canada]	
2458	15	2	15	2	Please replace 'may be' with ... 'is underway' [European Union (EU)]	
2460	15	3	15	3	Please include additional para (from an earlier version of the SPM): "delayed action or weak near-term policies increase the likelihood of exceeding 1.5°C and the amount of stranded investment in fossil-based capacity, leading to higher long-term mitigation challenges (high confidence). {2.1.3, 2.3.2, 2.5.1, 2.5.2}" [European Union (EU)]	
4592	15	3	15	3	For better balance, it is better to refer the constrains in substantial reduction in the energy sector since while economic, institutional and social constraints are mentioned in the industrial, transport and building sectors. Given higher energy cost is the biggest challenge in the energy sector, a paragraph should be added using the expression in page 4-89, 4.4.5.1 of Chapter 4. C3.2 bis This might be constrained by the higher energy costs of low emission options. Despite dramatic reduction in the unit costs of some low-emission technical options over the past decade, lower costs of some supply and demand side options does not always result in a proportional decrease in energy system costs. Energy costs can propagate across sectors amplifying overall production costs. [Japan]	
3756	15	4	15	11	Please add, if available, numbers regarding hunger and stunting. [Germany]	
3758	15	4	15	11	We strongly support the current language here. Still, we would have expected the SPM to at least mention the importance of protecting natural ecosystems, in particular forest, and halting deforestation explicitly. Please consider to include these points specifically. Also, it would be very helpful for policy makers to specify more clearly what is meant by the term „diet changes“ (see e.g. 5-25, Section 5.4.1.3). [Germany]	
4162	15	4	15	11	C3.3: move this para on land to end (as industry, transport, and buildings are all energy related) [Saint Kitts and Nevis]	
4250	15	4	15	11	C3 states that limiting warming to 1.5°C requires rapid and unprecedented transitions in energy, land, urban and industrial systems. However, there is an insufficient description of the economic, social, technological, ethical and political difficulties and challenges faced by the system transition, which is seldom mentioned except in C3.1-C3.5. So it is suggested to add C3.6 to specify difficulties and challenges faced by the large-scale rapid system-based transition as a new paragraph that includes but is not limited to the lock-in constraints to infrastructure, technological barriers, and political and ethical risks. [China]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4896	15	4	15	4	This is quite a vague statement. Please be more precise about the actual scale of the change that is implied. On the previous page we have numbers for the scale of CDR deployment, but it will not be intuitive for policy makers to translate this (and other land use change) into meaningful numbers. Being clear about the scale of land use change would really help this. [United Kingdom (of Great Britain and Northern Ireland)]	
5130	15	4	15	11	This paragraph is very general and does not bring out the key issues of land use for meting a 1.5°C limit. The paragraph should be rewritten to make clear statements on the follwing issues: 1) the sequestration of CO2 in forests and agricultural soils; 2) the close relationship between the demand for meat and dairy products and the availability of land for afforestation and bioenergy crops; 3) the large amount of biomass that most scenarios assume for energy usage. This should of course be embedded in the context of integrated land management and multi-benefit enhncement, but that should not mask some clear messages on specific climate relevant issues. [Hungary]	
5416	15	4	15	11	C3.3: move this para on land to end (as industry, transport, and buildings are all energy related) [Saint Lucia]	
6272	15	4	15	11	C3.3: can be better positioned and moved to paragraph on land to end (as industry, transport, and buildings are all energy related). [Fiji]	
6516	15	4	15	11	This paragraph is very general and does not bring out the key issues of land use for meeting a 1.5oC limit. The paragraph should be rewritten to make clear statements on the follwing issues: 1) the sequestration of CO2 in forests and agricultural soils; 2) the close relationship between the demand for meat and dairy products and the availability of land for afforestation and bioenergy crops; 3) the large amount of biomass that most scenarios assume for energy usage. This should of course be embedded in the context of integrated land management and multi-benefit enhncement, but that should not mask some clear messages on specific climate relevant issues. [Netherlands]	
6766	15	4	15	11	C3.3: move this para on land to end (as industry, transport, and buildings are all energy related) [Marshall Islands]	
6840	15	4	15	7	Edit to read: "There is a need for a shift to sustainable global and regional land use in a sustainable to limit waming to 1.5C, including through integrative policies…." [United Arab Emirates]	
8118	15	4	15	4	Change first sentence to read: "Transitions in global and regional land use are found in all 1.5°C-consistent pathways." [United States of America]	
8120	15	4	15	5	Text reads: "C3.3. Transitions in global and regional land use are required to limit warming to 1.5°C. Such transitions require integrative policies to sustainably manage competing demands on land for..." The initial thrust -- regarding the role of integrative policies -- is spot on, but the assumption that these land uses always compete with each other is not. Suggest revising to "Such transitions may rely on integrative policies to manage what can sometimes be complementary and sometimes competing demands on land for..." [United States of America]	
8122	15	4	15	11	C3.3 is a good place to point out land use requirements of BECCS in Pathways S2 and S5. If energy crops are used for BECCS, millions of hectares of land are needed to capture 10 to 20 GtCO2 per year, and will compete with food crops for land. An approximation of CO2 captured per hectare can be calculated as (crop yield in t/ha) x (carbon fraction in bioenergy crop) x (44/12 tCO2 per tC). [United States of America]	
8124	15	4	15	11	C.3 does not express the significant trade-offs in land use and the potentially highly transformative nature of land-use change as part of mitigation strategies that involve significant afforestation/reforestation and/or deployment of bioenergy with carbon capture and storage (BECCS). For example, 4.3.7.1 notes that BECCS deployment in 2°C pathways requires 25-46% of arable and permanent crop area in 2100. Similarly, the same section notes that "removing BECCS and CCS from the portfolio of available options significantly raises mitigation costs." These issues should be addressed in the SPM, given their salience. They are also discussed in Cross-Chapter Box 7. [United States of America]	
8126	15	4	15	11	The list of elements that need to be addressed in integrative policies has one glaring omission -- land tenure, which is widely acknowledged as a critical aspect for managing land use sustainably for development. There is a growing body of evidence suggesting that securing land and resource rights has a positive impact on food security and agricultural productivity. To support this change, suggest also adding a short new section on strengthening land tenure to Section 4.3.2.1 in Chapter 4. [United States of America]	
8128	15	4	15	11	This list of options for managing land to meet multiple, simultaneous demands should include reducing food loss and waste (FLW). The underlying text (pages 4-24 and 4-25) make the case for how reducing FLW is one of the major opportunities to reduce emissions in the agriculture sector, although this underlying text could be made stronger. See for example: http://www.wri.org/publication/reducing-food-loss-and-waste [United States of America]	
8622	15	4	15	29	Inconsistent language use - economic feasibility mentioned in C3.4 but also relevant to C3.3 and C3.5 - critically important for transitions in land and agriculture [Ireland]	
8876	15	4	15	5	Suggest re-phrasing as: "Transitions in global and regional land use would be required to limit warming to 1.5°C. Such transitions would require integrative policies …" [Australia]	
9174	15	4	15	11	C3.3: move this para on land to end (as industry, transport, and buildings are all energy related) [Nauru]	
9320	15	4	15	11	It would be usefull to provide figures on the emission reduction potential of the mentionned transitions. [Switzerland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9510	15	4	15	7	Is culture considered an ecosystem service? If not, I believe there should be an addition that considers the competing demands, including the right of indigenous peoples' to exercise their culture and spirituality. [Canada]	
2462	15	5	15	11	This section lacks the amount of land use change that is needed. Given the reliance on biomass, BECCs and or CDR through Land Use Changes to achieve certain levels of emission reductions and emission absorptions this section requires much more detail on what the impact are potentially on our land use system. This section barely says anything on the role of agriculture and how it can limit Non CO2 emissions, which seems to be a crucial feature if one wants to discuss remaining budget or achievability of pathways. It should be clearly articulated what the quantitative impacts are of lifestyle changes such as diets, which can play an important role in this respect. Be more specific how the different parts of the AFOLU sector react, what the non-CO2 emissions are and how they can reduce, and what the role of land use can be to decrease any emissions and increase the sink function. [European Union (EU)]	
2464	15	7	15	1	Please replace 'this may include sustainable intensification of landuse practices, enhanced agricultural productivity and diet changes' with "land use mitigation and adaptation options are interlinked wiht regional climate, food systems, dietary patterns, forest management, biodiversity, ecosystem services provision and the Sustainable Development Goals" (para from an earlier version of the SPM p22 l7-10) [European Union (EU)]	
4032	15	7	15	8	The first two examples given, namely "sustainable intensification of land use practices" and "enhanced agricultural productivity" seem to partly overlap and not add insight. If appropriate, please consider to rephrase or alternatively explain the difference between these two terms. [Norway]	
7182	15	7	15	1	Remove the last two sentences in para C3.3. From “This may include….” to “...can be overcome”. From a large list of competing demands, singling out only land use practices, enhanced agricultural productivity and diet changes for further comment distorts the picture. [India]	
9322	15	7	15	7	Write: "This may include technogical innovation, sustainabe intensification where agricultural yields are increased without adverse environmental impact and without the conversion of additional non-agricultural land, and shift towards less resource-intensive diets." [Switzerland]	
2466	15	8	15	9	Replace reference to "feasibility". The sentence essentially says it is possible for the (necessary) solutions to an identified problem to become feasible. Not clear how the reader is supposed to interpret this. Recommendation: * Refer to challenges or barriers to the uptake of the measures mentioned rather than "feasibility". This language seems appropriate since there is "high confidence" that constraints can be overcome. * State more clearly (e.g. with examples) how these constraints could be overcome. If there is high confidence in the finding, it must be possible to find an example (even if it is context-specific). [European Union (EU)]	
8624	15	8	15	8	Could rephrase "diet changes" to "diet optimisation" [Ireland]	
924	15	9	15	9	Add, "...including sustainable forest management {5.4.1.3, FAQ5.1)" at the end of this sentence, in order to give an example of such an experience. [France]	
1730	15	9	15	9	delete the phrase "though experiences show that these constrainsts can be overcome" since those experiences are not comparable to the unprecedented context of 1.5 °C. [Saudi Arabia]	
4252	15	9	15	9	It is suggested to delete “though experiences show that these constraints can be overcome”, since CDR and SRM have uncertain effects on many aspects including environment and ethics as mentioned in Chapters 1 and 5 of the underlying report in spite of the fact that the possibility of removing these obstacles through these approaches is also mentioned there. So the current description tends to mislead policymakers. [China]	
8626	15	9	15	9	"Experiences show" - could include examples or link to elsewhere in the Report [Ireland]	
2468	15	1	15	1	Please add at the end of the paragraph: land use is an important driver of regional climate. Biopysical climate feedbacks of land use change are not considered in the development of socio-economic pathways.{3.7.2.1} [European Union (EU)]	
8130	15	1	15	11	Sections 4.4.5 and 4.4.3 do not seem particularly relevant to the content of C3.3; however, the discussion of feasibility in 4.5.2 is relevant and should be cited. [United States of America]	
268	15	13	15	21	BECCS is highlighted in energy context. What about Bio-CCS in industry? According to new research, the potential (economic, technical) in industry is even higher in some regions than in energy production. [Finland]	
926	15	13	15	13	Consider adding « of GHG » : "Emissions of GHG from industry" [France]	
1732	15	13	15	13	insert "projected to be" between "are" and "about" [Saudi Arabia]	
2470	15	13	15	2	Can this section be split in some focus on the dominant industrial sectors regarding emissions, such as steel, cement and chemical sectors. Which sectors see which technologies deployed at what speed of penetration by 2050. Can more information be given on particular risks related to carbon lock in in these sectors, where capital can have typically long life times. What does it mean regarding increased investment needs in this sector. [European Union (EU)]	
4164	15	13	15	21	C3.4: This is a problematic message on industry: assesses feasibility of CCS at same level with other options. ES Chapter 2 does not help. Suggest adding statement on difference between CS and other options regarding certainty and depth of emissions reduction (CCS: never zero emissions). [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4594	15	13	15	2	Please add “4.3.3.” as the reference. Because it is described in the section* that Reducing the embodied energy in buildings material provides further energy and GHG savings, in particular through bio-based materials and wood construction.. * See Chapter 4 Page 29 from line 4 to 6?Reducing the embodied energy in buildings material provides further energy and GHG savings (Cabeza et al., 2013; Oliver and Morecroft, 2014; Koezjakov et al., 2018), in particular through bio-based materials (Lupíšek et al., 2015) and wood construction (Ramage et al., 2017). [Japan]	
5004	15	13	15	21	In this paragraph on industry, could be further strengthened by reference the finding from the underlying report that “Considerable carbon intensity reductions are already achieved by 2030, largely via a rapid phase-out of coal.” [United Kingdom (of Great Britain and Northern Ireland)]	
5418	15	13	15	21	C3.4: This is a problematic message on industry: assesses feasibility of CCS at same level with other options. ES Chapter 2 does not help. Suggest adding statement on difference between CS and other options regarding certainty and depth of emissions reduction (CCS: never zero emissions). [Saint Lucia]	
5784	15	13	15	21	(1) This part is not listing important options such as materials efficiency, product service efficiency, etc that were included in AR5 industry chapter, please amend. (2) On line 16 please delete "in several cases" or make it applicable also to the other options (electrification, bioenergy, etc.) [Sweden]	
5972	15	13	15	2	Section C.3 : we have the impression that there is not enough consideration for the investment aspects, ie the need to move investment out of fossil fuel-related industries toward low-carbon energy production and use. [Belgium]	
6518	15	13	15	14	These numbers appear to be for low-overhsoot pathways only, for high-overshoot pathways the range is 54-81 according to Table 4.1 [Netherlands]	
6768	15	13	15	21	C3.4: This is a problematic message on industry: assesses feasibility of CCS at same level with other options. ES Chapter 2 does not help. Suggest adding statement on difference between CS and other options regarding certainty and depth of emissions reduction (CCS: never zero emissions). [Marshall Islands]	
7184	15	13	15	2	Comparison to 2 deg. C should be added after the first sentence. [India]	
8132	15	13	15	14	C3.4 refers to emissions from industry in 1.5°C pathways as being 70-90% lower in 2050 than in 2010. This does not match the detailed discussion in 4.3.4, which refers to 70% lower emissions, and Chapter 2 appears to lead to a different conclusion. The discussion in 4.3.4 is also not written clearly and appears to conflict with Chapter 2: for example, is the 2 Gt CO2 reference in 4.3.4 a median or an upper bound? Chapter 2 would appear to suggest the upper bound is 5 Gt CO2. [United States of America]	
8134	15	13	15	21	C3.4 should cite 2.4.3. [United States of America]	
8136	15	13	15	21	Paragraph C3.4 should highlight the assessment in 4.3.4 that mitigation consistent with 1.5°C would on average require reduction of final industrial energy demand by one-third. [United States of America]	
8492	15	13	15	29	All this need to come before C3.3 as it is related to C3.2 [Zimbabwe]	
9176	15	13	15	21	C3.4: This is a problematic message on industry: assesses feasibility of CCS at same level with other options. ES Chapter 2 does not help. Suggest adding statement on difference between CS and other options regarding certainty and depth of emissions reduction (CCS: never zero emissions). [Nauru]	
4358	15	14	15	16	Energy-intensive industry can achieve these reductions through combinations of novel technologies and practices, including low-emission electrification, hydrogen, bio-based feedstocks, product substitution, and in several cases CCS (high confidence). ? Energy-intensive industry can achieve these reductions through combinations of novel technologies and practices, including low-emission electrification, hydrogen, bio-based feedstocks, product substitution, and in several cases CCUS (high confidence). [Republic of Korea]	
4596	15	14	15	14	The first sentence should be replaced by “Emissions from industry in 1.5°C -consistent pathways are characterized to be about 70 – 90% lower in 2050 compared to 2010” because this is only an explanation of model analysis. The second sentence is so strong but it is not always proven by enough evidences. From the cited literatures and text in Chapter 4, it seems to be impossible to find out any evidences why energy-intensive industries "CAN" achieve such a huge reduction. Also Table 4.3 seems to simply show innovative technologies without careful examination of the feasibilities and barriers. Request to add evidences of "CAN" based on literatures. If not, this sentence should be changed to “It is not proven whether energy intensive industries can achieve these reductions or not at this moment.” If evidences can be added, the second and third sentences should be replaced by more accurate representations to avoid misunderstanding as follows: Energy-intensive industry has these reduction potentials under carbon prices of about $400-$1000 /tCO2 through combinations of novel technologies and practices, (...). Although technically possible, the deployment at scale of these options (...)”. The carbon prices for 1.5°C -consistent pathways are estimated to be $400-$1000 /tCO2 according to Figure 2.26. The IAMs show the potential emission reductions in energy-intensive industry under such a high carbon prices, and this condition should be described as accurately as possible. [Japan]	
7178	15	14	15	16	Combinations of novel technologies and practices, referred to would require availability of technologies and finances for the same. This sentence should be revised to include present limitations faced by the developing countries on these accounts. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
270	15	15	15	16	Term "bio-based feedstocks" is not a familiar concept. [Finland]	
5132	15	15	15	15	The term "novel technologies" is too vague. Please specify what is meant here and make clear that this are not totally unknown technologies, but technologies that need to be further developed and scaled-up. [Hungary]	
6520	15	15	15	15	The term "novel technologies" is too vague. Please specify what is meant here and make clear that this are not totally unknown technologies, but technologies that need to be further developed and scaled-up. [Netherlands]	
7176	15	15	15	18	Refer to the underlying report: Chapter 4 (6,41,6,43) - The report states that efficiency and CCS technologies are less economically risky. While this may seem correct for efficiency, CCS technologies, due to their inherent technical, safety, logistics, social and legal issues, remain risky economically. [India]	
8138	15	15	15	15	"hydrogen" seems jarring here, as a molecule in the atmosphere or an element. Do authors mean "hydrogen fuels"? [United States of America]	
9004	15	15	15	15	Suggest defining: 'novel' technologies [Australia]	
2472	15	16	15	18	Edit sentence as follows: "Although individually technically proven, the effective deployment at scale of these options is limited by factors such as higher energy demand, thermodynamic limitations, economic feasibility and institutional constraints." given that limitations are only economic and institutional. Surely, things like using hydrogen for certain processes is proven, but it is not proven that it can reduce emissions, taking into account the energy (and therefore emissions) cost of producing, transporting and storying H2. Similarly, CCS may be technically feasible, but it drastically increases the primary energy requirement of the process concerned. Also, many bio-based substitutes of fossil-based materials take more energy to process. Even if the higher energy demand is met by renewable energy, that energy has a cost (also in terms of emissions and resources), and the opportunity cost of those factors can make the options prohibitively inefficient or even counterproductive regardless of the economic cost. [European Union (EU)]	
3760	15	16	15	16	Please introduce CCS. [Germany]	
5134	15	16	15	18	It would be reasonable to replace "Although technically proven, the deployment at scale of these options is limited by economic feasibility and institutional constraints" with: "The deployment at scale of these options is limited by economic feasibility and institutional constraints, though experiences show that at least some of these constraints can be overcome." ((explanation: there are such good examples e.g. for F-gases)) [Hungary]	
5974	15	16	15	18	We suggest adding the words "(as long as the carbon price is low)" after economic feasibility. [Belgium]	
6842	15	16	15	16	Delete "in several cases". [United Arab Emirates]	
8140	15	16	15	16	Spell out "CCS" acronym. [United States of America]	
8142	15	16	15	16	Not clear what "in several cases" means. Several scenarios? Or certain types of industry (cement, steel, pulp and paper, etc.)? [United States of America]	
2474	15	17	15	17	Please indicate which options you refer to - i.e. whether it is all of the above-mentioned ones. [European Union (EU)]	
4598	15	17	15	18	“Energy-intensive industry can achieve these reductions through combinations of novel technologies and practices, (...). Although technically proven, the deployment at scale of these options (...)” should be changed to “Energy-intensive industry can potentially achieve these reductions under carbon prices of about $400-$1000 /tCO2 through combinations of novel technologies and practices, (...). Although theoretically possible, the deployment at scale of these options (...)”. It is factually incorrect to describe the "novel technologies and practices" as "technically proven". For instance, there exists no working demonstrations of either ~100% CCS or hydrogen decarbonisation options for a full-scale (5 – 10 Mt/yr crude steel production) blast-furnace steel plant. Small-scale demonstrations indicate that such technologies are "possible" or "plausible", not "proven". Note also that Table 4.11 shades the technological dimensions in a "moderate" colour, indicating that barriers for implementation are non-negligible. [Japan]	
9512	15	17	15	17	Revise to soften the statement as follows: "…the deployment at scale of these options [delete: is][add: is often] limited by economic feasibility and institutional constraints". [Canada]	
1734	15	18	15	21	Options other than energy efficiency also need to be included or better delete the sentence "energy efficiency …. Industry" [Saudi Arabia]	
2476	15	18	15	18	"Energy efficiency can have a positive effect (synergy) on a large number of SDGs": Indeed, but this would make it essential to mention the deleterious effects of the energetically inefficient options considered, such as bioenergy (especially BECCS), most hydrogen, etc. It is disingeneous to celebrate the synergies resulting form efficiency gains, but not mentioning the impact of CCS on primary energy demand. [European Union (EU)]	
3762	15	18	15	2	Please insert "as well as popular opposition against CCS" after "constraints" in l. 18. Insert "4.3.1.6" in the list of sources in l. 20. [Germany]	
4600	15	18	15	29	“Energy efficiency can have a positive effect (synergy) on a large number of SDGs (...)” should be changed to “Energy efficiency improvement can have a positive effect (synergy) on a large number of SDGs compared with other mitigation options (...)” because excessive improvement of energy efficiency can cause trade-offs with some SDGs as described in e.g., 4.2.1.1.3, 5.4.1, and 5.4.1.1. [Japan]	
6844	15	18	15	18	Add "at the time of the report" at the end of the sentence. [United Arab Emirates]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7186	15	18	15	18	Add after the following sentence “Although technically proven….institutional constraints” - “These constraints pose a greater challenge for developing countries where the process of industrialisation is still underway”. [India]	
8144	15	18	15	18	Spell out "SDG" acronym (it is spelled out later in the document, but this is the first callout). [United States of America]	
8146	15	18	15	18	Why refer to SDGs? The point seems to be that EE practices and technologies can help in energy-intensive industry, and it doesn't seem pertinent to reference SDGs here. [United States of America]	
9514	15	18	15	18	As the SDGs are discussed in detail on pg. 18 and section D, recommend removing mention of SDGs from pg. 19, line 18 ("on a large number of SDGs") and line 26 ("while enhancing multiple SDGs"). [Canada]	
5786	15	19	15	19	"more economically feasible" - more than what? [Sweden]	
8148	15	19	15	19	Clarify 'more' as in compared to what? [United States of America]	
928	15	23	15	29	C3.5 is a very important point. A few remarks : 1) It has to be clarified, especially about the link between the first sentences which is not so clear 2) replace "efficient" by "energy-efficient" 3)add "the substitution of carbon-intensive materials with harvested wood products" to the examples of technical measures, with a reference to {2.3.4.2} 4) Add a mention to planning policies add enabling conditions of such reductions 5) add a mention to the change needed in tourism, especially about air travel We suggest to write it as follow : "Transport and buildings, and their associated infrastructure achieve deep emissions reductions by 2050 in 1.5°C-consistent pathways while enhancing multiple SDGs, relying on technical measures (such as energy-efficient appliances, substitution of carbon-intensive materials with harvested wood products, insulation and electrification), policies (such as urban and transportation planning), and lifestyle choices (reducing air travels, favouring cycling walking...)." [France]	
1736	15	23	15	23	insert "are projected to" before "achieve". [Saudi Arabia]	
2478	15	23	15	29	Please provide some more detail quantitative indication of the changes required in these sectors. For example, some (quantitative) insights along the following lines would be useful: * what is needed to make projected heating & cooling demand 1.5°C consistent? * what needs to happen in transport? how far do emissions need to fall (or stop rising) compared to today? what does this imply in terms of aviation? modal shift? rate of electrification of private vehicles etc. * what is the relationship between mitigation in the above sectors and electrification? If we can decarbonise electricity, is it sufficient merely to electrify these sectors or is more fundamental change needed. [European Union (EU)]	
2480	15	23	15	29	Please split transport and building in separate parts. They clearly merit separate focus. Please be more specific on the GHG reductions to be achieved in each sector, what technologies can be deployed and how they impact both final and primary energy demand (e.g. how to reduce emissions in building vs insulation vs H2 vs electrification), and what rates need to be applied to achieve the necessary reduction (e.g. what is the rate of deep renovation compared to historic rates in different regions). The transport part has to differentiate between sectors. The SPM says nothing on specific sectors such cars, LDVs, HDVs, aviation and maritime, each which have their specific situation. We need more information on where emission of aviation and maritime need to be in 2030, 2050 and beyond at global scale and what technologies or behavioural change are deployed to reduce emissions in the 1.5C and 2C pathways. [European Union (EU)]	
3764	15	23	15	29	Why are transport and buildings mixed into one statement? They are fundamentally different and examples provided here either apply to one or the other. Please provide separate sections with consistent information for these important sectors. [Germany]	
4166	15	23	15	29	C3.5: The transport sector is very important for many countries, in particular for SIDS. Add more detail on both transport and buildings for 2040. There is need to provide more policy relevant information on transport which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and one on transport with the material from Chapter 2. [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4360	15	23	15	28	Facilities and structures with high connectivity in the city may cause problems such as urban paralysis in the event of a disaster. Multidimensional simulation and effect monitoring for countermeasures to curb global warming are needed. [Republic of Korea]	
4362	15	23	15	29	The role of clean vehicles like electric vehicle and fuel cell car, etc. should be included as a measures for transport. The fuel cell car based on hydrogen produced from renewable energies should be emphasized. [Republic of Korea]	
4602	15	23	15	24	“Transport and buildings, and their associated infrastructure, achieve deep emission reductions by 2050 in 1.5°C-consistent pathways.” should be changed to “Transport and buildings, and their associated infrastructure, can contribute to deep emission reductions by 2050 in 1.5°C-consistent pathways.” or “Transport and buildings, and their associated infrastructure, are also required to reduce emissions deeply by 2050 in 1.5°C-consistent pathways.” The reason is that the original sentence of "(...) achieve deep emission reduction by 2050" can be interpreted misleadingly as a scientific truth, but this sentence must discuss only the possibilities of deep emission reductions under the economic burden estimated by IAMs. [Japan]	
4898	15	23	15	29	Transport and buildings are unhelpfully conflated here. They are very different sectors and it makes little sense to lump them together. For example, the second sentence refers to different measures that will help decarbonise but some of these will apply to either industry or transport more than another (or not at all). As a second example, to have a feasibility asessment, as at the end of the paragraph, that covers two completely different sectors is essentially meaningless. It would be better to separate these sectors out then 1) describe in quantitative terms their future decarbonisation 2) how this might be achieved 3) a rigorous and specific statement on feasibility [United Kingdom (of Great Britain and Northern Ireland)]	
5136	15	23	15	29	This paragraph is too condesed, covering both the buildings and the transport sector. That is why important messages got lost. It would be much better to separate the issues and have separate paragraphs for buildings and transportation. On buildings the phase-out of natural gas for heating should be emphasised as well as the need for deep renovation of exiting buildings. For transport more detail should be given on the need for phasing out oil before 2060 and complete electrification (possibly supplemented with (zero carbon) hydrogen fuel cells) of passenger and goods transport. This zero emission perspective should not be lost, as it is a key feature of the required transition. [Hungary]	
5420	15	23	15	29	C3.5: The transport sector is very important for many countries, in particular for SIDS. Add more detail on both transport and buildings for 2040. There is need to provide more policy relevant information on transport which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and one on transport with the material from Chapter 2. [Saint Lucia]	

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5838	15	23	15	29	Though transport's share of global energy-related CO2 emissions is significant (23%), the sector is only briefly mentioned in the current draft SPM. In the full report, chapter 2, 2.4.3.3, highlights the importance of transport in global energy-related CO2 emissions, the challenges for deep decarbonisation of the sector, and the variety of means and strategies to be considered: "Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other. The transport sector is the least diversified energy end-use sector; the sector consumed 65% of global oil final energy demand, with 92% of transport final-energy demand consisting of oil products (IEA, 2017a), suggesting major challenges for deep decarbonisation. [...] Deep emissions reductions in the transport sector would be achieved by several means. [...] The potential and strategies to reduce energy consumption and CO2 emissions in 2050 differ significantly among transport modes. [...] The reduction of CO2 emissions in the whole sector from the reference scenario to ETP-B2DS is 60% in 2050, with varying contributions per mode (Table 2.8). Since there is no silver bullet for this deep decarbonisation, every possible measure would be required to achieve this stringent emissions outcome. The contribution of various measures for the CO2 emission reduction from the reference scenario to the IEA-B2DS in 2050 can be decomposed to efficiency improvement (29%), biofuels (36%), electrification (15%), and avoid/shift (20%) (IEA, 2017a)."To accurately reflect the importance of reducing CO2 emissions in the transport sector, as expressly stated in the full report, we would therefore propose an additional paragraph to the draft SPM, following paragraph C3.5, focused on transport, with the suggested wording: "C.3.5.bis. Transport achieves deep emission reductions by 2050 in 1.5°C-consistent pathways. The transport sector is the least diversified energy end-use sector, suggesting major challenges for deep decarbonisation. Deep emissions reductions would be achieved by several means, and the potential and strategies to reduce energy consumption and CO2 emissions in 2050 differ significantly among transport modes. Since there is no silver bullet for this deep decarbonisation, every possible measure would be required to achieve this stringent emissions outcome, including efficiency improvement, biofuels, and electrification. {2.1.1, 2.4.3, 2.4.3.3.} Another posibility is to change the current paragraph for: "C3.5. Transport and buildings, and their associated infrastructure, achieve deep emission reductions by 2050 in 1.5°C-consistent pathways. Technical measures (such as efficient appliances, insulation and electrification) and policies that support lifestyle choices that lower energy demand or favour cycling and walking can achieve such deep emissions reductions while enhancing multiple SDGs. While technological performance can be improved for all these options, socio-cultural, market, and economic barriers may inhibit rapid and far-reaching change (high confidence) (Figure SPM4). There is no silver bullet for a deep decarbonisation in transport, and every possible measure would be required to achieve a stringent outcome, including efficiency improvement, biofuels and electrification.{2.3.4, 2.4.3, 4.3.3, 4.4.3, 4.5.2, 4.4.5, 5.4.1, Table 5.3}" [Brazil]	
5976	15	23	15	29	In the second sentence of C3.5, proposition to replace "lifestyle choices" by "behaviour changes", and to suppress the world "such". The last phrase of C3.5 could be amended in this way : "While technological performance can be improved for many options, socio-cultural, economic and institutionnal barriers need to be adressed in order to avoid the inhibition of rapid and far-reaching change". Some of these barriers can be lowered by setting a price on carbon. [Belgium]	
6274	15	23	15	29	The transport sector is very important for majority of the countries, in particular for SIDS. suggest adding more detail on both transport and low carbon buildings for 2040. There is need to provide more policy relevant information on transport, which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and the other on transport with the material provided in Chapter 2. [Fiji]	
6522	15	23	15	29	This paragraph is too condesed, covering both the buildings and transport sector. That is why important messages got lost. It would be much better to separate the issues and have separate paragraphs for buildings and transportation. On buildings the phase-out of natural gas for heating should be emphasised as well as the need for deep renovation of existing buildings. For transport more detail should be given on the need for phasing out oil before 2060 and complete electrification (possibly supplemented with (zero carbon) hydrogen fuel cells) of passenger and goods transport. This zero emission perspective should not be lost, as it is a key feature of the required transition. [Netherlands]	
6770	15	23	15	29	C3.5: The transport sector is very important for many countries, in particular for SIDS. Add more detail on both transport and buildings for 2040. There is need to provide more policy relevant information on transport which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and one on transport with the material from Chapter 2. [Marshall Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7188	15	23	15	24	Modify the first sentence as follows - “Transport and buildings, and their associated infrastructure, need to achieve deep emission reductions by 2050 in 1.5°C-consistent pathways (models). [India]	
7190	15	23	15	28	Reformulate the second sentence in the para - “Technical measures….SDGs”. There is limited evidence in literature that technical measures or choices suggested in the SPM can achieve such deep emissions reductions while enhancing multiple SDGs. The lack of evidence has been explicity recognized in Section 5.7 Synthesis and Research Gaps in Chapter 5. The sentence should be removed and the next sentence should be modified as follows - “While technological performance can be improved for many options, socio-economic, market, and other economic barriers may inhibit rapid and far-reaching change” [India]	
8150	15	23	15	24	C3.5 would benefit from addition of a phrase about the impact of land use patterns (referenced in 4.3.3.3) and how compact urban design with attention towards complementary adjacent uses contributes to reducing transport sector emissions (because of trip-chaining and the ability to use alternate modes of transport). On line 24, recommend adding: "Compact land use patterns that promote a range of complementary uses can reduce demand for emission-heavy transport options." [United States of America]	
8152	15	23	15	29	While much is possible in the electricity sector, the transitions of the transport and home heating sectors are moving much more slowly, and this needs to be acknowledged. Liquid biofuels need to be focused on use for long-distance transport that cannot be electrified and for home heating, which will take significant capital investment to change. A more nuanced presentation of the challenges is needed, reserving biofuels for where alternatives are most difficult and not for electricity, which is much more easily decarbonized. [United States of America]	
8154	15	23	15	29	The SPM could be stronger here by explaining how the spatial organization of urban areas gives rise to the potentials for emission reductions that do not appear in rural and suburban geographies, and by pointing so some of the inspiring successes and daunting barriers presented in the underlying text. For example, a positive point from the bottom of page 4-29: "The global transport sector could reduce 4.7 GtCO2e yr–1 (4.1–5.3) by 2030. This is significantly more than is predicted by Integrated Assessment Models (IAMs; UNEP, 2017b)." It would also be meaningful to state in the supporting text that the transport sector accounts for approximately 28% of energy consumption in urbanized areas (according to IEA 2016c, which is referenced elsewhere in the report) -- an amount of consumption nearly as much as buildings. Transportation and land use patterns are inherently linked when thinking about solutions for sustainability and mitigation. In the underlying text, page 4-29, section 4.3.3.3, end of first paragraph, it would help to explain what is meant by "spatial organization of urban energy" or use more plain-speak language. Finally, there is a significant difference between global energy consumption by buildings for developed and developing countries, primarily due to difference of energy use (air conditioning, heating, etc.). This should be referenced in the supporting text. [United States of America]	
8156	15	23	15	29	The conclusion in C3.5 that technical measures "... can achieve such deep emissions reductions ..." appears to be rooted in Section 4.3.3. However, the contribution of the buildings sector to that conclusion cannot be clearly seen from Section 4.3.3.2. That section (p. 4-28) cites a study that states that consistent pathways require construction to be fossil-free and near-zero energy by 2020 and that existing buildings in OECD need energy refurbishment at a rate of 5% per annum. These requirements do not seem feasible given the current state of construction and renovation in July 2018. The document states that several examples of net-zero energy in buildings are available, but that does not equate to all construction. [United States of America]	
8158	15	23	15	29	Some of the ideas referenced in Section 4.3.3, page 4-27, have a profound influence on our ability to limit warming to 1.5°C and could be brought forward into the SPM. The text reads: "There will be approximately 70 million additional urban residents every year through to the mid part of this century (UN, 2014). The majority of these new urban citizens will reside in small and medium sized cities in low- and middle-income countries (Cross-Chapter Box13 in Chapter 5). The combination of urbanisation and economic and infrastructure development could account for an additional 226 GtCO2 by 2050 (Bai et al. 2018). However, urban systems can harness the mega-trends of urbanisation, digitalisation, financialisation and growing sub-national commitment to smart cities, green cities, resilient cities, sustainable cities and adaptive cities, for the type of transformative change required by 1.5°C-consistent pathways (Revi and Rosenzweig, 2013; Parag and Sovacool, 2016; Roberts, 2016; Wachsmuth et al., 2016; Revi, 2017; Solecki et al., 2018)." [United States of America]	
8628	15	23	15	25	"deep emission reductions" could benefit from quantification - as a % or split between transport and buildings [Ireland]	
8666	15	23	15	29	C3.5: The transport sector is very important for many countries, in particular for SIDS. Add more detail on both transport and buildings for 2040. There is need to provide more policy relevant information on transport which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and one on transport with the material from Chapter 2. [Grenada]	
9006	15	23			Seeking clarification: does "deep" mean "significant", "Large" etc. [Australia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9178	15	23	15	29	C3.5: The transport sector is very important for many countries, in particular for SIDS. Add more detail on both transport and buildings for 2040. There is need to provide more policy relevant information on transport which is presently lumped together with building in C3.5 (C3.5. Transport and buildings). As Chapter 2 states “Transport accounted for 28% of global final-energy demand and 23% of global energy-related CO2 emissions in 2014. Emissions increased by 2.5% annually between 2010 and 2015, and over the past half century the sector has witnessed faster emissions growth than any other.” We suggest that C3.5 is split into two, one on buildings and one on transport with the material from Chapter 2. [Nauru]	
9324	15	23	15	23	"deep emission reductions": quantify it. [Switzerland]	
8160	15	24	15	26	The reference to lifestyle choices that favor cycling and walking should acknowledge that this is also a matter of sound urban planning and geography; cycling and walking may be less viable options in some parts of the world because of large distances, poor urban planning, air pollution, or climate conditions. [United States of America]	
4900	15	25	15	25	There are very few mentions of lifestyle choices in the SPM (really just here and above re: diet changes) and yet the underlying evidence (including the overall narrative from the SSPs) makes it very clear that this is an important part of the picture. Please consider expanding on this point. [United Kingdom (of Great Britain and Northern Ireland)]	
5138	15	25	15	25	or favour public transport, cycling and walking [Hungary]	
8162	15	26	15	26	Why reference SDGs? The statement holds true for sustainable development in general. [United States of America]	
9516	15	26	15	26	The reference to SDGs is beyond the scope of section C and should be removed. It belongs in section D4, which addresses the relationship between mitigation and sustainable development / poverty eradication. [Canada]	
2482	15	28	15	28	Please edit: "and economic barriers may inhibit rapid and far-reaching change or reduce its benefits through feedback mechanisms such as the rebound effect". [European Union (EU)]	
272	16		16		Add short titles after the pathway acronyms in the middle panel (Breakdown of contributions…): Pathway LED (low energy demand); Pathway S1 (sustainability oriented); Pathway S2 (middle of the road); Pathway S5 (high energy demand). The footnote in page 17 gives explanation on differences between pathways in concise way. Please, make sure that reader finds the footnote easily. [Finland]	
274	16				The text in panel "Temperature implications of emission trajectories" is understandable, but the bar graph at the bottom of the figure does not clarify the issue. Rather it confuses reader (e.g. what does the relative placement of LED, S1,... mean?). Please, remove it. [Finland]	
930	16		16		-Headline text : Replace "is achieved" by "can be achieved" -Why having chosen Black Carbon, and not another non-CO2 driver, for instance N2O ? Is it because it is a SLCF ? Could it be more precise about this choice ? -Add that LED means « Low Energy Demand » [France]	
932	16		17	9	This figure is useful and informative, particularly in the distinction of the 4 archetype pathways and the temperature implications of emissions trajectories. However, it could be clearer by changing some details. 1) The dotted lines of the upper graph could be different from each other, as for Figure 2.5 (chapter 2) 2) Explanations should be provided to justify why the 4 archetype pathways do not start with the same level of emissions in 2010. The legend should emphazise the difference of need of CDR between the pathways. 3) The "temperature implications" graph is not clear. The axis has no units, so it is difficult to understand why the 4 pathways are not regularly placed on the axis. We suggest to put it above the 4 achetypes-graphs, as shown in the joint file. 4) There are too many things written. Text can be removed, especially the upper one, because these information have been already given in section C. [France]	
1836	16				figure upper panel rigt hand side: Replace figure showing Black Carbon emissions by figure showing N2O emissions. [Denmark]	
1838	16				What is the scale for lower panel at the very bottom? Could be quantified by cumulative negative emissions until 2100 for the idealised pathways. [Denmark]	
2490	16		16		It is unclear what the (negative) emissions of BECCS are supposed to represent. Does -1 t CO2 mean 1 t CO2 being buried under ground, or does it mean that much having been removed from the atmosphere overall? If the latter, is there an estimate just how much more CO2 would need to be buried under ground for 1 t of net benefit (as the energy penalty of CCS and irreduceable collateral carbon losses will inevitably mean that 1 t CO2 reduction requires more CO2 to be sequestered), and how much land / biomass it would take? [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2492	16		16		In the small graphs, the current AFOLU CO2 balance is indicated as a (significant) source. Currently, terrestrial ecosystems are a significant sink. This suggests that the AFOLU figures do not in fact represent AFOLU, but only LUC (same mistake that was made in the WG III report of AR5). If so, it means that the forest sink (forest remaining forest) is not in the graphs, thus changes to that sink (like its reduction by increased bioenergy use, foregone sequestration) is also not taken into account. That is also suggested by the counterintuitive relationship between the green band and BECCS in scenarios LED, S1 and S2 (i.e., that the net sink can significantly increase at the same time when bioenergy and BECCS are being deployed), and the lack of response of the green band to the deployment of increasing amounts of BECCS across the scenarios. [European Union (EU)]	
3918	16				Figure SPM 3: The archetypes scenarios in this Figure are appreciated as they highlight the implications in the long term of policy choices in the short term. It would be more useful and enhance transparency to add to the figures of the amount of negative emissions needed to reach each of the four scenarios. [Luxembourg]	
4090	16		16		SPM3: This figure presents several useful concepts, but a range of key improvements need to be made: • Remove all pathways that don't hold warming to "well below 2°C" and are therefore incompatible with the Paris Agreement. This would also include archetype S5. • Provide GHGeq pathways and include 2030 NDC assessments as in CC Box 11 Fig 1 • show temperature implications for pathways (instead of figure SPM 1) • mark archetype pathways in large figure with different colours - they are hard to distinguish otherwise [Saint Kitts and Nevis]	
4364	16				All 1.5?-consistent pathway reach net-zero around 2050 in figure SPM3. So it would be needed additional explanation like conditions of each scenario in the panel 'Global CO2 emissions in 1.5 [Republic of Korea]	
5030	16		16		LED: please explain acronym [Italy]	
5466	16		16		SPM3: This figure presents several useful concepts, but a range of key improvements need to be made: • Remove all pathways that don't hold warming to "well below 2°C" and are therefore incompatible with the Paris Agreement. This would also include archetype S5. • Provide GHGeq pathways and include 2030 NDC assessments as in CC Box 11 Fig 1 • show temperature implications for pathways (instead of figure SPM 1) • mark archetype pathways in large figure with different colours - they are hard to distinguish otherwise [Saint Lucia]	
5478	16				Figure SPM3: please inform explicitly about the amount of negative emissions in each scenario. [Austria]	
6816	16		16		SPM3: This figure presents several useful concepts, but a range of key improvements need to be made: • Remove all pathways that don't hold warming to "well below 2°C" and are therefore incompatible with the Paris Agreement. This would also include archetype S5. • Provide GHGeq pathways and include 2030 NDC assessments as in CC Box 11 Fig 1 • show temperature implications for pathways (instead of figure SPM 1) • mark archetype pathways in large figure with different colours - they are hard to distinguish otherwise [Marshall Islands]	
9224	16		16		SPM3: This figure presents several useful concepts, but a range of key improvements need to be made: • Remove all pathways that don't hold warming to "well below 2°C" and are therefore incompatible with the Paris Agreement. This would also include archetype S5. • Provide GHGeq pathways and include 2030 NDC assessments as in CC Box 11 Fig 1 • show temperature implications for pathways (instead of figure SPM 1) • mark archetype pathways in large figure with different colours - they are hard to distinguish otherwise [Nauru]	
4042	16		17	9	There is important information about the four archetype pathways in the footnote on page 17, but it can easily be overlooked. Please consider to include a reference to the footnote in the subtitle "Breakdown of contributions to…" instead of refering to the footnote in the figure text on page 17. [Norway]	
4902	16		16		What these pathways show as much as anything is the influential role being played by the SSPs. And yet the SPM lacks an explicit discussion of the role that such assumptions make in the success or otherwise of 1.5 pathways. There is a later discussion of the importance of sustainable development, but it's not a direct link. For example, it would be helpful to state that in some future worlds, we couldn't find 1.5 pathways. [United Kingdom (of Great Britain and Northern Ireland)]	
4904	16		16		It is notable that of the four archetype pathways, only one crosses net zero within the interquartile range of all pathways, and only two cross net zero within the 10-90% range. This could arguably confuse the reader as to why they are presented as archetypes. The 10-90% and interquartile range could be removed from the graph to potentially avoid confusion [United Kingdom (of Great Britain and Northern Ireland)]	
4906	16		16		It is likely not very intuitive to the reader why a scenario with slower initial decarbonisation and with a GHG intensive lifestyle (S5) reaches net zero before the more sustainable scenarios. Additionally, it may be seen to confuse the point being made in the figure SPM 1 - "bringing forward the date of net zero emissions from 2055 to 2040 increases the chance of limiting warming to 1.5C". Could this be clarified. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4908	16		16		The final "temperature implications…" image is somewhat abstract What does the graphic actually add here? It's just a horizontal line with no scale. So, for example, it is unclear as to why for example LED and S1 are close together while S2 and S5 are far apart. [United Kingdom (of Great Britain and Northern Ireland)]	
6864	16		16		Remove "to net zero" from line 1 under Figure SPM 3 heading "Emissions in foud 1.5C-consistent pathways and their temperature implications". [United Arab Emirates]	
2484	16	1	17	9	Please add the figure 2 on contribution of natural climate solutions to stabilizing warming … of 'Griscom et al' in Figure SPM 3 [European Union (EU)]	
2486	16	1	16	1	How do the pathways LED, S1, S2, and S5 relate to the more well known SSPs? [European Union (EU)]	
2488	16	1	16	54	While informative, this page lacks two important elements. How does 1.5C compares to well below (66%) 2°C as well as some regional analysis of pathways. This has to be included in the SPM. This is instrumental for policy makers to understand better the meaning of the wording of the Paris agreement that refert to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century [European Union (EU)]	
3766	16	1	17	9	Figure SPM 3: The bold headline at the top of figure SPM 3, incl. the text has no clear arrangement, weather it is a statement (then it needs a label such as C_) or it is a subheading, or anything else. This needs to be clarified. Furthermore Figure SPM 3 consists of three parts. The two parts at the top correspond to the Figure 2.5 of CH2, whose legibility is rather higher than in the SPM. In addition, we propose to use only one colour for the text in the figure. Also, please choose different signatures and/or colours to depict the archetype pathways (LED, S1, S2, S5), as they are currently hard to distinguish, and introduce the term "CCS" in the caption "pathway LED". [Germany]	
3768	16	1	17	9	Figure SPM.3 delivers very relevant information, and we strongly support the integration of the 4 Archetype Pathways and the "Scale" at the bottom, as they provide policymakers with differentiated attributes for different policy-choices. We have a few minor but relevant remarks that may improve Figure SPM.3 further. 1) The Archetype pathways (and the full suite of pathways) start at different CO2 emission levels in 2010. As they are later directly compared, this should be explained. 2) While the median of all scenarios' net-zero point may well be in 2050, S5 is the only Archetype pathway that goes through 2050, with the other three reaching net zero close to 2060. It would be useful to consider a graphical representation which makes the connection between the suite of scenarios and the bar showing "net-zero CO2 around mid-century" visually more clear. Also, please consider to add a line (in the caption) explaining why the archetype pathways 3 of the 4 archetypes reach net zero CO2 later than the scenario median highlighted across the SPM. 3) please add more information about the NETs/CDR requirement (as shown in Figure 2.10) in addition to the current 3 lines below the scale at the bottom. 4) the statement "pronounced" or "limited" temperature decline after peak is not self-explanatory - if the authors want to hint at the additional Earth-System uncertainty (will CDR actually lead to cooling as projected) and potential risks for ecosystems/adaptation that stem from such fast rates of temperature change (even if, in this case, cooling) this needs to be better explained. Alternatively, one could simply state "lower rates of warming and cooling" vs" higher rates of warming and cooling" at the ends of the slide, which would encompass not only the higher risk from steep cooling but also from faster warming . [Germany]	
3770	16	1			The message of figure SPM 3 is not clear to us, especially the pathways we do not understand. From a first glance it seems that Pathway S5 has the highest potential for CO2 reduction, but we are not sure. Suggest (and that is generally true for all figures) to aiming for clear messages of the figures that are to high degrees self-explaining. [Germany]	
3772	16	1			Figure SPM.3 bottom part: We find that "scale" part of the figure very useful and have some suggestions to further improve and extend its significance. Please consider to extend the format by including information currently shown in the bottom part of Figure SPM.4, and have one scale each per category, where the Archetypes can be positioned exactly where they belong - we assume that would still produce a very strong and simple picture but would provide some more space for important characteristics to be displayed and might be more representative (e.g. one line/scale for temperature implications; one for CDR requirements; one for SD trade-offs, one for SD synergies. Such a figure could potentially also be stand-alone and replace figure SPM.4, when more information from Figure 2.28 is included. [Germany]	
3774	16	1			3rd line: The term "The overall level of carbon dioxide removal (CDR) varies…" gives the wrong impression of an existing technology-option that can be deployed. This should be avoided. At least you should add "assumed carbon dioxide removal". [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3776	16	1			Figure part "archetype pathways": The underlying assumptions and further implications of the four pathways displayed here as archetypes become not clear/ transparent enough, and may create the impression for policymakers that those pathways are somehow equivalent options to choose from. You can question if a dramatic reduction energy demand (in pathway LED) or drastic overshooting (in pathway S5) really is possible? In addition to that: As a policy maker you tend towards shifting problems and solutions to the future. Therefore the illustration and demonstration of Pathway S 5 here gives the message to policy makers: "Let's do nothing today - and shift the problem to next generations in the future". If possible, please amend the description of the pathways and/or caption/figure text to point out that those pathways entail different risks and challenges, in particular with regard to the assumption of large scale CDR. [Germany]	
3778	16	1			Figure "Pathway S2": The description of this pathway "technological development follows historical patterns" is not correct, it gives the wrong impression of "business as usual". Even if this is a "middle of the road scenario" the implications of this transformation scenario would be far from other historic examples. The ambition of change with its implication for industry and society is downplayed by this description. Please revise. [Germany]	
3780	16	1			Figure SPM.3: Some more suggestions and questions: Please exchange "marked reduction" by "significant reduction". Please show N2O as one of the major non-CO2 drivers in an additional panel, please use straight-forward-names for the archetypes - why "LED" and SX?" Why "peak warming" and not "peak temperature" as the first expression would refer to a longer period according to the definition of global warming on p3-30? [Germany]	
4034	16	1	16	1	Please consider to spell out "LED" in the heading or explaining text of the small bottom left subfigure. [Norway]	
4036	16	1	16	1	Please consider to include a vertical bar in the large top figure (similar to the red horisontal bar) to show the range of emissions in 2030 - consistent with the numbers in C1.4. [Norway]	
4038	16	1	16	1	Figure SPM 3 topleft large figure: Since the x-axis starts in 2010, please consider to include historical emissions from 2010 to 2017, or alternatively only in 2017. This would mark where we are "today" and highlight how near we are 2020 and the rapid decline in global emissions thereafter. [Norway]	
4040	16	1	16	1	Please consider to indicate the range NDCs in 2030 in the large top figure - consistent with D1.1. [Norway]	
4604	16	1	16	1	Although the remaining carbon budget is closely connected to the CO2 emissions pathway, the methodology to relate the temperature to the carbon budget is not necessarily consistent with that to the emissions pathway in SR1.5, which we believe results in substantial increases in the carbon budget in SR1.5 compared to that in AR5. Therefore, the following notes should be given for the term "1.5-consistent pathways": "Consistency with 1.5 degree is assessed by the same method as in AR5, but it is not consistent with the method to estimate the remaining carbon budget in SR1.5. Geophysical uncertainties are being recognized such that the former presumes higher non-CO2 radiative forcing than the latter {2.1.3, 2.2.1, 2.6.1}." [Japan]	
5788	16	1			Figure SPM-3: The text under the scale at the very bottom of the figure "peak warming…. Peak warming" should be amended with arrows, for example pointing to the left and to the right from under "S2", if the text is not to be understood to specifically apply to "LED" and "S5", respectively. [Sweden]	
5978	16	1			Figure SPM-3 : We would like to have information on non-CO2 long-lived forcers, in particular N2O. Is it possible and advisable to continue emitting anthopogenic N2O and/or long-lived F-gases ? We also suggest to supplement the graph on black carbon with information on sulfur aerosols. [Belgium]	
5980	16	1			Figure SPM-3 : We do not fully understand the meaning of the line "Temperature implications of emissions trajectories" (in the lower part of the figure) : what is the meaning of the distance between the scenarios (S1, S2, S3...) ? Is it related to the amount of overshoot, or to the amount of net negative emissions ? We do not understand the indications on the left of the line because they simultaneously refer to "peaking at or below 1.5°C" and "reduced overshoot" : "at or below" can be interpreted as "no" overshoot, not just "reduced" overshoot (given that "overshoot" means "temperature overshoot" as defined on page SPM-4). A possibility could be to simplify the figure by removing the bottom part and stating under the description of scenarios that LED and S1 involve little or no temperature overshoot, while S2 involves a medium overshoot and S5 involves a marked overshoot. [Belgium]	
6524	16	1	17	8	Why a new set of scenarios is used?? SSPs are widely used, documented and available. At least explain this to the reader. Several IAMC - SSP developers were on the writing team. Not helpful for consistency between sections, as are the 'idealized' emission pathways. [Netherlands]	
7194	16	1	16	1	Fig. 3: The discussion could be restricted to only CO2 and omit non-CO2 agents to stay focussed, at least in the figure. The main text can discuss the minor gains due to reduction in non-CO2 radiative forcing agents. [India]	
8164	16	1	16	1	This figure includes 1.5°C-consistent pathways only, and does not allow for comparison to a business as usual scenario. For context, the graphic should include the range of emissions projected in 2030 taking into account analysis of NDCs. [United States of America]	
8166	16	1	16	1	The acronym LED is never defined. [United States of America]	
8168	16	1	16	1	Why is one scenario labeled differently from the others? That is confusing, particularly where it seems that the LED scenario is little different that the S1 scenario. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8170	16	1	16	1	Scenario pathways S1, S2, and S5 as well as LED materialize out of nowhere in Figure SPM-3. They aren't referenced in the text and are confusing. Presumably S1, S2, and S5 correspond to pathways based on SSP1, SSP2, and SSP5, respectively. But this is never stated. So even a knowledgeable reader cannot really be sure what is going on. There are no references to the literature for any of them. And, what is the LED scenario? A policymaker cannot be expected to have the requisite background to appreciate what and why those scenarios. [United States of America]	
8172	16	1	16	1	Of the four scenarios highlighted in the SPM (LED, S1, S2, and S5) three of them involve cutting global emissions roughly in half by 2030, and the fourth requires even more rapid decarbonization than the others starting in 2030 to reach net zero before the other highlighted scenario and achieves far greater net-negative emissions in the second half of the century. Much of the variation and flexibility in different ways that 1.5°C can be achieved that are discussed in this report are predicated upon this massive increase in the pace of decarbonization starting in 2020 to reduce global emissions in half by 2030. Outside of this herculean increase in ambition in the next few years, only a very narrow path remains to achieve 1.5°C. This message does not come across strongly enough in this report. [United States of America]	
8174	16	1	16	1	The bottom temperature graph requires some kind of label for the horizontal dimension to explain to the reader what is being shown. [United States of America]	
8176	16	1	16	1	Figure SPM-3 reports BC and CH4; but equally, if not more important, is the sulfur emissions pathway. The co-benefit of reducing acid deposition precursors has the side effect of unmasking climate forcing and offsetting some of the near-term benefits of GHG mitigation efforts. In so doing it also keeps the range of temperature change in the near term tighter than it otherwise would be if only GHG emissions were changing. Sulfur emissions should also be displayed. [United States of America]	
8178	16	1	16	1	The finding in D1 that 1.5°C pathways require emissions reductions in 2030 greater than what would result from fulfilling current NDCs is not emphasized enough. Of the four scenarios highlighted in the SPM in the figure on page SPM-16, three of them (LED, S1, and S2) involve a sharp discontinuity in 2020 with global emissions cut roughly in half by 2030, while the fourth (S5) has emissions in 2030 more similar to the ambition indicated by the NDCs, but then reaches net-zero before any other scenario, and requires the most net-negative emissions in the second half of the century. The descriptions of these scenarios fail to convey this difference. The descriptions of these four scenarios should lead with the timing of the precipitous emissions drops. Scenarios S1, S2 and LED are all scenarios in which all countries increase ambition immediately in order to cut global emissions roughly in half by 2030, while scenario S5 is one in which countries delay this dramatic increase in ambition, resulting in greater challenges for reaching 1.5°C in the future. [United States of America]	
8180	16	1	16	1	In the "Breakdown of contributions..." panels, rapid economic growth is only associated with S5, the greenhouse gas intensive option. Is rapid economic growth not possible with S1, S2 or LED pathways? The framing of economic growth should be re-considered in this figure, since it is key for policymakers. [United States of America]	
9008	16	1	16	1	Suggest rephrasing the term: "archetype" Suggest this page refers to "four indicative pathways" or similar. [Australia]	
9010	16	1	16	1	Suggest clarifying the graph's caption: "Global emissions in 1.5C-consistent pathways" To "CO2 emissions would be reduced to net zero globally around mid-century in 1.5°C-consistent pathways" [Australia]	
9012	16	1	16	1	Suggest rephrasing this headline caption to: "Limiting warming to 1.5°C during the 21st century could be achieved by reducing CO2 emissions to net zero in combination with marked reductions in non-CO2 emissions. The overall level of carbon dioxide removal (CDR) would vary across pathways depending on mitigation choices, as would the relative contributions of Bioenergy with Carbon Capture and Storage (BECCS) and removals in the Agriculture Forestry and Other Land Use (AFOLU) sector." [Australia]	
9014	16	1	16	1	Suggest the caption above "Non-Co2 emissions relative to 2010" be rephrased to "Emissions of non-CO forcers would also be reduced in 1.5°C-consistent pathways but they would not reach zero levels". [Australia]	
9016	16	1	16	1	Suggest presenting "Temperature implications of emissions trajectories" as a time-series graph similar to the GTCO2/year graphs above it, but with GMST/preindustrial on the y axis. The 'bar' as presented may be difficult for policy maker to understand and relate to the pathways. [Australia]	
9326	16	1	16	1	Are Figures SPM.1 and SPM.3 consistently presenting the evolution of non-CO2 emissions? [Switzerland]	
9328	16	1	16	1	The part of Figure SPM.3 "Temperature implications of emissions trajectories" has a x-axis of qualitative nature and while it may understood that the proximity of S1 to LED indicates that these pathways are close, it is difficult to the reader to quantify the proximity/difference of the other pathways. In other words: would it be possible to introduce some degree of quantification in this part of Figure SPM.3? [Switzerland]	
9330	16	1	16	1	In the description of LED only afforestation is mentionned. Is reforestation not considered at all in LED? [Switzerland]	
9518	16	1	16	1	Fig SPM.3: Recommend that the italicized text under the heading "Non-CO2 emissions relative to 2010" be revised to "Emissions of non-CO2 forcers are also rapidly reduced in 1.5C consistent pathways...". This more aptly describes the emissions paths presented. The near-term reductions in these substances is an imporant message for policymakers. [Canada]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4606	16	8	16	8	Please add 2030 CO2 emissions estimate based on NDCs to the graph titled "Global CO2 emissions in 1.5°C-consistent pathways. By adding this information, policymakers can clearly understand the degree of challenge. [Japan]	
5670	16	3			To increase the confidence to transformational development it is necessary to promote the monitoring of research on processes that could evaluate the transformation. [Mexico]	
5672	16	4			As well as incorporate traditional ecological knowledge [Mexico]	
8182	17	1	17	8	Fine to present such scenarios, but all contain a real step change in the level of commitment of nations to reducing emissions that seem far beyond what seems economically and politically possible. The report provides no indication of how serious the issue would be were such a change not to be possible or achieved. [United States of America]	
8184	17	1	17	8	The labels for archetype pathways S1, S2, and S5 are apparently derived from Shared Socioeconomic Pathways SSP1, SSP2, and SSP5. There is no need to change the labels, but this connection could be stated in Footnote 8. If scenario labels unchanged, it should be clarified that scenario titles are drawn from the underlying literature and that labels do not imply endorsement of any particular pathway. [United States of America]	
5790	17	5	15	5	As the figure already explains the pathways, a footnote would seem to be unnecessary and not provide useful information. [Sweden]	
6180	17	9	18		More clarity is needed under subsection"Synergies and Trade-offs Between Climate Change Mitigation and the SDGs". The statement, focusing more on reducing energy demand is not clear, Suggest to replace with focusing more enhancing efficiency, effectiveness and sustainability in energy supply [United Republic of Tanzania]	
5674	17	31		32	Analysing sustainable actions and adaptation pathways can strengthen opportunities to create synergies and reduce trade-offs between responses, which have been poorly integrated in research and practice so far. See: Ürge-Vorsatz, D., Rosenzweig, C., Dawson, R. J., Rodriguez, R. S., Bai, X., Barau, A. S., ... & Dhakal, S. (2018). Locking in positive climate responses in cities. Nature Climate Change, 8(3), 174. [Mexico]	
276	18		18		Figure SPM4 is really informative and useful. However, presently it is very difficult to read due to the small size of the texts and symbols. In order to ease this, we suggest to delete the box below the figure ("Alignment of 1.5 pathways…"). Its content can be given in the text instead. [Finland]	
278	18		18		The SDG symbols are not familiar to many readers. In the fig both symbools and text in them are really small. Please, make efforts to enlarge symbols and/or see the following suggestion. Suggestion: The names of the SDGs could be e.g. under the figure (if there is enough space) or in the caption. They could for example be listed in the caption according to the number: “The sustainable development goals are: 1. No poverty, 2. Zero hunger …” [Finland]	
426	18				This paragraph from chapter 4 executive summary (4-9) should be incorporated into the SPM: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems....This implies the mobilisation of institutional investors and mainstreaming of climate finance within financial and banking system regulation. Access by developing countries to low-risk and low-interest finance through multilateral and national development banks would have to be facilitated (medium evidence, high agreement).New forms of public-private partnerships may be needed with multilateral, sovereign and sub-sovereign guarantees to de-risk climate-friendly investments, support new business models for small-scale enterprises and help households with limited access to capital. Ultimately, the aim is to promote a portfolio shift towards long-term low-emission assets, that would help redirect capital away from potential stranded assets (medium evidence, medium agreement)." [Chad]	
428	18				Fig SPM1 has some useful messages in, but it is rather confusing insofar as the pathways shown are not real 1.5°C compatible pathways (e.g. no negative emissions) [Chad]	
934	18		19	9	Overall very interesting table and graph. It's easy to understand at the first sight that climate change abatement has significantly more synergies with the SDGs than trade-offs. However, we think that it contains too many information to be easily understood in details, without spending much time on it. It doesn't reflect the effective possibility to implement the different options, and doesn't make any difference between "no information" and "no impact" Finally, naming the 16 SDGs would make the figure clearer. [France]	
1738	18				The mapping of the mitigation options in terms of synergies and trade-offs to SDGs necessarilly involve a lot of lead authors judgement that not all may agree to. Hence, it will be more transparent to provide in the Figure caption the methodology used for mapping and a link to an appendix line-citing the literature used. [Saudi Arabia]	
1840	18				Qualification of scale in bottom figure is needed. [Denmark]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3790	18		18		You write that "The overall synergies and trade-offs in the 1.5°C pathways will depend on the selected technology portfolio, the design of the mitigation policy, and the local circumstances and context." Formulated this way, the sentence is incorrect as there are more factors which influence the successful alignment of climate change mitigation and sustainable development, such as for example the governance approaches applied as outlined in chapter 5 in many places. Please revise. [Germany]	
3920	18				Figure SPM4: The readability of this figure has greatly improved from its previous iteration. The message that positive interactions outweigh negative interactions for most SDGs is much clearer presented. It is however not clear if a white box means: neutral interaction or this interaction has not been assessed. We suggest dropping the frame of the boxes in case the interaction has not been assessed. A white box with frame: the interaction has been assessed and is neutral; a white box without frame: this interaction has not be assessed. [Luxembourg]	
3922	18				Figure SPM4: In order to further increase the transparency of this figure, please add in each line the number of boxes in each category (+3, +2, +1 , 0, -1 ,-2, -3). [Luxembourg]	
4366	18				In explaining the relationship between climate change mitigation and SDGs, a simple causal relationship may lead to misunderstandings. It is necessary to review and propose the possibilities for the interactions to progress gradually and to complement each other. [Republic of Korea]	
4368	18				representation of "Figure SPM4": While this figure gives holistic information on the STRENGTH of positive (synergy) and negative (trade-off) effects between climate change and mitigation measures, it is still required to provide UNCERTAINTY by adding, for example, vertical lines(low confidence), horizontal lines(medium confidence), and diagonal lines(hing confidence) in each box. [Republic of Korea]	
4370	18				The characters in the picture is too small to read the contents. [Republic of Korea]	
5032	18		18		Not clear how land options are considered to impact negatively SDG6 [Italy]	
5234	18		18		please delete this figure, it should be really helpful but we feel some messages are not very objective. The problem is that the original table is very confusing itself, we believe it would be great to have a closer look at the underlying information in order to include something like it farther down in AR6. [Spain]	
5330	18				Negative interactions (trade-offs) of 1.5°C with SDGs - Energy supply and SDG6 are too heavily weighted in negative direction - emphasis is on replacing coal with CCS, nuclear and even renewable sources impacting negatively access to clean water and sanitation [Zambia]	
5332	18				Reference is to Fig. 2.28, but that figure has illegible legends [Zambia]	
6666	18				Negative interactions (trade-offs) of 1.5°C with SDGs - Energy supply and SDG6 are too heavily weighted in negative direction - emphasis is on replacing coal with CCS, nuclear and even renewable sources impacting negatively access to clean water and sanitation [Sudan]	
6950	18				Negative interactions (trade-offs) of 1.5°C with SDGs - Energy supply and SDG6 are too heavily weighted in negative direction - emphasis is on replacing coal with CCS, nuclear and even renewable sources impacting negatively access to clean water and sanitation [Gambia]	
6952	18				Reference is to Fig. 2.28, but that figure has illegible legends [Gambia]	
8454	18				Negative interactions (trade-offs) of 1.5°C with SDGs - Energy supply and SDG6 are too heavily weighted in negative direction - emphasis is on replacing coal with CCS, nuclear and even renewable sources impacting negatively access to clean water and sanitation [Nepal]	
8456	18				Reference is to Fig. 2.28, but that figure has illegible legends [Nepal]	
2494	18		19	9	Figure SPM4 is overly generic in its representation of linkages - synergies and trade-offs - between SDG13 (incl. mitigation options to achieve a 1.5 degree world) and all other SDGs. The figure has no clear concept of level of assessment (e.g. global, national or sub-national), nor a clear description of what are the agggregated or individual mitigation options assessed. It refers to Figure 5.3 and Table 5.3 in Ch. 5 as its basis, neither of which are clearly referenced. The Table 5.3 is an annex to Ch. 5, which consists of 19 pages of literature review as the basis to score individual mitigation options based on an SDG interaction 7-point scale. This table and analysis has previously in the 1.5SOD review been criticised for being unreadable and not helpful to policy makers. It is unclear, how the individual mitigation options are aggregated to an assessment in SPM4, of how high level SUPPLY-side options vs DEMAND-side options interact with the other 16 SDGs. The only reference for the research behind Table 5.3 also illustrated in Figure 5.3 and again, in a new way in SPM4 is McCollum 2018. This reference seems to be made publicly accessible as late as 18 June 2018, judging from the date of publishing supplementary information. The McCollum 2018 reference is about 'Energy investment needs..' and does not present a literature review similar to Table 5.3. Other assessments of climate action and SDG linkages exist e.g. based on quantitative scenario analysis such as Gokul Lyer et. al (2017): Implications of sustainable development considerations for comparability across nationally determined contributions, Nature Climate Change, Vol 8, February 2018. Too much emphasis and significance is attached to a single, possibly inadequate reference behind SPM4. The figure - as it stands- does not clearly illustrate or explain, what are the complex linkages between mitigation options for a 1.5 degree world and sustainable development synergies and trade-offs. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4608	18		18		We recognize the importance of understanding synergies and trade-offs between climate change mitigation and the SDGs, and acknowledge authors' effort to collect variety of literatures to make Figure SPM4 based on Figure 5.3 and Table 5.3. However, as Figure SPM.4 seems to have several points to be improved, we think this Figure is better to be addressed in subsequent IPCC outputs such as SRCCL and AR6 with progressed assessment. We would propose the following improvements to prescribe the necessary information to avoid misunderstanding. 1) To address a whole-system transition, with related contents such as Ch. 2.4. in case of this special report, when you discuss synergies and trade-offs between climate change mitigation and the SDGs. In current draft, although the literatures used in Table 5.3 cover wide range of research topics, most of the literatures seems not to deal with 1.5°C or 2°C pathways directly. They mainly analyze interactions among "each" of the climate change mitigation options and "each" of the SDGs targets, and not as a "whole" system. 2) To describe more about how synergies and trade-offs between each option and SDGs were analyzed. It is not clear with current draft even by looking into Figure 2.28 and Annex 2.A.5. 3) To analyze, with clear criteria for scoring (assessment), the possible negative impacts on poverty eradication by the energy supply options, namely, the increasing energy cost by substituting coal with non-biomass renewable, biomass, BECCS and CCS. 4) To add explanation about what kind of policies or technologies are assumed and what is the criteria of scoring (assessment) of those. Strength of interaction between mitigation and the SDGs is fundamentally determined by complex factors such as specific technology used in the option, measures and the scale of the implementation. Climate adaptation options also affect the interaction. For example, climate change mitigation itself may cause adverse effects on SDG1, 2 and 8 effecting on people in poverty. 5) If followings points are applicable to an assessment of the figure, it is better to be clearly explained so with the reason for more clarity of interpretation. - Lack of literatures is interpreted as no direct interactions. - The literatures collected in Table 5.3 covers limited regions or countries, and not global analysis. 6) To add analysis of gas for energy-supply options (currently, only replacing coal or advanced coal is analyzed). If it is difficult to identify the difference between coal and gas, we would suggest to modified "coal" to "fossil fuel". Other mitigation options, such as replacing gas to non-biomass renewables or nuclear, would be better to be noted, too to show wide range of mitigation options. 7) To add the explanation, like SPM figure 2, that "this figure here is reflect the expert judgement of the report authors", and "a footnote" to provide relevant information regarding this expert judgement. 8) To add all abbreviations and ideas mentioned in this Figure be defined in the Glossary in order for the SPM to be more user-friendly. The mitigation measures listed in current Figure SPM 4 contains some abbreviations and ideas which might not be easy to understand for those who are not familiar with this area (e.g. Responsible sourcing, REDD+, Blue carbon, "advanced" Nuclear, etc.) and while some can be found in the Glossary, some cannot. [Japan]	
4910	18		18		Although obviously built on the underlying chapter, this summary diagram appears to be somewhat arbitary in places and it is not always clear how the strength of trade-off/synergy is derived. For example, the evidence for the nuclear and health interaction (nuclear is one of the safest generating technologies available and there is abundant evidence that confirms this). Or healthy diets and the negative trade off with peace/justice. One potential improvement could be to include an insufficient evidence category and not just a 0, to indicate where there is limited evidence in particular areas. [United Kingdom (of Great Britain and Northern Ireland)]	
4912	18		18		The squares going down the centre of the figure (representing the SDGs) are too small and thus illegible, making it difficult to see what SDG is being referred to. It would be better to replace the symbols/illustration with a simple number, which could then link to a legend explaining which SDG each number corresponds to. [United Kingdom (of Great Britain and Northern Ireland)]	
4914	18		18		It would be helpful to include a clearer message/implication to accompany this figure. As it stands, its not particularly informative to state that different strategies exist and different pathways come with different trade-offs. That is fairly obvious. What is needed is what this actually implies - for example it could be replaced by the important message that comes from D4.2 [United Kingdom (of Great Britain and Northern Ireland)]	
5006	18		18		An important take-away from this figure is that generally (if not universally) behaviour change and demand side response makes SDGs easier to achieve. However this point is not strongly brought out in the SPM. For example, it could be used to stengthen the currently somewhat vague comments on page 20, from line 40. [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6682	18		19	9	Figure SPM4 is now much better than in the first draft and we appreciate your efforts to assess and present very complex data. But many synergies and trade-offs can easily raise questions for the readers. We recognize that Table 5.3 gives the background information for all synergies and trade offs, and this information is very valuable. It would therefore be useful to include a reference in the ingress to the figure to Table 5.3 where the underlying scientific basis is found. It is not clear if the "0" in the color-legend means "no data" or "N/A" or if it means "no synergies/trade-off", and this should be speficied in the figure. The wording used in Table 5.3 is "no direct interaction" which we also question; does this mean that there are no trade-offs for i.e. blue carbon on any of the SDGs or is it a lack of scientific litterature on this topic? There should be added a symbol to indicate "no data" if you find it appropriate. It might as well be that there are less evidence for some categories than others e.g. ocean fertilization and blue carbon and this may be explained in the figure caption. The symbols of the different SDGs are currently to small to read, please consider to find a way to increase readability, for instance substitue "SDG1", "SDG2" etc. on the leftmost (or rightmost) side of the Figure with the actual name of the corresponding SDG. We would also like you to consider to somehow "sum up" the total synergies (to the right of each SDG) and the total tradeoff (to the left of each SDG) for each SDG. [Norway]	
8700	18		18		In grey box at bottom of page: change to "Fewer SYNERGIES" and "Fewer TRADE-OFFS" (not "less") [New Zealand]	
9520	18		18		This Figure is discussed extensively in section D. As such, it should be moved to after that section which is consistent with the approach used for other diagrams in the SPM. [Canada]	
2496	18	1	18	1	It is not clear how Scenarios S5,S2,S1 and LED are linked into the variety of options outlined in the red and blue columns above? Is S5 mostly describing the red columns, and LED the blue ones? How can the cross-linkage be understood? [European Union (EU)]	
2498	18	1	19	8	Figure SPM4 comes across as a confirmation of a predominant strong alignment/potential for synergies between mitigation and the SDGs. However, it does not specify: (a) the basis for the assessment made in the table (i.e. is it based on expert judgement or on scientific literature), and (b) how to read interactions that are positive and negative at the same time - some of them even strongly negative and positive at the same time. Could this be clarified based on the underlying chapters? [European Union (EU)]	
3782	18	1			Figure SPM.4: The SDG icons are not readable (font size) and not explained in the description. If this figure is kept, we suggest to replace the icons with text (SDG1 - no poverty), and place the icons on the right side and add a reference to SPM text that explains the SDGs further (e.g. p.20 lines 40-45), or improve legibility otherwise. Also, please make clear that SPM.4 belongs to section D. It has to be clarified whether the bold headline at the top incl. the text is a statement (then it needs a label such as D_) or a subheading, or something else. Top-level titles "negative interactions" and "positive interactions" in the title of the respective figure should correspond to the naming in the caption of the figure, which should be modified to "Potential positive interactions (synergies)" and "Potential negative interactions (trade-offs)", see our comment on the caption on page 19-1 for an explanation of this modification. Similarly, the word "potential" should be added to the title of the lower panel to read "Alignment of 1.5°C pathways with potential SDG synergies and trade-offs". [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3784	18	1			While we sympathise with the attempt to provide an overview of synergies and trade-offs of various mitigation options with SDGs in Figure SPM 4, we have several issues with the current presentation: 1) The figure is very complex and carries a lot information, and it is difficult to read which SDGs are which, as icons are not explained (see also editorial comment). The figure may be too complex for the SPM. 2) It is difficult to follow the logic behind some of the values given. For example, it seems unintuitive that healthy diets and reduced food waste have a negative impact on poverty, clean water and sanitation, peace justice and strong institutions, and partnerships for the goals. 3) The figure is conceptually flawed as it does not differentiate between "no effect" and "no information about an effect"; this is essential for a meaningful analysis. We do not believe that literature was available for all categories for all SDGs to assess synergies and trade-offs, so if this figure is kept, that difference has to be made explicit. We also suggest to add a short description of how values were derived in the caption. 4) The description suggests that only mitigation measures are evaluated, while there are obviously elements of CDR that venture into geoengineering (BECCS, enhanced weathering, ocean iron fertilisation). Replacing "mitigation" with "responses to climate change" and clarifying somewhere that there are both elements of mitigation and CDR-geoengineering would be helpful. 5) We propose, to reduce both the number of mitigation options, and possibly also the depicted SDGs. Specifically, we are opposed to including ocean iron fertilization as the London protocol bans OIF for other than research purposes. It is also not helpful to show well established, mature technologies side by side with enhanced weathering and ocean fertilization that are hardly beyond the conceptual/lab stage. Considering the second part of the figure is based on the IAM literature, you may wish to only include options that are substantial part of the IAM-portfolios, implicitly or explicitly. 6) The general statement from the bottom-level graph "Alignment of 1.5°C pathways with SDG synergies and trade-offs" is based on a separate analysis combining pathways literature with the results of 5.4 (Figure 2.28), this should be made more clear at least in the caption. We would strongly support to lift the main message from this second part of the graph to a text, e.g. as a stand-alone Dx. Finally, we'd urge the authors to reconsider whether a different graphical representation which better includes the very significant SDG benefits of avoided climate change impacts, losses, and adaptation costs at 1.5°C (compared to 2 C and higher) would be possible to make optimal use of the scarce space and avoid a skewed message. (see our comment "Alternative Figure" to p18 ln 1). [Germany]	
3786	18	1			Figure SMP4, list of mitigation options: introduce acronyms "CCS/CCU". [Germany]	
3788	18	1			Alternative Figure Proposal: We would prefer a more holistic representation of SD implications of pursuing 1.5C. We call upon the authors to develop a graphic that integrates the SD benefits of avoiding higher levels of climate change (incl. lower costs of damages and adaptation), as well as the risk entailed by delaying action, i.e. reliance on (high-risk, large scale) CDR technologies with the SD risks from mitigation. To that end, we repeat our suggestion to include a variant of Figure 5.1 or FAQ 5.2, Figure 1 which displays the general interdependence between a strong response to the climate challenge and other SDGs, addresses the path-dependency and importance of near-term action for achieving highest resilience and best solutions and also substantiates the meaning of CRDP. In addition, we would suggest to combine the current grey box in Figure SPM.4 with a stylized comparison between low-OS 1.5C pathways (LED/S1), a late-peaking high-OS 1.5C version (S5), and a pathway that continues on current NDC with comparable mitigation efforts afterwards or a 2C pathway in order to show how SD benefits depend on the societal choices. Such a graph would visualize very clearly the reduced risk and development-benefits from early mitigation action and by pursuing pathways with minimal overshoot: the reduced risk from going from NDC-trajectory to a LED/S1 trajectory would be supported by the analysis in section B (climate change impacts on SGD-goals, especially risks of overshoot; also with a view to reduced adaptation challenges; also section 5.2); the reduced risk from post 2050 reduced reliance on CDRs and higher synergies with low-OS pathways would in addition be supported by the findings of section C and D (mitigation and SDG literature as currently in SPM.4/Chapter 5.2, 5.4 plus Chapter 2.3.4, 2.3.5 and Figure 2.10; box 4.11). The graph could visualize the multiple lines of evidence and sources of reduced risk; and at the same time making the concept of CRDP more clear, the CRDP literature would form a fourth line of evidence underpinning in particular the institutional, governance and equity dimensions. [Germany]	
4084	18	1	18	1	Fig SPM4 represents only the effects of mitigation measures on SDGs. However, there are clear benefits for limiting warming to 1.5°C compared to 3°C implied by current NDCs or also against 2°C that link directly to SDGs. These are summarized e.g. in Table 3.5. In order to provide a comprehensive perspective on 1.5°C and SDGS, Fig. SPM4 should also include avoided impacts on SDGs at 1.5°C. Alternatively, an additional Fig. SPM5 covering this should be added. [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4086	18	1	18	1	Figure SPM 4 - good to have such a figure in principle, but message about how some tradeoffs can be managed is missing. Also the mitigation categories need to be improved: electrification in buildings, transport, industry is missing (with important cobenefits), zero carbon instead of low carbon fuels should be included for industry and transport, modal shift is missing in transport, decarbonisation in industry should be separated from CCS/CCU, decarbonisation of electricity beyond replacing coal is missing: replacing gas with renewable energy. Some entries need to be carefully checked. In particular, why do behavioural response, energy efficiency improvement in transport, improved access and low carbon fuel switch have strong trade-offs with SDG 8 or 9? Same with replacing coal with renewables (not biomass) and SDG 6. [cont'd below] [Saint Kitts and Nevis]	
4088	18	1	18	1	[cont'd] Looking at the table for chapter 5, some justifications for trade-offs are difficult to follow - e.g. for behavioural response in the transport sector, this is deemed to have a positive and negative impact on SDG9 (resilient infrastructure) because new infrastructure will be required, but it is not clear why this is equally negative and positive. For SDG8 (economic growth) behavioural response in transport is assessed as being only negative, even though the need for new infrastructure (and associated jobs) and the availability of more public transport could lead to inclusive growth, job creation and poverty alleviation. [Saint Kitts and Nevis]	
5468	18	1	18	1	Figure SPM 4 - good to have such a figure in principle, but message about how some tradeoffs can be managed is missing. Also the mitigation categories need to be improved: electrification in buildings, transport, industry is missing (with important cobenefits), zero carbon instead of low carbon fuels should be included for industry and transport, modal shift is missing in transport, decarbonisation in industry should be separated from CCS/CCU, decarbonisation of electricity beyond replacing coal is missing: replacing gas with renewable energy. Some entries need to be carefully checked. In particular, why do behavioural response, energy efficiency improvement in transport, improved access and low carbon fuel switch have strong trade-offs with SDG 8 or 9? Same with replacing coal with renewables (not biomass) and SDG 6. [cont'd below] [Saint Lucia]	
5470	18	1	18	1	[cont'd] Looking at the table for chapter 5, some justifications for trade-offs are difficult to follow - e.g. for behavioural response in the transport sector, this is deemed to have a positive and negative impact on SDG9 (resilient infrastructure) because new infrastructure will be required, but it is not clear why this is equally negative and positive. For SDG8 (economic growth) behavioural response in transport is assessed as being only negative, even though the need for new infrastructure (and associated jobs) and the availability of more public transport could lead to inclusive growth, job creation and poverty alleviation. [Saint Lucia]	
5472	18	1	18	1	Fig SPM4 represents only the effects of mitigation measures on SDGs. However, there are clear benefits for limiting warming to 1.5°C compared to 3°C implied by current NDCs or also against 2°C that link directly to SDGs. These are summarized e.g. in Table 3.5. In order to provide a comprehensive perspective on 1.5°C and SDGS, Fig. SPM4 should also include avoided impacts on SDGs at 1.5°C. Alternatively, an additional Fig. SPM5 covering this should be added. [Saint Lucia]	
5792	18	1			Figure SPM-4: (1) Have all of the elements of the matrix been assessed? If there are missing data, it should be indicated (i.e., "not assessed" instead of "0"). (2) The text under the scale at the very bottom of the figure "More trade-offs…. More synergies" should be amended with arrows, for example pointing to the left and to the right from under "S2", if the text is not to be understood to specifically apply to "S5" and "LED", respectively. [Sweden]	
5982	18	1			Figure SPM-4 : The bottom part showing the scenarios could be interesting but it would require some explanation regarding how the distance between scenarios is evaluated and it would benefit from some form of confidence statement (or a statement about the amount of evidence and agreement). [Belgium]	
5984	18	1			Figure SPM-4 : We have difficulties with that figure : the topic is so broad that it is too complex ; making it simpler would probably increase interpretation difficulties related to the aggregation of different issues ; and it only considers links between SDGs and mitigation, disregarding adaptation. We thus suggest to remove the upper part. [Belgium]	
6162	18	1	18	53	Figure SPM4 - white cells indicate no synergy or trade-off. It is difficult believe that all these options are thoroughly studied. Can there be that some of these are unknown? There should be a different colour for these. Also please modify the insertion box in the bottom of the page by removing 'Demand-side' and 'supply-side' from the headings - there are likely to be supply-side options with low land footprints and synergies that were not considered in the pathways - using 4 selected pathways to make generalisations (and that is the impression that the box gives as it is) goes too far. Alternatively remove the entire box. [Estonia]	
6526	18	1	19	8	The legend of figure SPM 4 says 'strength of trade-off [synergy]'. If the Nilsson et al. scale is used (unclear), this is rather representing a categorisation, although it can be interpreted as strength. [Netherlands]	
6528	18	1	19	8	Was the scoring done at SDG goal or target level? [Netherlands]	
6530	18	1	19	8	Figure requires a legenda on the 17 SDGs as the present buttons are unreadable [Netherlands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6818	18	1	18	1	Figure SPM 4 - good to have such a figure in principle, but message about how some tradeoffs can be managed is missing. Also the mitigation categories need to be improved: electrification in buildings, transport, industry is missing (with important cobenefits), zero carbon instead of low carbon fuels should be included for industry and transport, modal shift is missing in transport, decarbonisation in industry should be separated from CCS/CCU, decarbonisation of electricity beyond replacing coal is missing: replacing gas with renewable energy. Some entries need to be carefully checked. In particular, why do behavioural response, energy efficiency improvement in transport, improved access and low carbon fuel switch have strong trade-offs with SDG 8 or 9? Same with replacing coal with renewables (not biomass) and SDG 6. [cont'd below] [Marshall Islands]	
6820	18	1	18	1	[cont'd] Looking at the table for chapter 5, some justifications for trade-offs are difficult to follow - e.g. for behavioural response in the transport sector, this is deemed to have a positive and negative impact on SDG9 (resilient infrastructure) because new infrastructure will be required, but it is not clear why this is equally negative and positive. For SDG8 (economic growth) behavioural response in transport is assessed as being only negative, even though the need for new infrastructure (and associated jobs) and the availability of more public transport could lead to inclusive growth, job creation and poverty alleviation. [Marshall Islands]	
6822	18	1	18	1	Fig SPM4 represents only the effects of mitigation measures on SDGs. However, there are clear benefits for limiting warming to 1.5°C compared to 3°C implied by current NDCs or also against 2°C that link directly to SDGs. These are summarized e.g. in Table 3.5. In order to provide a comprehensive perspective on 1.5°C and SDGS, Fig. SPM4 should also include avoided impacts on SDGs at 1.5°C. Alternatively, an additional Fig. SPM5 covering this should be added. [Marshall Islands]	
7304	18	1	18	1	Fig. SPM4. This figure is too complicated for SPM. Messaging is too hard with this figure. Why to show synergies and trade-off separately? Can synergies and tradeoffs be added together and only the net be shown in this Figure? Then one could clearly see which options have overall synergy with SDG goals. [India]	
8186	18	1	18	1	This figure should be removed from the SPM. This figure is too complicated to understand easily, and once studied carefully, presents little to no helpful information to the reader. How is the reader to interpret a difference between something that has been given a value of +3 versus +2, etc.? Many interactions are presented with both trade-offs and synergies, leaving the reader unable to interpret the underlying message. And all sectors are presented as equal, when clearly some clusters may have more weight than others. [United States of America]	
8188	18	1			This figure is extremely complicated, and the main messages are unclear. For example, some things appear to have both trade-offs and synergies (SDG 1, Energy Supply Options, Replacing Coal with BECCS), and then it's noted that the trade-offs and synergies depend on local context. There are 46+ columns and 17 rows, and many cells need to be interpreted with consideration of other cells. It's unclear what a reader is supposed to do with all of this info. This figure should be either be radically simplified so main points can be captured, or deleted. [United States of America]	
8190	18	1	18	1	The graphic on page SPM-18 is so complex and dense with information that it is confusing and likely falls short of the objective to communicate information quickly and accessibly to readers who do not regularly engage with this material. Consider, for example, using fewer words and simpler summaries of SDGs, perhaps using in buckets of goals or conveying that positive synergies outweigh any negative consequences of limiting global warming to a 1.5°C pathway. [United States of America]	
8192	18	1	18	1	To what extent is the scale of deployment reflected in Figure SPM-4? Some options will have synergies at low deployment levels, but trade-offs at high deployment levels. Is this assessed here? If so, what scale is assumed to get this combination of synergies and trade-offs? [United States of America]	
8194	18	1	19	9	Section 5.4.1.2 (and perhaps Section 4.3.1.3) should note that nuclear energy has a smaller land footprint per Megawatt of generation capacity, which can be beneficial for land and species conservation (SDG15). This should be reflected in Figure SPM-4, if that figure is retained, and the associated figures within Chapters 2 and 5, and considered for inclusion in SPM discussion of nuclear power. [United States of America]	
8196	18	1	22	1	Pretty large focus on synergies with SDGs. What's the justification? These are important, but not the focus on the report. Authors should consolidate main findings and retain focus on 1.5°C pathways and mitigation/adaptation. [United States of America]	
9018	18	1	18	5	Suggest simplifying figure SPM4 as it is information-dense. [Australia]	
9020	18	1	18	1	Suggest rephrasing the term "Negative interactions" to: "Adverse interactions" Suggest rephrasing the term "Positive interactions" to: "Beneficial interactions" [Australia]	
9022	18	1	18	5	Suggest increasing the size of the Sustainable Development Goal (SDG) logos. [Australia]	
9096	18	1	18	1	Fig SPM4 represents only the effects of mitigation measures on SDGs. However, there are clear benefits for limiting warming to 1.5°C compared to 3°C implied by current NDCs or also against 2°C that link directly to SDGs. These are summarized e.g. in Table 3.5. In order to provide a comprehensive perspective on 1.5°C and SDGS, Fig. SPM4 should also include avoided impacts on SDGs at 1.5°C. Alternatively, an additional Fig. SPM5 covering this should be added. [Solomon Islands]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9226	18	1	18	1	Figure SPM 4 - good to have such a figure in principle, but message about how some tradeoffs can be managed is missing. Also the mitigation categories need to be improved: electrification in buildings, transport, industry is missing (with important cobenefits), zero carbon instead of low carbon fuels should be included for industry and transport, modal shift is missing in transport, decarbonisation in industry should be separated from CCS/CCU, decarbonisation of electricity beyond replacing coal is missing: replacing gas with renewable energy. Some entries need to be carefully checked. In particular, why do behavioural response, energy efficiency improvement in transport, improved access and low carbon fuel switch have strong trade-offs with SDG 8 or 9? Same with replacing coal with renewables (not biomass) and SDG 6. [cont'd below] [Nauru]	
9228	18	1	18	1	[cont'd] Looking at the table for chapter 5, some justifications for trade-offs are difficult to follow - e.g. for behavioural response in the transport sector, this is deemed to have a positive and negative impact on SDG9 (resilient infrastructure) because new infrastructure will be required, but it is not clear why this is equally negative and positive. For SDG8 (economic growth) behavioural response in transport is assessed as being only negative, even though the need for new infrastructure (and associated jobs) and the availability of more public transport could lead to inclusive growth, job creation and poverty alleviation. [Nauru]	
9230	18	1	18	1	Fig SPM4 represents only the effects of mitigation measures on SDGs. However, there are clear benefits for limiting warming to 1.5°C compared to 3°C implied by current NDCs or also against 2°C that link directly to SDGs. These are summarized e.g. in Table 3.5. In order to provide a comprehensive perspective on 1.5°C and SDGS, Fig. SPM4 should also include avoided impacts on SDGs at 1.5°C. Alternatively, an additional Fig. SPM5 covering this should be added. [Nauru]	
9332	18	1	18	1	Figure SPM.4: the idea to have this figure is good, but ther is too much information in it. It would be well suited for a Technical Summary. Consider three options: but in each calculate the mean level of strength and color accordingly. This would result in a 7x16 matrix instead of a 47x16 matrix as now. Also, delete lower grey box. [Switzerland]	
9334	18	1	18	1	The part of Figure SPM.4 "Alignement of 1.5 °C with SDG synergies and trade-offs" has a x-axis of qualitative nature and while it may understood that the proximity of S1 to LED indicates that these pathways are close, it is difficult to the reader to quantify the proximity/difference of the other pathways. In other words: would it be possible to introduce some degree of quantification in this part of Figure SPM.4 and make compatible with the same part of Figure SPM.3? [Switzerland]	
9522	18	1	18	1	Figure SPM 4 is very complex for an SPM figure, and it cannot really be understood or interpreted in isolation from Table 5.3. One aspect that is unclear is the extent to which the trade-offs and synergies change under the different pathways described in the box at the bottom of the Figure. The Figure caption (second sentence) just states that interactions are indicated for each assessed combination of a mitigation measure and a SDG, but the different pathways will include various mitigation measures to different extents. For example, to what extent are the various options given for 'replacing coal' pathway dependent? [Canada]	
6532	18	4	18	5	I understand the choice, but SDG 13 is actually about resilience, education, institutional capacity etc., so saying it is implicitly represented in mitigation measures is a bit of a stretch. The mitigation measures may even influence the SDG 13 targets. [Netherlands]	
7196	18	13	18	14	Refer to the underlying report: Chapter 2 (6,32,6,33); Chapter 4 (9,25), (10,41), (17,46,17,50), (30,table 4.4), (31,44,31,45), (121,2,121,3); Chapter 5 (37,3,37,4), (38,17,38,19) and SPM- Throughout the report, there is an overwhelming reliance on use of carbon catpure and storage/ BECCS/ other carbon capture / storage technologies for a climate secure future. The 1.5 degree C scenario, especially relies too heavily on carbon dioxide removal technologies. However, it must be noted that as on date, large scale CDR technologies are not proven or available. CCS has many associated technical, safety, logistic and legal concerns/ issues eg. high capital costs, high auxiliary power consumption, low net efficiency, very limited experience of commercial scale application especially in Power Sector, non-availability of maps for potetntial sites for CO2 storage, and uncertainity in preventing leakage of the stored CO2 - to name a few. These constraints are also reflected at a few instances in the report. As such, it may not be prudent to continue to rely on adoption of a technology whose political, socio-cultural and technical acceptance is highly questionable. The report, however, at times acknowledges the constraints associated with CCS. [India]	
7198	18	26	18	27	Do [India]	
5676	18	32		33	Include this citation: Ürge-Vorsatz, D., Rosenzweig, C., Dawson, R. J., Rodriguez, R. S., Bai, X., Barau, A. S., ... & Dhakal, S. (2018). Locking in positive climate responses in cities. Nature Climate Change, 8(3), 174. [Mexico]	
4388	19		22		In comparison to A, B, C, relatively less pages were allocated to D (Strengthening the global response in the context of sustainable development and efforts to eradicate poverty). The section D needs to be strengthen with more contents. The section D is important in that it provides policy makers and the public with the insight for their future actions. In the main Report, almost 40% of the total pages were allocated to the contents in relation with D. [Republic of Korea]	
3792	19	1	19	1	The naming of the left and right part of the graph should be modified to "Potential positive interactions (synergies)" and "Potential negative interactions (trade-offs)" to keep the notion of interactions between two objectives instead of just one-way effects, and to keep the symmetry of the names. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8752	19	1	22	1	This chapter being on the global response in the context of sustainable development and eradication of poverty, the linkages on the means of implementation to implement what is being described in the text is rather missing or very weak. Especially information about the financial implications, or the financial requirements for the implementation to persue a below 1.5 degree is very vaguely represented in the report. [Maldives]	
9336	19	1	22	1	Section D: Is the length of this section in the SPM commensurate with the depth of assessment and the quantification? It is a lot of unquantified material with many weak statements and truisms. This section would benefit from substantial condensation (by at least a factor of 2!) and strengthening of language. [Switzerland]	
936	19	1	22	1	Section D : This section and the associated paragraphs are of prime importance. They are very policy-relevant and reflect correctly the state of knowledge. They should be kept in future versions. However, the new version of the SPM is more unbalanced than the previous draft. There is now a very large focus on resilience and developement, while considerations related to mitigation are very scarce. This should be corrected. [France]	
2500	19	1	22	1	Key messages of chapters 4 and 5 are now reduced to 3 pages in the final draft of the SPM compared to 12 pages in the earlier version [European Union (EU)]	
2502	19	1	22	1	Section D of the SPM generally comes across as less precise and fluent in terms of overall storyline compared to the other sections of the SPM. Overall, given the overly generic statements made, it is strange that this section is given so much space in the SPM. It is missing hard statements of the kind that suggest that missing the 1.5°C target will have strongly detrimental effects on reaching the SDGs. This is very likely and needs to be made very clear. [European Union (EU)]	
3794	19	1	22	1	Please consider to reorder the sections in D in a way that provides a clear framing along the CRDP. D1 should be directly followed by D5, with the following sections D2, 3, 4 and 6 providing additional detail on interaction, enabling factors and conditions for the areas of mitigation, adaptation and policy implementation. It would also be helpful to reduce the current overlap with Section B and C concerning Adaptation (B6 and D2, D3 D4), and between D2.4, D2.5 and D6.4 concerning government issues and policies, and make sure the whole section is as concise as possible. As much of the information on sustainable development impacts in Section C and Fig. 3 and Fig.4 is organized around the archetype pathways, it would be helpful for the reader to reference these archetypes more clearly in the text. [Germany]	
3796	19	1			We consider the finding of this report (cf. S Ch3 p 10 para Land Use, Food Security and Food Production Systems; cf. Ch 4 ES p 4-6, para 1-4) that pressure on land (mediated through resource intensity of consumption patterns, especially food choices, energy demand and bioenergy/BECCS/CDR development) is one of the key factors that determine the sustainable development implications of 1.5C pathways (cf., e.g. "Land use and land-use change emerge as a critical feature of virtually all mitigation pathways that seek to limit global warming to 1.5°C (robust evidence, high agreement)." Ch 3 ES) as very central. At the same time substantial benefits for food production and land based ecosystems can be expected from limiting warming to 1.5C (cf. SPM B2, B5.3 and B5.6, Fig SPM.2). The report also clearly shows that agriculture, forestry and other land use mitigation measures, if done well, harbour large synergies for both adaptation and other sustainable development goals (including biodiversity, food security, poverty eradication..), while also carrying substantial risk if not managed and implemented in a sustainable and inclusive way. We would encourage the authors to highlight the crucial role of the AFOLU sector for successful mitigation, adaptation and the SDGs beyond its current form in a headline statement. For example, an additional sub-bullet could be added as D2.7 with a statement along the lines above (AFOLU measures, if done well, provides large synergies, ..., but also carry risks if not. Limiting warming to 1.5C will strongly reduce risks to ecosystems and their services) and add "Pressure on land and its management and use emerge as key factors that enable 1.5C pathways and determine their sustainable development implications" to headline D2; [Germany]	
3798	19	1			Please specify the "global response" and add "to the threats of climate change" [Germany]	
3800	19	1			Section D should be framed more positively. While there are challenges, barriers and trade-offs facing mitigation, adaptation and sustainable development, taken together Chapters 2, 3, 4 and 5 of the report show an underlying theme that it is not only possible to limit warming to 1.5°C, but doing so is good for many societal goals and that immediate action can provide synergies between climate action and sustainable development. While we support starting Section D with the paragraph on NDCs, it would be helpful to directly follow in Section D2 with a bold statement reflecting those multiple benefits , for example from the ES of Ch 1, pg. 5: “Ambitious mitigation actions are indispensable to limit warming to 1.5°C while achieving sustainable development and poverty eradication (high confidence).”, followed by what is currently D5 “Pursuing climate-resilient-development-pathways can limit warming to 1.5C while adapting to its consequences and simultaneously achieving sustainable development", and then continue with the rest of current D5, followed by current D2, D3, D4 and D6 (cf. our comment on p19 ln 10-p22 ln 10). [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4044	19	1	22	1	Comment about structure and section titles: It is somewhat unclear where to look for text about "implementing mitigation options". As it is now, it is mentioned in both part C and part D. Could it be descibed in the same section? With the title used for section D, it will be tempting to go to this section to find information about how to strenghten the global response to climate change, while a lot of information about mitigation is placed in C, which have a title that do not give the impression of mitigation. Please consider the section titles for C and D and the structure of these two sections. [Norway]	
5986	19	1	19	1	Section D : we would like to have more information on timing of the phasing out of fossil fuels, in relation with the scenarios shown on figure SPM-3 (sub-panels). This is very important for decision making. [Belgium]	
6166	19	1	22	1	Section D is disproportionally long compared to other sections and could be condensed by removing repetitions. Figure SPM 4 supports this section (adding another page to this section) and there is no need to repeat the information presented in this figure in a text form. Summarising it briefly would be enough. [Estonia]	
6168	19	1	22	1	How does the information presented in Section D for 1.5C warming pathways compare to 2C warning pathways? Please add a brief comparison [Estonia]	
7242	19	1	22	1	The entire section D has to be reworded to take account of the following - 1) Complete absence of differentiation. The constant invocation of word poverty alongside the word sustainable development suggests the absence of responsibilities of developed countries. 2) In most instances of the linkage between SDGs and 1.5 deg. C model pathways, no comparison with 2 deg.C model pathways is provided. 3) The use of the word trade-off should be avoided and be replaced with negative consequences with all occurrences. The word is used to mean negative consequences in all instances of use. As such use of the word trade-off gives a misleading impression. [India]	
8198	19	1	19	1	Here and in many later statements, it seems as though the SD and SDGs do not include eradication of poverty. Yet, SDG #1 is "no poverty" so that poverty is indeed included and should not be singled out more than any other SDG. If authors are compelled to review the SDGs from the point of view of 1.5°C and note the more important ones, then do this as a separate task and avoid confusing the reader. [United States of America]	
8200	19	1	19	1	"response TO 1.5C pathways." [United States of America]	
8202	19	1	21	1	The authors should carefully consider whether they are referring to the Sustainable Development Goals, the underlying efforts contained within these goals, or sustainable development generally. Throughout this section, the SDGs seem to be taken as synomomous with sustainable development. They are not the same. One is a set of goals agreed upon by the international community; the other should be largely self defined by local communities. After all, the aim should be to acheive the efforts that are contained within the SDGs, not simply to accept that the global community succeeded in checking the boxes it set for itself. [United States of America]	
9338	19	1	22	1	In this section a more tangible statement on what strong emission cuts imply for low-income countries is missing. The text is fairly vague which is partly due to the SPM character but maybe some more specifics can be given? This section deals with key concerns for many parts of the world. [Switzerland]	
9524	19	1	22	1	Overall, Section D is too long for a summary for policy makers. Suggest shortening the section. [Canada]	
392	19	13	19	15	Again, paragraph C3.2 should be strengthened, especially with regards to developing countries and the SDGs: "The largest growth driver for renewable energy since AR5 has been the dramatic reduction in the cost of solar PV" (directly from Sec. 4.3.1.1,) or "Small-scale distributed energy projects are being implemented in developed and developing cities where residential and commercial rooftops offer potential for consumers becoming producers (called prosumers)" [Chad]	
398	19	13	19	29	D1.2) In addition to the above comment, this statement needs a reference to adaptation limits and losses. E.g. it could read "exceeding 1.5°C would result in higher impacts and adaptation challenges and limits, with concurrent losses and higher transitional challenges to reduce GHG emissions after 2030" [Chad]	
938	19	13	19	15	This paragraph could recall that fulfilling the current NDCs lead to warming of about 3°C (which is then obvisouly more than 1.5 but also 2°C), according to the Cross-Chapter Box 11 in Chapter 4. We suggest to add this as follow : "...will still result in global warming of more than 1.5°C, estimated between 2.7 and 3.4°C in 2100, with associated risks and adaptation challenges." OR "...will result in a global warming estimated between 2.7 and 3.4°C in 2100, with associated risks and adaptation." [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1740	19	13	19	29	It is not clear that D1 is an SPM. The fact that the current NDCs are not enough to put the world on the road to even 2 °C has already been assessed and communicated before launching this report. That additional reductions above the NDCs will be needed to futher lower transitional challanges and the need for overshoot is also obvious before hand. Then the only remaining part to inform by this SPM statement is with respect to SDGs, yet stating that additional reduction can contribute to achievement of SDGs seems too weak to qualify for making it a statement for policy makers. I suggest either revise or delete. [Saudi Arabia]	
2504	19	13	19	29	Please quantify the difference between the collective NDC pledges and pathways compatible with 1.5 °C warming. This information should be provided in the text as well as in Figure SPM.3 (e.g. based on Figure ES.2 of the UNEP Emissions Gap Report 2017). [European Union (EU)]	
2506	19	13	19	15	The first statement is unjustifiably circumspect given the evidence presented in Ch2. Recommendation: replace with Ch2's much clearer headline finding Under emissions in line with current NDCs, global warming is expected to surpass 1.5°C, even if they are supplemented with very challenging increases in the scale and ambition of mitigation after 2030 (high confidence). [European Union (EU)]	
2508	19	13	19	17	The second sentence is not acceptable under its current form. It states that emission reductions and actions in addition to current NDCs lead to lower overshoot, when Ch2 demonstrates that following NDC emission levels to 2030 takes us beyond what the report considers a 1.5°C 'overshoot' pathway - unless the entire min-max range is considered. So this part of the sentence seems simply wrong. It then states that additional action and lower emissions can contribute to the achievement of the SDGs, but the following sub-statements (D1.1 and D1.2) do not mention anything related to the SDGs. [European Union (EU)]	
3802	19	13	19	18	This paragraph is very unclear. The first sentence could mean that fulfilling the current NDCs already exhausts the remaining carbon budget and commits the world to more than 1.5C warming (in 2030), or that the NDCs are not in line with cost-effective 1.5C emission trajectories (towards 2100). So, which is it? Also, please clarify that additional emission reductions will not automatically lead to an overshoot pathway to 1.5C but may only lead to a stabilization at higher temperatures or even worse, slow the increase of global warming without stabilizing. Please specify the amount of warming that can be expected from implementing the NDC. Sentence one of this paragraph should be amended to clearly depict the pathway that current NDCs lead to. Sentence two could be modified to say that the extensive emission reductions needed to limit global warming to 1.5 °C (without or with limited overshoot) can contribute to achievement of SDGs. [Germany]	
3804	19	13	19	3	The current wording is not appropriately reflecting the urgent need for more ambitious NDCs. We would encourage the authors to revise section D1 in its entirety, and in particular D1.2, in order to better reflect the analysis as summarized below. The analysis in Chapter 2 and CC Box 11 is very clear about the fact that implementing current NDCs will lead to a trajectory that puts the 1.5C goal out of reach. Chapter 2 ES states: "Under emissions in line with current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs), global warming is expected to surpass 1.5°C, even if they are supplemented with very challenging increases in the scale and ambition of mitigation after 2030 (high confidence). This increased action would need to achieve net zero CO2 emissions in less than 15 years. Even if this is achieved, temperatures remaining below 1.5°C would depend on the geophysical response being towards the low end of the currently-estimated uncertainty range. Transition challenges as well as identified trade-offs can be reduced, if global emissions peak before 2030 and already achieve marked emissions reductions by 2030 compared to today." Cross Chapter Box 11 states: "There is high agreement that current NDC emission levels are not in line with pathways that limit warming to 1.5°C by the end of the century (Rogelj et al.,2016, 2017; Hof et al., 2017; UNEP, 2017b; Vrontisi et al., 2018). The median 1.5°C emissions gap (>66% chance) for the full implementation of both the conditional and unconditional NDCs for 2030 is 26 (19–29) to 28 (22–33) GtCO2-eq (Cross-Chapter Box 11, Figure 1 above)." In addition, it is not clear whether CDR can be developed at the scale required in such a scenario, whether CDR will really effectively cool the planet as foreseen by the models, and what risks to society would be attached to such an endeavour. (see Chapter 2 ES "Limitations on the speed, scale, and societal acceptability of CDR deployment also limit the conceivable extent of temperature overshoot. Limits to our understanding of how the carbon cycle responds to net negative emissions increase the uncertainty about the effectiveness of CDR to decline temperatures after a peak" and "CDR deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5°C." [Germany]	

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4372	19	13	19	13	The following sentences of the main Report need to be included in the SPM. A part of the message was included in various sentences in the SPM. However, those sentences are not strong to ask for actions as much as the following sentences. “Limiting warming to 1.5°C would require transformative systemic change, integrated with sustainable development. Such change would require the upscaling and acceleration of the implementation of farreaching, multi-level and cross-sectoral climate mitigation and addressing barriers. Such systemic change would need to be linked to complementary adaptation actions, including transformational adaptation, especially for pathways that temporarily overshoot 1.5°C {Chapter 2, Chapter 3, 4.2.1, 4.4.5, 4.5} (medium evidence, high agreement).” [Republic of Korea]	
4610	19	13	19	18	Although the issue of uncertainties associated with NDCs is clearly described if one carefully reads the Cross-Chapter Box 11 (5. The impact of uncertainties on NDC emission levels) in Chapter 4, this is not at all mentioned in the SPM (D1.). Since it is assumed that most policy makers tend to read the SPM mainly and not necessarily all the respective chapters of the entire report, we would suggest adding the following phrase ,with reference to the Cross-Chapter Box 11 and by quoting from Chapter 4 page 99 line 44-46 in SOD, "despite the uncertainties associated with the NDCs. For instance, some countries have reduction targets based on a percentage of business-as-usual emission projections, which adds additional uncertainties on the level of emissions. "at the end of the first sentence. Thus, it should read as follows. D1. Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks and adaptation challenges, despite the uncertainties associated with the NDCs. For instance, some countries have reduction targets based on a percentage of business-as-usual emission projections, which adds additional uncertainties on the level of emissions." [Japan]	
4916	19	13	19	13	"Fulfilling the current pledges" should be replaced with "Fulfilling only the current pledges with no additional action" to show that with further action, global warming can be limited to 1.5C [United Kingdom (of Great Britain and Northern Ireland)]	
5140	19	13	19	14	The statement on the temperature implications of the current NDCs is far too weak. The message should be stronger, therefore we would suggets, in line with the text of the Paris Agreement, to clearly state that the effect of the current NDCs not only exceed 1.5 °C but the 2°C target as well. [Hungary]	
5292	19	13	19	15	D1) In line with section B of the SPM, this sentence D1 should include a reference to adaptation limits so as to read "Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks, adaptation challenges and - limits and concurrent losses" (ample examples of losses are given in section B of the SPM) [Zambia]	
5298	19	13	19	29	Section D covers the interactions between mitigation and adaptation and sustainable development, but a more explicit coverage of how impacts of climate change affect sustainable development is needed for this picture to be complete. We have gone through chapter 3 and have picked out pieces of evidence that show an interaction between a climate change impact and an SDG - see the table linked here: https://docs.google.com/spreadsheets/d/e/2PACX-1vQwJ6UqNcyl8RHvrJK2AQa9b2BBL6qk10oxgVVSfmFLD8g2RsrwlS1GD9r85aZdG2elijEQiWd7e8Eb/pubhtml?gid=820676025&single=true We call for the inclusion of an additional figure SPM5 to illustrate the SDG implications of limiting warming to 1.5°C. The initial analysis we have provided could be a starting point. [Zambia]	
6192	19	13	19	18	D1, is negatively stated as such is not helpful. It is important to quantify the achievement or positive that will emerge as a results of fulfilling the current pledges under Paris Agreement (the NDC) and later highlight the Gaps. [United Republic of Tanzania]	
6534	19	13	19	18	Replace "still result in global warming of more than 1.5C" by " be insufficient to limit global warming to 1,5C". More clearly indicates the adequacy of present pledges to meet the 1,5C target; add after "challenges": "even if they are supplemented with very challenging increases in the scale and ambition after 2030 (high confidence)"(see page 2 of summary of Chpt 2). [Netherlands]	
6536	19	13	19	15	The statement on the temperature implications of current NDCs is far too weak. Assessments of the implied temperature increase are available in the literature and on average indicate an increase of more than 3 degrees C compared to pre-industrial by the end ofhe century. Then just saying it will be "more than 1.5 degrees C" is misleading. Replace by "more than 3 degrees". [Netherlands]	
6628	19	13	19	15	D1) In line with section B of the SPM, this sentence D1 should include a reference to adaptation limits so as to read "Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks, adaptation challenges and - limits and concurrent losses" (ample examples of losses are given in section B of the SPM) [Sudan]	

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6634	19	13	19	29	Section D covers the interactions between mitigation and adaptation and sustainable development, but a more explicit coverage of how impacts of climate change affect sustainable development is needed for this picture to be complete. We have gone through chapter 3 and have picked out pieces of evidence that show an interaction between a climate change impact and an SDG - see the table linked here: https://docs.google.com/spreadsheets/d/e/2PACX-1vQwJ6UqNcyl8RHvrJK2AQa9b2BBL6qk10oxgVVSfmFLD8g2RsrwlS1GD9r85aZdG2elijEQiWd7e8Eb/pubhtml?gid=820676025&single=true We call for the inclusion of an additional figure SPM5 to illustrate the SDG implications of limiting warming to 1.5°C. The initial analysis we have provided could be a starting point. [Sudan]	
6912	19	13	19	15	D1) In line with section B of the SPM, this sentence D1 should include a reference to adaptation limits so as to read "Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks, adaptation challenges and - limits and concurrent losses" (ample examples of losses are given in section B of the SPM) [Gambia]	
6918	19	13	19	29	Section D covers the interactions between mitigation and adaptation and sustainable development, but a more explicit coverage of how impacts of climate change affect sustainable development is needed for this picture to be complete. We have gone through chapter 3 and have picked out pieces of evidence that show an interaction between a climate change impact and an SDG - see the table linked here: https://docs.google.com/spreadsheets/d/e/2PACX-1vQwJ6UqNcyl8RHvrJK2AQa9b2BBL6qk10oxgVVSfmFLD8g2RsrwlS1GD9r85aZdG2elijEQiWd7e8Eb/pubhtml?gid=820676025&single=true. We call for the inclusion of an additional figure SPM5 to illustrate the SDG implications of limiting warming to 1.5°C. The initial analysis we have provided could be a starting point. [Gambia]	
7200	19	13	19	18	Refer to the underlying report: Chapter 4 Strengthening and implementing the global response, Executive Summary page 5, para 2: The draft Report calls for strengthening implementation of global responses and all countries significantly raising the level of ambition, financial flows, address equity across and between generations and regions and build capacities. Article 4 (3) and 4 (4) of the Paris Agreement states --- “Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances”. Hence, the draft Report should not confuse the concept of equity and equality when the Parties determine their ambition depending upon the national circumstances. [India]	
7210	19	13	19	18	Refer the underlying report: Chapter 4 “Strengthening and implementing the global response”, in executive summary, under “Mitigation and adaptation option’, section 4.1 Accelerating the Global Response to Climate Change, section 4.2.1.1.2 Greater policy design and decision-making implications, section 4.3.1.2 Bioenergy and Biofuels (page 19 para 2) and many places in this chapter. Also in chapter 5: Sustainable Development, Poverty Eradication and Reducing Inequalities in section 5.4.1.1, page 23 para 1, 5.4.1.2 Energy Supply: Accelerated Decarbonisation, section 5.5.3.1 Transformations, Equity, and Well-being, page 34 and 35. The Paris Agreement invited the IPCC to provide a Special Report on the impacts of global warming of 1.50C above pre-industrial levels and related global greenhouse gas emission pathways. This Report is in the context of strengthening global response to the threat of climate change. The term “decarbonisation” has not featured in the Paris Agreement. What Paris Agreement aims at, according to Article 2 (b), is increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production. Any indicator to measure ‘decarbonisation’ may have considerable implications against the sustainable Development objectives of the developing nations. Any specific recommendation or policy measure that may coerce the developing countries to forego the sustainable development objectives are but out of place. Also decarbonisation should not mean reduced use of fossil fuels but rather reduced emissions from their use via cleaning and greening. There are some exciting new developments on this and the international community should direct resources and attention to making this happen. It may be better to substitute "de-emissionization" for "decarbonisation." [India]	
7214	19	13	19	18	The sentence "Emissions reductions and action in addition ... UN Sustainable Development Goals"links NDCs with SDG thus make it developing country centric. The right way to state is "NDCs vary from country to country in their ambitions. Many developing countries have already pledged ambitious NDCs. The articulation should reflect that in respect to matured and advanced economies of developed countries, higher level of emission reduction to achieve 1.5 deg C would be required. Developing countries confronted with developmental aspirations and for meeting SDGs will require special dispensation in terms of new and additional financial resources and environmentally begnin technology transfers. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7218	19	13	19	18	It is not clear if the global community adhere with their NDC commitments then what will be the projected rise in GMST by the end of century. Moreover, providing the expected changes (in absolute sense) to achieve the 1.5/2.0 deg C target will help. [India]	
7222	19	13	19	18	The underlying report in Chapter 1, page 10, para 2 also talks about “an asymmetry in future response capacity”. In this case it is important to highlight the historical responsibilities. Fairness demands that the developed countries take the lead in taking actions against climate change and climate actions of the developing countries needs to be supported by transfer of technology and finance. This is important considering the adverse impacts that climate change would have on the vulnerable population in the developing countries and a large part of the expenditure would need to be on adapting to climate change which is unlikely to be financed just by private players. [India]	
7238	19	13	19	18	Is it possible to give the projected warming if the NDC targets are implemented, since literature exists. [India]	
7244	19	13	19	15	Modify first sentence of section D1 as follows: “Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of 2.8 to 3.6 deg. C, with associated risks and adaptation challenges (very high confidence)”. PROVIDE REFERENCE. [India]	
7258	19	13	19	18	Reduction in carbon footprint by countries should be based on climate justice and the principles of Equity and Common But Differentiated Responsibilities and Respective Capabilities. Climate justice is not discussed in this report which should be included. [India]	
8204	19	13	19	18	Is the whole headline statement talking about actions taken pre-2030 (i.e., saying that if action is not taken beyond the NDCs prior to 2030 that 1.5°C will definitely be exceeded)? Or is it just trying to say that if you meet the NDCs and then emissions flatline you'll still exceed 1.5°C? More precision could help. [United States of America]	
8206	19	13	22	1	Missing from Section D, and the report in general, is a discussion of institutional issues. Implementing the policies and measures needed for the world to embark on an emissions pathway that looks like one of the lines in Figure SPM-3 requires levels of sustained commitment to deliver unprecedented rates of system changes. [United States of America]	
8208	19	13	22	1	There is no discussion of how the land system can be managed to halt deforestation on global scales, or deliver net global afforestation. [United States of America]	
8424	19	13	19	15	D1) In line with section B of the SPM, this sentence D1 should include a reference to adaptation limits so as to read "Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks, adaptation challenges and - limits and concurrent losses" (ample examples of losses are given in section B of the SPM) [Nepal]	
8430	19	13	19	29	Section D covers the interactions between mitigation and adaptation and sustainable development, but a more explicit coverage of how impacts of climate change affect sustainable development is needed for this picture to be complete. We have gone through chapter 3 and have picked out pieces of evidence that show an interaction between a climate change impact and an SDG - see the table linked here: https://docs.google.com/spreadsheets/d/e/2PACX-1vQwJ6UqNcyl8RHvrJK2AQa9b2BBL6qk10oxgVVSfmFLD8g2RsrwlS1GD9r85aZdG2elijEQiWd7e8Eb/pubhtml?gid=820676025&single=true We call for the inclusion of an additional figure SPM5 to illustrate the SDG implications of limiting warming to 1.5°C. The initial analysis we have provided could be a starting point. [Nepal]	
8758	19	13	19	29	Since the report will be used over some years and the NDCs will change over time you may consider to connect a year to "current NDCs). Furthermore, since some emissions are covered in other agreements than UNFCCC it may be useful for the reader to know if "current NDCs" also include the efforts done on emissions from international aviation and shipping under ICAO and IMO and the agreement on HFCs under the Montreal Protocol. This could for instance be done in a footnote. [Norway]	
9526	19	13	19	15	This sentence is unclear given that current NDCs only last until 2025 or 2030, while the warming would not be expected to exceed 1.5C until around 2040. The first sentence should be clarified to: “Fulfilling the current pledges … would still result in an emissions pathway consistent with global warming of more than 1.5°C…” [Canada]	
9528	19	13	19	18	Recommend deleting the words “and can contribute to the achievement of the UN Sustainable Development Goals (SDGs)” from D1 given that the discussion of mitigation vs. SDGs already occur in D4 and supporting paragraphs D1.1 and D1.2 do not mention SDGs. Finally,it is unclear which part of the sentence confidence qualifiers apply to. [Canada]	
2510	19	14	19	14	Please replace' more than 1.5°C' with 'of 3°C ' (clear language showing that current ambition is not enough). Please replace also "will still result in global warming of more than 1.5°C," with "will would still result in global warming of much more than 1.5°C, with a central estimate of XX°C". It is correct, but disingenous to say that NDCs would result in increases higher than 1.5 degrees, as they would be definatelly higher than 2 degrees, or perhaps even 3. [European Union (EU)]	
2512	19	14	19	14	Indicate more precisely by how much the temperature is expected to rise if the current NDCs are implemented. [European Union (EU)]	
5480	19	14	19	14	Delete "still". [Austria]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
940	19	15	19	15	In order to clarify this, as it is not clear what "action" means, we suggest to wirte "other actions before 2030" instead of "action" [France]	
4254	19	15	19	17	It is suggested to reformulate “Emissions reductions and action in addition to current NDCs lead to lower overshoot and lower transitional challenges after 2030 and can contribute to the achievement of the UN Sustainable Development Goals (SDGs) (high confidence)” as “Emissions reductions and action in addition to current NDCs lead to lower overshoot and lower transitional challenges after 2030 and may contribute to the achievement of some UN Sustainable Development Goals (SDGs) (high confidence)” [China]	
4374	19	15	19	15	‘emission reductions and action in addition to’ can be changed to ‘Additional actions on mitigation and support besides’ or ‘emissions reductions and actions on support in addition to’. [Republic of Korea]	
4918	19	15	19	17	This sentence is slightly unclear. Do you mean to say that extra emissions reductions prior to 2030, in addition to the NDCs will result in lower overshoot and post 2030 challenges? Or we follow an NDC pathway to 2030 and then make extra emission reductions to lower the risk of overshoot? Presumably the former, but it isn't entirely clear. If its the latter, this would seem to understate the risk of overshoot and would be a misleading message. Either way, please clarify. [United Kingdom (of Great Britain and Northern Ireland)]	
5142	19	15	19	18	This sentence does not give useful information, as it just talks about "reductions in addition to NDCs", which can be anything and not necessarily 1.5 degree consistent. What should be stated here is that the window for meeting the 1.5C limit is closing rapidly as we move beyond 2020, as that would lead to very high temperature overshoots and huge volumes of CDR and extremely fast rates of emission reductions towards 2050, That is an approach which on paper might still be feasible, but in reality would effectively mean the 1.5 limit is out of reach. The SPM should not raise false expectations that any delay, overshoot or CDR volume is still feasible if the emissions gap in 2030 is not closed rapidlly. In other words, this paragraph needs to stress the critical role of short term strengthening of NDCs to bring global emissions back on a 1.5 consistent pathway. [Hungary]	
5678	19	15		16	Therefore, evaluation of the process of proposal of adaptation measures is highly important. Promote the sinerty between mitigation and adaptation is crucial. Also to promote transversality and co-production of proyects that end on measures is fundamental for a real transformation. [Mexico]	
6538	19	15	19	18	This sentence does not give useful information, as it just talks about "reductions in addition to NDCs", which can be anything and not 1.5 degree consistent. What should be stated here is that the window for meeting the 1.5C limit is closing rapidly as we move beyond 2020, as that would lead to very high temperature overshoots and huge volumes of CDR and extremely fast rates of emission reductions towards 2050, That is an approach which on paper might still be feasible, but in reality would effectively mean the 1.5 limit is out of reach. The SPM should not raise false expectations that any delay, overshoot or CDR volume is still feasible if the emissions gap in 2030 is not closed rapidlly. In other words, this paragraph needs to stress the critical role of short term strengthening of NDCs to bring global emissions back on a 1.5 consistent pathway. [Netherlands]	
6850	19	15	19	17	Delete "after 2030" as the SDGs have only been negotiated to 2030 and not beyond. [United Arab Emirates]	
7248	19	15	19	18	Modify the sentence to the following - “Drastic increases in emission reductions and action in addition to current NDCs, with significantly enhanced finance and technology transfer can lead to lower overshoot and lower transitional challenges after 2030 and can contribute to the achievement of the UN Sustainable Development Goals (SDGs) (high confidence) {1.2, 2.3, 3.3, 3.4, 4.2, 4.4, Cross-Chapter Box 11 in Chapter 4}. Finance and technology transfer has been recognized as an enabling condition in Sec 5.6.1. [India]	
8210	19	15	19	15	"actionS" [United States of America]	
8816	19	15	19	15	Before "Emissions" add "Full implementation of UNFCCC and emissions…" [Iran]	
2514	19	16	19	16	Please delete: … 'to lower overshoot and'. [European Union (EU)]	
8630	19	16	19	18	Reference to achievement of SDGs should clarify which SDGs NDC action will contribute to. [Ireland]	
942	19	19	19	19	Section D1 may require a paragraph on SDG achievement, on top of GHG emissions projected (D1.1) and overshoot trajectories (D1.2), since they are mentioned in the headline. [France]	
280	19	2			Is it possible to present information on current level of emissions also? [Finland]	
944	19	2	19	22	These figures should be linked to others in order to be more relevant for policy-makers. We suggest to add at the end of the sentence : "...which would consume most of the remaining carbon budget to limit the global warming to 1.5°C" OR "Available pathways that aim for limited (0–0.2°C) or no overshoot of 1.5°C keep GHG emissions in 2030 to 26–31 GtCO2eq/yr in 2030 {2.3.5}" [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1848	19	2	19	21	Consider adding sentence on estimated effect of current NDCs in terms of degrees of global warming. Add statement on current trajectory and NDC's, for instance: "The current nationally determined contributions to GHG emission reduction do not limit warming to 1.5 degrees. Depending on mitigation decisions after 2030 they cumulatively track toward a warming of 3-4 degrees C above preindustrial temperatures by 2100" [1.1.3] [Denmark]	
2516	19	2	19	22	Add the expected warming through implementation of the NDCs [European Union (EU)]	
3806	19	2	19	22	Please add: "The median 1.5°C emissions gap (>66% chance) for the full implementation of both the conditional and unconditional NDCs for 2030 is 26 (19–29) to 28 (22–33) GtCO2-eq", quote from Cross Chapter Box 11. [Germany]	
4046	19	2	19	2	Please define conditional and unconditional NDCs either in the Glossary or in the text itself (i.e. footnote) [Norway]	
4048	19	2	19	22	It is a challenge that D1.1 describe the projected emissions in 2030 related to the NDC, while the needed emission reduction for 1.5 is described in another place (C1.4). The needed emission reductions for 2 degrees is not mentioned anywhere. One way to do this could be to have a cross reference or to gather all text about the need for emission reductions in the same section. [Norway]	
4170	19	2	19	22	D1.1: Move this to statement on needed emissions reductions in C1 in order to have message on gap and need for urgent action higher up in SPM. [Saint Kitts and Nevis]	
4376	19	2	19	22	Slight addition on the elements of 'conditional elements'. [Republic of Korea]	
4920	19	2	19	22	It may be helpful to state again what emissions in 2030 need to be to provide an indication of the emissions gap. You could also potentially add further context by linking back to the size of the available carbon budget, discussed in section C, and when it would be exceeded. [United Kingdom (of Great Britain and Northern Ireland)]	
4922	19	2	19	22	It is important to be clearer as to what the temperature implications are of the NDCs - where do they take us? These numbers, presented without an associated temperature range, are not particularly informative and do not contextualise the emissions gap sufficiently. Additionally, note that the info presented in Chapter 1 in this respect (1.1.3) may not be wholly accurate - says 3 to 4c, but a recent estimate (Vrontisi et al 2018) has a lower range (2.4 to 3.1). Please also check this point. [United Kingdom (of Great Britain and Northern Ireland)]	
5024	19	2	19	22	It's unclear if 52-58 GtCO2eq/yer refers to unconditional NDC or the sum of conditional+unconditional NDC. [Italy]	
5424	19	2	19	22	D1.1: Move this to statement on needed emissions reductions in C1 in order to have message on gap and need for urgent action higher up in SPM. [Saint Lucia]	
6774	19	2	19	22	D1.1: Move this to statement on needed emissions reductions in C1 in order to have message on gap and need for urgent action higher up in SPM. [Marshall Islands]	
7228	19	2	19	21	Says what would be the results in terms of projection of GHGs with the implementation of conditional (50-54 GtCO2eq/yr) and unconditional (52-58 GtCO2eq/yr) NDCs. It is a bit strange to see the separation of conditional and unconditional NDCs. Nearly most of developing countries' NDC are conditional or they have a conditional component. It does not appear to make sense the not-so-vast difference in projections between conditional and unconditional. This needs to be looked into closely. It might be a good idea to indicate from the NDCs what are the financial amounts required to implement the NDCs. [India]	
8212	19	2	19	22	There is no recognized definition of what elements of current NDCs are conditional or unconditional. Therefore the IPCC should refrain from using such terms in its reports. [United States of America]	
8214	19	2	19	22	It would be helpful to compare the figures identified in D1.1 to a range of emissions levels that would be aligned with 1.5°C-consistent pathways. In particular, these estimates of emissions ranges should be added to Figure SPM-3. [United States of America]	
8494	19	2	19	21	Is is resulting in GHG emissions or GHG emission reduction [Zimbabwe]	
8730	19	2			for consistency, refer to "current NDCs" (or "first NDCs") [New Zealand]	
9024	19	2	19	2	Suggest rephrasing to: "Implementation of the current conditional and unconditional NDCs …" [Australia]	
9182	19	2	19	22	D1.1: Move this to statement on needed emissions reductions in C1 in order to have message on gap and need for urgent action higher up in SPM. [Nauru]	
9530	19	2	19	22	For comparative purposes, provide present day CO2-eq emissions. [Canada]	
946	19	21	19	21	The recent study from Benveniste et al. gave higher ranges (56.8-66.5GtCO2eq/yr). This study is quoted in chapter 2 (p. 2-47), but not its results. Why ? The ranges should have higher ends (66GtCO2 for unconditionnal NDCs). [France]	
282	19	23	19	23	We suggest adding a note (a new D1.2 between the current D1.1 and D1.2) on the gap between the current NDCs and the 1.5°C pathways, e.g.: "There is high agreement that current NDC emission levels are not in line with pathways that limit warming to 1.5°C by the end of the century. The median 1.5°C emissions gap (>66% chance) for the full implementation of both the conditional and unconditional NDCs for 2030 is 26 (19–29) to 28 (22–33) GtCO2-eq. {4.4.1, Cross-Chapter Box 11 in Chapter 4}" [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
948	19	24	19	25	The first sentence od D1.2 could be understood as : « if we fulfil the NDC, we will target the 1.5°C warming at the end of the century by pursuing an overshoot trajectory. » We suggest to formulate it as follow : "Collectively meeting only the current conditional or unconditional NDCs would imply overtaking 1.5°C-global warming during the century. An overshoot trajectory would be the only solution to return global warming to 1.5°C." [France]	
1700	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Belize]	
2518	19	24	19	29	The statement is very problematic since NDC targets have been found to be not consistent with the 1.5 deg C scenario, particularly that it is considered to be of high confidence. The discussion in this para should be consistent with the pathways presented in Fig SPM 3. That is the place where overshoot and CDR choices are laid out - yet all pathways in that Figure have substantially lower emissions than the NDCs. [European Union (EU)]	
3808	19	24	19	25	The sentence may be misunderstood as the last part of the sentence ("to return to...") may be either read as the condition to be met or as a depiction of the pathway. The paragraph should not send the message that current NDCs already lead to an overshoot pathway to 1.5C but entail the possibility that 1.5C will not be met. The sentence should be reworded: "Collectively meeting the current conditional or unconditional NDCs would imply that an overshoot trajectory has to be pursued in order to return global warming to 1.5°C." [Germany]	
4050	19	24	19	25	Unclear sentence. "to return global warming to 1.5" sounds like the NDCs are enough to limit global warming to 1.5. Please consider to include the emission gap between the NDCs and what is needed to limit global warming to 1.5 degrees and relate this to the gap between NDCs and the 2 degree target mentioned in the Paris Agreement. [Norway]	
4172	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Saint Kitts and Nevis]	
4924	19	24	19	29	It would be helpful to make clearer the implications of delayed action. The FOD contained the following important paragraph, which could be re-used. 'Delaying actions to reduce greenhouse gas emissions increases the risk of cost escalation, stranded assets, job losses, and reduced flexibility in future response options in the medium to long-term. These may increase uneven distributional impacts between countries at different stages of development (medium evidence, high agreement). {5.4.2}' [United Kingdom (of Great Britain and Northern Ireland)]	
4926	19	24	19	25	This appears to overstate the likelihood of achieving 1.5 in 2100 if the NDCs are pursued. Some high overshoot pathways with NDCs were found. But in other instances, a failure to achieve 1.5C occurred. It would be more balanced to recognise this and to point out that if we follow the NDCs then there is a very good chance that 1.5C is infeasible. Additionally, it would be helpful for policymakers to know by how much we would overshoot - what level of overshoot occurs in the low and high OS pathways? - and about whether the level of negative emissions required is actually feasible. As mentioned in other comments, the SPM is not clear on the challenges of CDR so the enormous challenge of bringing temperature back down through negative emissions is not clear. [United Kingdom (of Great Britain and Northern Ireland)]	
5426	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Saint Lucia]	
6276	19	24	19	25	This statement implies that current NDCs could still be consistent with 1.5°C with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5°C: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass/exceed 1.5°C even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Fiji]	
6540	19	24	19	25	This sentence repeats the mistake of paragraph D1 (see comments above) by totally understating the importance of urgent strengthening of NDCs. Add the emission reduction gap between the emission level of the pledges and the range of emission levels in 2030 for the S1, S2, LED and S5 pathways. Additionally indicate the pledges level in the figure on page 16. [Netherlands]	

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6776	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Marshall Islands]	
7220	19	24	19	29	Refer to the Underlying report Chapter 2: Page 50 line 22: Add on: Satellite data derived land cover and transformations can be used in the execution of WRF models for understading intra-annual and inter-annual radiative forcing. [India]	
7230	19	24	19	29	In the underlying report, chapter 1, page 36, line 39-49 add on:Spatial and temporal distributions of the impacts can be best assessed using space platforms. [India]	
7250	19	24	19	25	The sentence misrepresents the scientific evidence presented in Chapter 2, therefore it should be replaced with the following sentence from chapter 2: “It is unclear whether following NDCs until 2030 would still allow global mean temperature to return to 1.5°C by 2100 after a temporary overshoot, due to the uncertainty associated with the Earth system response to net negative emissions after a peak.” (2.3.5). [India]	
8216	19	24	19	27	Many pathways to 1.5°C likely involve an overshoot. The way this is framed is potentially misleading, as it could be understood to imply that doing more beyond NDCs avoids overshoot. The authors should consider whether it would be more accurate to say something like: "would imply pursuing a trajectory with a greater overshoot." [United States of America]	
8496	19	24	19	25	This where the report needs to talk of the amount of overshoot reduced by implementing the NDCs [Zimbabwe]	
8818	19	24	19	24	Delete: Collectively [Iran]	
9058	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Solomon Islands]	
9184	19	24	19	25	D1.2: This statement implies that current NDCs could still be consistent with 1.5 with overshoot. This contradicts the much stronger statement in ES chapter 2, according to which current NDCs are clearly not consistent with 1.5dC: Chapter 2 page 4: "Under emissions in line with current pledges (NDCs) global warming is expected to surpass 1.5 even if they are supplemented with very challenging increases in scale and ambiition of mitigation after 2030". [Nauru]	
9340	19	24	19	29	D1.2 can be misinterpreted as saying that meeting the NDCs means the world will end in an overshoot path to 1.5°C, which is not correct. The NDCs are not inconsistent with such a path, but meeting the NDCs in itself is not sufficient for such a path. The wording should be clarified. [Switzerland]	
394	19	25	19	29	D1) In line with section B of the SPM, this sentence D1 should include a reference to adaptation limits so as to read "Fulfilling the current pledges under the Paris Agreement (known as Nationally-Determined Contributions or NDCs) will still result in global warming of more than 1.5°C, with associated risks, adaptation challenges and - limits and concurrent losses" (ample examples of losses are given in section B of the SPM) [Chad]	
396	19	25	19	29	D1.2) This statement is not fully consistent with the bold statement D1, which states that the current NDCs will lead to warming above 1.5dC. The NDCs are not long-term targets, so we cannot say whether they would lead to a trajectory that returns to 1.5°C by the end of the century (and returning from such a high overshoot would be very challenging). [Chad]	
950	19	25	19	28	This sentence could be strengthened as follow : "This would result in higher impacts and adaptation challenges compared to pathways that are consistent with limited or no overshoot, as well as reductions of GHG emissions after 2030 and CDR deployment, both at a rate that may not be feasible." [France]	
5294	19	25	19	29	D1.2) This statement is not fully consistent with the bold statement D1, which states that the current NDCs will lead to warming above 1.5dC. The NDCs are not long-term targets, so we cannot say whether they would lead to a trajectory that returns to 1.5°C by the end of the century (and returning from such a high overshoot would be very challenging). [Zambia]	
5296	19	25	19	29	D1.2) In addition to the above comment, this statement needs a reference to adaptation limits and losses. E.g. it could read "exceeding 1.5°C would result in higher impacts and adaptation challenges and limits, with concurrent losses and higher transitional challenges to reduce GHG emissions after 2030" [Zambia]	
5794	19	25	19	25	Of coure, an overshoot would be implied for any long-term stabilisation level than around 3oC, not only 1.5oC. 1.5oC here comes from the context. It might be useful to indicate the projected impact of the NDCs, not only that they do not meet what would be required by 1.5C. [Sweden]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6630	19	25	19	29	D1.2) This statement is not fully consistent with the bold statement D1, which states that the current NDCs will lead to warming above 1.5dC. The NDCs are not long-term targets, so we cannot say whether they would lead to a trajectory that returns to 1.5°C by the end of the century (and returning from such a high overshoot would be very challenging). [Sudan]	
6632	19	25	19	29	D1.2) In addition to the above comment, this statement needs a reference to adaptation limits and losses. E.g. it could read "exceeding 1.5°C would result in higher impacts and adaptation challenges and limits, with concurrent losses and higher transitional challenges to reduce GHG emissions after 2030" [Sudan]	
6914	19	25	19	29	D1.2) This statement is not fully consistent with the bold statement D1, which states that the current NDCs will lead to warming above 1.5dC. The NDCs are not long-term targets, so we cannot say whether they would lead to a trajectory that returns to 1.5°C by the end of the century (and returning from such a high overshoot would be very challenging). [Gambia]	
6916	19	25	19	29	D1.2) In addition to the above comment, this statement needs a reference to adaptation limits and losses. E.g. it could read "exceeding 1.5°C would result in higher impacts and adaptation challenges and limits, with concurrent losses and higher transitional challenges to reduce GHG emissions after 2030" [Gambia]	
7252	19	25	19	29	As it is unclear "whether following NDCs until 2030 would still allow global mean temperature to return to 1.5°C by 2100 after a temporary overshoot, due to the uncertainty associated with the Earth system response to net negative emissions after a peak" (2.3.5), the second sentence does not follow. Remove the second sentence in the para - "This would result….until 2030". [India]	
8218	19	25	19	25	The logic of 'to return' is strained. Suggest "… overshoot trajectory before returning to global warming of 1.5°C." [United States of America]	
8220	19	25	19	25	Change to "Such trajectories …" [United States of America]	
8426	19	25	19	29	D1.2) This statement is not fully consistent with the bold statement D1, which states that the current NDCs will lead to warming above 1.5dC. The NDCs are not long-term targets, so we cannot say whether they would lead to a trajectory that returns to 1.5°C by the end of the century (and returning from such a high overshoot would be very challenging). [Nepal]	
8428	19	25	19	29	D1.2) In addition to the above comment, this statement needs a reference to adaptation limits and losses. E.g. it could read "exceeding 1.5°C would result in higher impacts and adaptation challenges and limits, with concurrent losses and higher transitional challenges to reduce GHG emissions after 2030" [Nepal]	
8222	19	28	19	28	"until 2030" What about prior to 2030? [United States of America]	
952	19	31	2	14	In the section D2 the agricultural sector is not mentionned, although it plays a large role in the transition [France]	
1702	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Belize]	
2520	19	31	19	34	Overall, the statements made under D2 are very vague, generic and rather weak. We recommend deep revision. [European Union (EU)]	
2522	19	31	2	19	Adaptation is mostly beneficial for sustainable development. What about mitigation? Surely statements D2 & D3 can both be applied to both mitigation and adaptation.D3 states that adaptation is "mostly beneficial for poverty reduction". This implies that adaptation is more beneficial for SDGs and poverty than mitigation. Is this true? Couldn't be also argued that mitigation (i.e. avoiding the substantial impacts mentioned in section B) is "mostly beneficial for sustainable development" - alongside the caveats contained already in D2 & D3? [European Union (EU)]	
3810	19	31	19	31	Suggestion: "Limiting global warming to 1.5°C and adaptation to related changes...". Otherwise the link to "adaptation actions" mentioned in the following line is not clear. [Germany]	
3812	19	31	19	34	This comment could be misunderstood that "adaptation actions" can contribute to "limiting global warming to 1.5°C" while the focus of the sentence should be on reaching both 1.5 C and SD, i.e. pursuing a climate resilient development pathway. Please revise the formulation of the sentences to avoid such misunderstanding. [Germany]	
3814	19	31	2	14	The chapter D2 is concentrating on "softer" mitigation instruments and measures such as e.g. innovation policies, public acceptability and education, information (see SPM-20), whereas "stronger" instruments such as fiscal and pricing policies are treated very superficially. The necessity of such stronger instruments should be underlined here as well (e. g. abolition of subsidies of fossil fuels and air travel / stop of investments in coal / CO2-pricing through Carbon taxes and/or introduction of emission trading systems). These instruments and their possible impact should be explained shortly (in addition to D2.4-D.2.6), e.g. by exemplifying what stringent integrated policy packages" might look like. Otherwise you get the impression we only need more innovation and information to reach 1.5C. [Germany]	
4052	19	31	2	14	Please consider to include a paragraph somewhere in D2 on key barriers with examples on such key barriers [Norway]	
4174	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4378	19	31	19	34	'Information & Knowledge gap' is acting as a major barrier for a wide range of reduction and adaptation actions to achieve the 1.5? goal. Sharing of broad information and knowledge on technology-finance-policy-market-environment is essential to achieve 1.5? goal. Limiting global warming to 1.5? in the context of sustainable development and poverty eradication requires a portfolio of mitigation and adaptation actions that work across sectors and scales. These actions would face key barriers and are enabled by change, such as finance, technology and behaviour. ? Limiting global warming to 1.5? in the context of sustainable development and poverty eradication requires a portfolio of mitigation and adaptation actions that work across sectors and scales. These actions would face key barriers and are enabled by change, such as finance, technology, behaviour, information and knowledge. [Republic of Korea]	
5144	19	31	19	34	This headline paragraph is so general that is does not contain any useful information. As it is the headline statement for a section that is mostly about costs, financing and innovation, the paragraph should be rewritten to cover those issues. Something like " Limiting global warming to 1.5 °C requires a substantial shift away from fossil fuel investments and an increase in investment in low carbon energy supply and transportation, buildings, and industrial infrastructure and in innovation. While that would help avoid economic damages from climate change, reduce adaptation costs and would bring many co-benefits, the costs of such investments will increase compared to limiting warming to 2°C." Paragraphs D2.1, D2.3 to D2.4 can then follow, although in a different order, starting with D2.3., then D2.4 and then D2.1 D2.2 can be deleted as it does not contain any useful information. A new headline statement is needed for paragraphs D2.5 and D2.6. [Hungary]	
5428	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Saint Lucia]	
6542	19	31	19	34	This headline paragraph is so general that is does not contain any useful information. As it is the headline statement for a section that is mostly about costs, financing and innovation, the paragraph should be rewritten to cover those issues. Something like "Limiting global warming to 1.5C requires a substantial shift away from fossil fuel investments and an increase in investment in low carbon energy supply and transportation, buildings, and industrial infrastructure and in innovation. While that would help avoid economic damages from climate change, reduce adaptation costs and would bring many co-benefits, the costs of such investments will increase compared to limiting warming to 2C." Paragraphs D2.1, D2.3 to D2.4 can then follow, although in a different order, starting with D2.3., then D2.4 and then D2.1 D2.2 can be deleted as it does not contain any useful information. A new headline statement is needed for paragraphs D2.5 and D2.6. [Netherlands]	
6778	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Marshall Islands]	
7204	19	31	19	34	" Refer to the underlying report: Chapter 4 (69,1,69,1), (77,29,77,31), (77,40,77,45) and (93,38,93,43) - The report cites studies estimating the financial implications of reducing emissions and developing a climate resilient infrastructure/ societies. However, the report does not contain any assessment / commentary of how the finance would be sourced/ channelized to acheive the desired results in an effective, equitable and fair manner. Although the report briefly cites general budget, energy or resource taxation, or emission trading schemes as potential source of finance, however, the statement seems to relieve developed countries from their responsibility of providing financial support to developing countries." [India]	
7206	19	31	19	34	R+I134efer to the underlying report: Chapter 4 (5,21,5,27) - The report cites that all countries would be required to raise ambitions, finance and efforts for implementation of global responses to climate change. While doing so, the report does acknowledge the support required by developing countries for acheiving the same, but refrains from assigning a specific role to developed countries in scaling up their support for the global climate response. Further, in asking all countries to raise finance and other efforts, the report drifts away the agreed and established principles of Common but Differentiated Responsibilities (CBDR). [India]	
7224	19	31	19	34	There seems to be a lot of emphasis on effective policies. However, anything concrete on finances is missing from the entire document. So there is need for emphasis on finance, technology and capacity building and should be reflected in the SPM. This should also figure prominently in the headline messages. [India]	
7226	19	31	19	34	There is a focus on change in behaviour in the draft Report. It is now well recognised the world over that the driving force for environmental stress is excessive consumption patterns of the developed world. This should be suitably embodied in the report. [India]	
7240	19	31	19	33	Why bring in poverty eradication? Since poverty eradication may not significantly contribute to GHG emissions, and there is no paragraph below where poverty eradication is discussed. [India]	

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7254	19	31	19	34	D2 to be reworded to reflect SDGs apply to all countries but the different goals and targets represent different degrees of challenge and ambition for different countries depending on their present state of development and other national circumstances (Osborn et al 2015) . D2 should be reworded as follows: Limiting global warming to 1.5°C in the context of sustainable development and poverty eradication in the developing countries and the sustainability challenges facing the developed world in transforming their economies in a more sustainable direction requires a portfolio of mitigation and adaptation actions that work across sectors and scales. These actions would face key barriers and are enabled by change, such as finance, technology made available by developed countries to developing countries and behaviour (high confidence). Osborn, D., Cutter, A., & Ullah, F. (2015). Universal sustainable development goals. Understanding the transformational challenge for developed countries. Technical Report. London: Stakeholder Forum. [India]	
8224	19	31	19	32	Limiting warming to 1.5°C does not require adaptation actions; the adaptation actions are a response to the temperature increase. Suggest revising as follows: " ... requires a portfolio of mitigation actions that work across sectors and scales, and will need to be reconciled with adaptation responses to a 1.5° climate." [United States of America]	
8226	19	31	19	34	Suggest clarifying D2 to state explicitly that limiting global warming to 1.5°C depends on actions in the developing and developed world. Currently, it's unclear what 'sustainable development' refers to in the sentence. Does it refer to both the developed and developing countries? This is not a common interpretation and would need to be clarified. On the other hand, if it refers to sustainable development in the developing world (a more common interpretation), then the text should be updated to something like "... would require a global effort and a portfolio of mitigation and adaptation actions that work across sectors and scales." [United States of America]	
8228	19	31	19	34	Consider better linking the following sentence with the previous that starts on line 31: "These actions would face key barriers and are enabled by change, such as finance, technology and behaviour." Currently it is unclear how change in finance, for example, would effect mitigation actions. [United States of America]	
8230	19	31	19	37	D2.1 should replace what is now the headline D2 statement. The current D2 statement is generic to all levels of warming, but the D2.1 is specific to the report and should be highlighted. [United States of America]	
8232	19	31	2	14	This section is lacking a discussion of the importance of good governance and enabling policies. This omission makes the discussion incomplete and inconsistent with the underlying report, which highlights the criticality of both of these aspects. Also, the wording seems strange and would probably read better to say "... changes in GOVERNANCE, POLICIES, finance, technology, and behavior..." [United States of America]	
8732	19	31	19	52	The use or "requires" in these paragraphs may be perceived as being policy-prescriptive, even when it is gramatically not. Consider alternative wording for easier acceptance. [New Zealand]	
8774	19	31	19	31	to add term "food security" after term "sustainable development" [Iran]	
8820	19	31	19	31	After "1.5°C" add "principals and provisions of UNFCCC and …" [Iran]	
9026	19	31	19	32	Suggest rephrasing to: "Limiting global warming to 1.5°C in the context of sustainable development and poverty eradication would require a portfolio…" [Australia]	
9060	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Solomon Islands]	
9186	19	31	19	34	D2: Add important statement that less action on adaptation is needed for 1.5 than for higher levels of warming [Nauru]	
9532	19	31	19	33	Change the sentence to: "Limiting global warming to 1.5C [delete: in the context of sustainable development and poverty eradication] requires...". As written, it is unclear how adaptation actions, sustainable development or efforts to eradicate poverty contribute to limiting global warming to 1.5°C. Also, please add "requires the implementation of a portfolio of…actions" because actions and implementation are important. [Canada]	
3816	19	32	19	32	The term "requires a portfolio of mitigation and adaptation actions" is rather general. The requirement of mitigation is downplayed. The main, necessary finding (based on the full SR15) in the context of limiting global warming to 1.5C should be the requirement of " a portfolio of strong mitigation actions", whereas "adaptation" in the context of 1.5 is not challenging to the same extent, and adaptation efforts will be lower compared to a world with higher warming, even if they are substantial and vital for sustainable development - please revise in order to make that distinction. cf. also our comments on p19 ln 31. [Germany]	
8234	19	32	19	32	"requires" is policy prescriptive, consider rewording [United States of America]	
9342	19	32	19	32	Write: " … adaptation actions by all countries, that work …" [Switzerland]	
400	19	33	19	34	Section D covers the interactions between mitigation and adaptation and sustainable development, but a more explicit coverage of how impacts of climate change affect sustainable development is needed for this picture to be complete. We have gone through chapter 3 and have picked out pieces of evidence that show an interaction between a climate change impact and an SDG - see the table linked here: https://docs.google.com/spreadsheets/d/e/2PACX-1vQwJ6UqNcyl8RHvrJK2AQa9b2BBL6qk10oxgVVSfmFLD8g2RsrwlS1GD9r85aZdG2elijEQiWd7e8Eb/pubhtml?gid=820676025&single=true We call for the inclusion of an additional figure SPM5 to illustrate the SDG implications of limiting warming to 1.5°C. The initial analysis we have provided could be a starting point. [Chad]	

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954	19	33	19	34	This sentence is unclear, because : 1) "change" is ambiguous and subject to interpretation 2) "Finance" is not properly defined and discussed in this paragraph, it should be termed 'access to finance' 3) mention of "long-term planning and policies" could be added to make this sentence more concrete We suggest to modify it as follow : "are enabled by appropriation of challenges, such as access to finance, technology innovation and behaviour changes, supported when relevant by long-term planning and policies." [France]	
2524	19	33	19	34	Re-consider the use of 'such as' which doesn't relate well to the word 'change'. [European Union (EU)]	
3818	19	33	19	34	Meaning unclear: "finance, technology and behaviour" are not changes per se. We suggest to change the wording to "changes in different fields such as finance, technology and behaviour". [Germany]	
3820	19	33	19	34	We think that "key barriers" are very relevant to the policy makers. In the following sub statements D2.1 - D2.6, we could only identify "public acceptability" (see D2.5) as a potential barrier to the implementation of such actions. The underlying report, in particular chapter 4 and 5, discusses various barriers to mitigation and adaptations actions consistent with a 1.5. warming as well as the SDGs and we urge the authors to specify these barriers in the SPM and ways to overcome them (e.g. " To overcome barriers to policy implementation, local conflicts of interest or vested interests, strong leadership and agency is needed by political leaders". 4-61). [Germany]	
5300	19	33	19	34	D2)"Change" needs to be specified as "finance, technology and behaviour" are not forms of change per se. Examples of plausible categories of change in this context include "enhanced access to finance and technology as well as substantive behavioural change". [Zambia]	
5796	19	33	19	33	What kind of change [in finance, technology and behaviour] is meant here? [Sweden]	
6194	19	33	19	33	In the statement "These Actions would face key barriers…. And are enables by change such as Finance, Technology and Behaviour.", It is not clear, What is meant by key barriers? Which are those Key Barriers? What is meant "enabled by change, such as Finance, Technology" [United Republic of Tanzania]	
6544	19	33	19	34	It is unclear what "are enabled by change" means; suggest to replace by "and its implementation conditional on changes in areas" [Netherlands]	
6636	19	33	19	34	D2)"Change" needs to be specified as "finance, technology and behaviour" are not forms of change per se. Examples of plausible categories of change in this context include "enhanced access to finance and technology as well as substantive behavioural change". [Sudan]	
6920	19	33	19	34	D2)"Change" needs to be specified as "finance, technology and behaviour" are not forms of change per se. Examples of plausible categories of change in this context include "enhanced access to finance and technology as well as substantive behavioural change". [Gambia]	
7232	19	33	19	33	The phrase "enabled by change, such as…" is unclear. It should, perhaps, read "changes IN…" [India]	
8236	19	33	19	34	It would be useful to provide examples of key barriers to action. [United States of America]	
8238	19	33	19	34	Put the clauses together: "Such actions face barriers in finance, technology, and behavior, and are enabled by change." "key" has no meaning and "would" is the wrong word choice here. [United States of America]	
8432	19	33	19	34	D2)"Change" needs to be specified as "finance, technology and behaviour" are not forms of change per se. Examples of plausible categories of change in this context include "enhanced access to finance and technology as well as substantive behavioural change". [Nepal]	
8498	19	33	19	34	These actions require key enablers such as finance, technology and behaviour change as well as removal of bariers to these [Zimbabwe]	
8822	19	33	33	34	Change phrase "change, such as finance, technology and behaviour" to " finance, technology and change behaviour" [Iran]	
9534	19	33	19	33	Recommend repharsing and clarifying the sentence "…are enabled by change, such as finance, technology and behaviour". For example, finance is not a change. [Canada]	
2526	19	34	19	34	Please add after …behaviour: 'Delaying actions to reduce greenhouse gas emissions increases the risk of cost escalation, stranded assets, job losses, and reduced flexibility in future response option in the medium and long term. (medium evidence, high agreement) {5.4.2}'; to strengthen the implementation of the global response, all countries would need significantly raise their level of ambition, shift financial flows and investment patterns, improve coherence in governance, address equity across and between generations and regions and strengthen capacities, including traditional knowledge (medium agreement , high evidence) {2.5.2, 4.4.1, 4.4.2, 4.4.6} [European Union (EU)]	
4380	19	34	19	34	capacity building seems more suitable than "behaviour" . [Republic of Korea]	
284	19	36	19	36	Numbers for costs are existing (if one can say that 3-4 times higher), why not report them here to get a grasp on the magnitude? Also, please, present some clarification on the context of costs and benefits in assessing 1.5 degree pathways. [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
402	19	36	19	37	D2)"Change" needs to be specified as "finance, technology and behaviour" are not forms of change per se. Examples of plausible categories of change in this context include "enhanced access to finance and technology as well as substantive behavioural change". [Chad]	
956	19	36	19	37	Doesn't it concern the price of carbon (=marginal abatement cost) instead of abatement cost in general? But even for carbon price, we cannot find this information, that is given also in the executive summary of chapter 2, in the report. Chapter 2 p.79 also mentions carbon price "three to four times higher at 1.5°C than at 2°C" but the figures given don't fit with this statement. If properly understood, we suggest to replace this sentence by : "The undiscounted carbon price of a 1.5°C warmer world (i.e. cost of mitigating one extra unit of Emission) would be 135–5500 USD/tCO2e in 2030 (compared to 10–200 at 2°C) and 245–13000 USD/tCO2e in 2050 (compared to 45–960 at 2°C). {2.5.2}" [France]	
1742	19	36	19	37	Abatement costs are only preliminary indicators of mitigation costs. Implications for sustainable development and poverty eradication depend on impacts of mitigation measures on GDP and welfare and on how distribution of the mitigation burden is shouldered. Policy makers will be looking for GDP/welfare impacts than just abatement costs of the needed mitigation efforts to limit warming to 1.5 °C [Saudi Arabia]	
1858	19	36	19	37	The statement appears only to cover abatement investment cost; hence, avoided costs for adaptation and the (valued) differences between losses in a 1,5 and 2,0 degree world seem not to part of the statement. The basis of the abetement cost estimate should be clear. [Denmark]	
2528	19	36	19	36	It is not clear which costs have been considered. Furthermore this paragraph does not fit in this section. We propose to either delete or re-phrase to avoid misinterpretation. [European Union (EU)]	
2530	19	36	19	36	Please add new paragraph: The transition and adaptation to a world in which global warming is limited to 1.5°C can only be realised by upscaling and accelerating the implementatin of rapid, far-reaching, multi-level and cross-sectoral climate mitigation and adaptation actions, integrated with development initiatives (high agreement, medium evidence) {Cross-Chapter Box 4.1, 4.2.1, 4.4} [European Union (EU)]	
2532	19	36	19	37	The higher abatement costs should be presented together with the avoided cost of impacts. [European Union (EU)]	
2534	19	36	19	36	What are the corresponding benefits? And what about compared to the DNCs? [European Union (EU)]	
2536	19	36	19	52	The findings on costs are extremely important but need to be placed in context and based on the body of findings from Ch2 & Ch4. In particular: * finding D2.1 that 1.5°C abatement costs are '3-4 times higher' than for 2°C appears to be based purely on model-derived carbon prices from integrated assessment modelling which basically refers to the marginal cost of measures. However, this is misleading if not placed in a wider context: - it is necessary to link this finding with that of D2.3 and mention other findings in the report. Furthermore, box 4.8 implies that additional investment requirements for 1.5°C compared to 2°C are much lower than 3-4 times. - What about the role of other changes (such as demand-side, dietary change) in reducing emissions and its impact on cost estimates ? - What about the mitigation measures (e.g. in non-CO2) that Ch2 points out are not fully captured in the integrated assessment models? - it is also necessary to place mitigation costs in the context of avoided impacts and adaptation costs, and benefits such as energy security, etc. [European Union (EU)]	
3822	19	36	19	36	Please delete the word "modelling". The costs are not for modelling but for achieving the pathway. [Germany]	
3824	19	36	19	36	Please consider replacing "abatement" with "mitigation" as the meaning of abatement is unclear if not defined. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3826	19	36	19	37	We strongly suggest the revision of this paragraph. First of all, the statement as it stands is simply not correct, it is not the (total) abatement cost that is 3-4 times higher in model experiments, but the marginal abatement cost. That is an important distinction. Please be precise about what cost metric is used here (e.g. discounted or undiscounted, marginal or bulk). The original conclusion from ES Chapter 2 p.5 2nd para is: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5°C consistent pathways (high confidence). Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5°C being about three four times higher compared to 2°C, with large variations across models and socioeconomic assumptions." We miss the first part of the statement here, and would strongly encourage authors to include language on carbon pricing as a necessary but not sufficient condition for effective climate policy. As stated in the ES Ch2 p.5 "A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments, like technology policies or performance standards, can complement carbon pricing in specific areas". Also, according to CH4.4.5 (p89, 2nd para, here again marginal abatement costs!), it should read "2-3 times higher" instead of "3-4 times higher". We would also like to see this statement framed by wording that addresses the fact that those cost estimates do represent incentives for action in models that aim for "minimization of mitigation expenditures, but not climate-related damages or sustainable development impacts" (2.1, p8) - rather than costs to society, and neither include (avoided) damage or adaptation costs nor co-benefits from mitigation (such as improved air quality), and are therefore not to be mistaken for net-costs to society from mitigation, for example, "Climate damages, avoided impacts and societal co-benefits of the modelled transformations remain largely unaccounted for and are important knowledge gaps." (2.6.2, 2-87): [Germany]	
4054	19	36	19	37	Please consider including the following statement from IPCC/AR5/WG3/SPM, page 15 (somewhat rewritten to fit this phrase: "This estimate does not include benefits of reduced climate change as well as co-benefits and adverse side-effects of mitigation." Please also consider to include the footnote 19 from the same statement as a footnote to D2.1: "The total economic effects at different temperature levels would include mitigation costs, co-benefits of mitigation, adverse side-effects of mitigation, adaptation costs and climate damages. Mitigation cost and climate damage estimates at any given temperature level cannot be compared to evaluate the costs and benefits of mitigation. Rather, the consideration of economic costs and benefits of mitigation should include the reduction of climate damages relative to the case of unabated climate change." [Norway]	
4176	19	36	19	37	D2.1: The statement on abatement costs being 3-4 times higher for 1.5 compared to 2dC is very misleading and needs to change. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5 consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5 being about three to four times higher compared to 2dC with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues. [cont'd below] [Saint Kitts and Nevis]	
4178	19	36	19	37	[cont'd] Also include important statement from Ch 2 page 4: "Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)." In this context, also the need to reduce "socially inefficient" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels [Saint Kitts and Nevis]	
4256	19	36	19	37	According to Comment No 16, the textual D2.1 has been relocated to C4.2. So it is suggested to remove D2.1 from here. [China]	
4382	19	36	19	37	This sentence is important and should be highlighted in bold combining D2. D1+D2, it gives a clear message that limiting global warming to 1.5? is beneficial compared to 2?. [Republic of Korea]	
4384	19	36	19	37	Insertion of quantified amount of abatement costs resulting in 1.5°C. [Republic of Korea]	
4386	19	36	19	37	Instead of having D.2.1, What would be more relevant for policy makers is to understand on economics of 1.5?. Another option is D.2.1 could be replaced with a statement on policies and pathways that lower mitigation cost and maximize societal co-benefits, acknowledging such measures are key for the acceptability of 1.5? compatible action. (contents in SR15 Ch3 Box 3.6, Ch2 p76/79/80,and Ch4 P16, 90) [Republic of Korea]	

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4614	19	36	19	37	Request to clarify the definitions and keep consistency of their use: price of carbon, carbon price, marginal cost, abatement cost, and marginal abatement cost. For example, it is unclear whether "abatement cost" in D2.1 is the equivalent of "price of carbon" in subsection 2.5.2.. If they are equivalent, suggest using the same term in order to not confuse the reader. It is also unclear the use of the word "mitigation cost" in other chapters. If "mitigation cost" is just another way of saying "abatement cost" then suggest inclusion of text explaining the relationship between the different wordings. Also, the word "cost" seems to have various implications. It would be better to use the wording "abatement/mitigation marginal cost" if it is used identically with "price of carbon". [Japan]	
4616	19	36	19	37	Request inclusion of an explanation on of which figures were used to say that abatement costs resulting in 1.5°C-consistent pathway modelling are "3-4 times higher" as we were unclear on which figures from 2.5.2 and 4.4.5 were compared. Despite the description in D2.1, subsection 4.4.5.1 states that the abatement costs for 1.5°C are "two or three times higher than for a 2°C limit" (Chapter 4, page 89, para2)). Also, while we were referring to 4.4.5.1, we found that "the price envelope of worldwide marginal abatement costs for 1.5°C-consistent pathways reported in Chapter 2 is 135 – 475 USD tCO2–1 in 2030 and 245 – 1100 USD tCO2–1 in 2050" but were unclear on where the upper limits of 475USD or 1100USD were indicated in Chapter 2, so request clarification on the how these figures were derived. [Japan]	
4618	19	36	21	9	Request clarification of relationships between "costs" in D2.1, "investments" in D2.3 and "investment needs" in D4.4. If abatement costs include investment, please clarify so. [Japan]	
4620	19	36	19	37	We would propose to add the following assessment on the mitigation cost, to promote understanding of the scale of the mitigation challenges properly. It is one of the most significant points in this report to present what levels of mitigation costs would be required for both the 1.5°C-consistent pathways and the 2.0 °C-consistent pathways. 1) To add Figure 2.26 with the concrete mitigation costs ranges (USD per tCO2) for the 1.5°C and 2.0 °C, in addition to their difference by factor, and the values used for the text 'Abatement cots resulting in 1.5°C-consistent pathway modelling are 3 – 4 times higher, on average, compared to holding warming to 2°C' in D2.1. The 'costs' here, seems to be the average discounted carbon price of emissions for 1.5?C- and 2?C pathways (assuming a 5% annual discount rate) according to the text in page 2-79, but it is unclear with current text. 2) To describe the assumptions of estimation, such as "the equal marginal abatement costs among all countries and all sectors". The marginal abatement costs (carbon prices) shown in Figure 2.26 are basically estimated by the integrated assessment models (IAMs) assuming the ideal conditions, that is, the equal marginal abatement costs among all countries and all sectors. However, such ideal conditions would not be practically realized in the real world, and marginal abatement costs under various real world constraints would deviate from the ideal ones. 3) To add explanation that there exist some scenarios that cannot reach the 1.5?C target, depending on future socioeconomic developments and the degree of progress of technology to provide an accurate picture of the abatement costs for the 1.5?C target. As described in Chapter 2 (24 page), no models found a 1.5?C consistent pathway for SSP3 and some models could not identify 1.5?C consistent pathways for SSP5. 4) To add the marginal abatement costs (carbon prices) of NDCs with the global trade (according to J. Aldy et al., Nature Climate Change 6, 1000–1004 (2016), the prices are 7-28 US$2015/tCO2 (for the average 2025-2030)) in the Figure 2.26. It would help understanding of the required challenges to achieve the 1.5?C pathway as compared to the Nationally Determined Contributions (NDCs). 5) To add reference, using expression in page 4-13, 4.2.1.1.2 of Chapter 4, about the impact of energy cost increase to cross-sector, cross-nation and cross-policy trade-offs. For example, the sentence would be "Managing these costs and distributional effects would require an approach that takes account of unintended cross-sector, cross-nation and cross-policy trade-offs during the transition." [Japan]	
4928	19	36	19	37	This statement on abatement costs (which should more accurately be described as carbon price) needs much more context to make clear what scale this is. E.g. relative to GDP, how big is this? What is this relative to the uncertainty over level of GDP itself? What scale are the benefits that go with it? What are the total costs, not just incremental? Why are the costs greater than 2C and what drives this? And to specify that it is mitigation (and adaptation?) cost only, not including avoided damages, benefits etc. [United Kingdom (of Great Britain and Northern Ireland)]	
4930	19	36	19	37	It's a narrow focus to simply point to the mitigation costs and not the avoided costs. Both need to be presented (even though there are uncertainties) for a balanced picture, as highlighted in AR5. The limitations of mitigation cost estimates should be mentioned, and the costs should be put into context by comparing them to the costs of failing to meet the goal from climate impacts and lost economic growth - are these higher or lower than the abatement costs, and how does this compare to the uncertainty in economic growth over the same period? Perhaps B5.5 could be included here? [United Kingdom (of Great Britain and Northern Ireland)]	
5008	19	36	19	52	This section on costs could be greatly strengthened if information were provided on how the additional costs of achieving 1.5 could be minimised (earlier action etc). [United Kingdom (of Great Britain and Northern Ireland)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5010	19	36	19	37	This narrow focus on upfront capital costs obscures many of the benefits of action, for example for air quality and biodiversity (although noting potential trade-offs). These benefits should be made more explicit in this section [United Kingdom (of Great Britain and Northern Ireland)]	
5026	19	36	19	37	Abatement costs could be presented also in relation to avoided costs in terms of impacts. [Italy]	
5146	19	36	19	37	Move this paragraph after D2.4 (see comment above) and add detail on the 2 degree abatement costs (such as the following information from Rogelj et al, 2018: "2-6% consumption loss by 2050 (0.04-0.14 perc point reduction in growth" Just mentioning that it is greater than for 2°C is not useful. Then add a statement that the economic losses from climate change according to Burke et al, 2018 are "5-8% GDP loss (2°C) and 3-5% (1.5°C)" and further add that avoided adaptation costs and net co-benfits are not included in these numbers (assuming they cannot be quantified). [Hungary]	
5236	19	36	19	37	very negative statement. If possible, add information on the reduction of adaptation costs because of the 1.5ºC consistent pathway. [Spain]	
5302	19	36	19	37	D2.1) Where the number "3-4 times higher" comes from is not clear. Reference is made to Chap. 4.4.5 and on p. 4-89 there is reference to marginal abatement costs in terms of CO2 prices, but this is not the same as saying what total costs will be. Elsewhere in the cited chapters and sections there is a lot of discussion of uncertainty, balancing costs and benefits, co-benefits, etc. These issues are particularly important for LDCs, so the use of overly simplistic statements should be avoided. [Zambia]	
5430	19	36	19	37	D2.1: The statement on abatement costs being 3-4 times higher for 1.5 compared to 2dC is very misleading and needs to change. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5 consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5 being about three to four times higher compared to 2dC with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues. [cont'd below] [Saint Lucia]	
5432	19	36	19	37	[cont'd] Also include important statement from Ch 2 page 4: "Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)." In this context, also the need to reduce "socially inefficient" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels [Saint Lucia]	
5798	19	36	29	37	This finding would seem to be rather incomplete and as such imprecise. It should be explained (1) how high the costs are, (2) how they relate to assumed economic development (consider, e.g., content such as of section B5.5) , (3) what the estimated net costs and benefits are, after consideration of avoided damages and synergies, (4) how relevant carbon price (alone) is a driver for mitigation action as well as what it actually expresses, as discussed in Chapter 2 and Chapter 4. Indeed, there may be high confidence from the modelling but is there really high confidence in modelling assumptions? History shows otherwise. This should be explained or proper caveats to the meaning or definition of the stated cost given. It could be considered to integrate some wordings into this paragraph about the co-benefits of stringent climate policy, either in D2.1 or in its own paragraph, given the general relavance of putting costs into the context of the benefits of action. Many of these benefits cannot or can only with difficulty be assessed in monetary values, and also such benefits should be acknowledged. [Sweden]	
5988	19	36	19	37	"Abatement costs" should be replaced by "Marginal abatement costs", because total abatement costs differ less. The fact that « on average » is used in the same sentence adds to the confusion (the meaning is on average between different models). We did not find a comparison with total abatement costs in the text. To avoid that policy makers think that the total cost will be quadrupled, at least a proxy for total abatement costs should be mentioned in the same paragraph. One could mention that the mean total investments in the energy system increase by roughly 15 % under a 1.5 °C scenario compared to 2°C scenario (figure 2.27) (Box 4.8 table 1 finds comparable results for mean abatement costs) . In general, the summary gives (too) little information about costs. The SPM should provide a balanced approach regarding cost of mitigation, cost of adaptation and cost of impacts. In case that it is not possible to report proxies of total costs, it would be better to delete paragraph 2.1, because otherwise it would be misleading. Any reference to costs should come with a clear explanation on the context, ie what these costs are about. [Belgium]	
6142	19	36	19	37	D2.1 - Costs higher 3-4 times from 1.5 to 2C. What is meant by costs here? How does this compare to the climate change damage and adaptation costs without mitigation? [Estonia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6200	19	36	19	37	Having read the whole report (sections 2.5.1, 2.5.2, 4.4.5, 5.5.2), we find that significant uncertainties and complexities on the estimation of differences between the 1,5° C scenario vis a vis a 2°C, in terms of investments and/or related abatement costs. [Argentina]	
6202	19	36	19	37	Having read the whole report (sections 2.5.1, 2.5.2, 4.4.5, 5.5.2), we find that significant uncertainties and complexities on the estimation of differences between the 1,5° C scenario vis a vis a 2°C, in terms of investments and/or related abatement costs.In this concern, we consider that a relevant message should be focused on the costs of a 1,5°C scenario vis a vis the costs of inaction o delayed action. Having said this, we consider that a more appropriate approach would be as described in section 4.4.5.1 (Page 86) that reads: In summary and despite inherent uncertainties, the emerging literature indicates a gap between current investment patterns and those compatible with 1.5°C (or 2°C) pathways (limited to medium evidence, high agreement). Estimates and assumptions from modelling frameworks suggest a major shift in investment patterns and entail a financial system effectively aligned with mitigation challenges (high confidence). [Argentina]	
6278	19	36	19	37	The statement on abatement costs being 3-4 times higher for 1.5°C compared to 2°C is inconsisent and may mislead, thus needs re-structuring the statement. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message in my opinion. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5°C consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5°C being about three to four times higher compared to 2°C with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues...continued below. [Fiji]	
6280	19	36	19	37	May I suugest for the inclusion of the another statement from Ch 2 page 4: that is, "Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)." In this context, also the need to reduce "socially inefficient" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels... [Fiji]	
6546	19	36	19	37	Abatement costs are relevant, but more relevant is the economic impact. I would add that here if possible. Should be feasible from literature. It is actually quite unclear what is meant with "abatement costs" here. Which year? Cumulative? Which discount rate is used? More specific information is needed here. For NDC assessments, Hof et al 2017 as cited in Chapter 4 find that adaptation costs of 1.5 degree pathway is 2 times as high as 2 degree pathway in 2030. Does not seem to be consistent with "high confidence" of 3-4 times higher. The statement also seems at odds with Figure 2.27, where approximately a doubling of investment costs is shown. [Netherlands]	
6548	19	36	19	37	This paragraph should be in bold; ideally it would better fit in with a separate bold section on the economic aspects of 1,5 pathways. Move this paragraph after D2.4 (see comment above) and add detail on the 2 degree abatement costs (such as the following information from Rogelj et al, 2018: "2-6% consumption loss by 2050 (0.04-0.14 perc point reduction in growth" Just mentioning that it is greater than for 2C is not useful. Then add a statement that the economic losses from climate change according to Burke et al, 2018 are "5-8% GDP loss (2oC) and 3-5% (1.5oC)" and further add that avoided adaptation costs and net co-benfits are not included in these numbers (assuming they cannot be quantified). [Netherlands]	
6638	19	36	19	37	D2.1) Where the number "3-4 times higher" comes from is not clear. Reference is made to Chap. 4.4.5 and on p. 4-89 there is reference to marginal abatement costs in terms of CO2 prices, but this is not the same as saying what total costs will be. Elsewhere in the cited chapters and sections there is a lot of discussion of uncertainty, balancing costs and benefits, co-benefits, etc. These issues are particularly important for LDCs, so the use of overly simplistic statements should be avoided. [Sudan]	
6688	19	36	19	36	We cannot really find the reference to the "3-4 times higher" in any of the chapters of the report. Is it meant "marginal abatement costs"? If so, please consider to clarify and if appropriate also indicate the result in absolute terms, e.g. the carbon price. Furthermore, this cost does not include the benefits of limiting waring to 1.5 compared to 2C, and should also be mentioned if there are results about this in the main report. [Norway]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6780	19	36	19	37	D2.1: The statement on abatement costs being 3-4 times higher for 1.5 compared to 2dC is very misleading and needs to change. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5 consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5 being about three to four times higher compared to 2dC with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues. [cont'd below] [Marshall Islands]	
6782	19	36	19	37	[cont'd] Also include important statement from Ch 2 page 4: "Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)." In this context, also the need to reduce "socially inefficient" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels [Marshall Islands]	
6922	19	36	19	37	D2.1) Where the number "3-4 times higher" comes from is not clear. Reference is made to Chap. 4.4.5 and on p. 4-89 there is reference to marginal abatement costs in terms of CO2 prices, but this is not the same as saying what total costs will be. Elsewhere in the cited chapters and sections there is a lot of discussion of uncertainty, balancing costs and benefits, co-benefits, etc. These issues are particularly important for LDCs, so the use of overly simplistic statements should be avoided. [Gambia]	
7202	19	36	19	37	Refer to the underlying report: (Chapter 4 Strengthening and implementing the global response Section 4.4.5.1: The Core Challenge: Cost Efficiency, Coordination of Expectations and Distributive Effects).In the Section on mastering the cost efficiency challenge, regulations and standards are suggested. However, one must keep in mind that creating functioning markets and regulatory structures is: (a) an inherent and evolutionary part of the development process; and (b) does not come without costs. One cannot just assume that somehow such an enabling environment will come in the developing world to support private sector investment in sustainable development and climate change. This fact has to be recognized in the Report. [India]	
7234	19	36	19	37	Are synergies and trade-offs included in this cost estimate? If not, then this should be made clear and, ideally the likely implications of including them mentioned, even if cannot be quantified i.e. will synergies and trade-offs increase or decrease these costs? Also, ideally the benefits of 1.5 deg C in terms of avoided harm should also be included. If that cannot be computed, perhaps this should be explicitly stated. [India]	
8240	19	36	19	36	The reference to "abatement costs" should clarify that it refers to marginal abatement costs, not total costs, if the costs are derived from the carbon price estimates presented in Chapter 2. [United States of America]	
8242	19	36	19	36	What are the abatement costs and how did the authors arrive at the range? [United States of America]	
8244	19	36	19	37	The statement, "Abatement costs resulting in 1.5°C-consistent pathway modelling are 3-4 times higher, on average, compared to holding warming to 2°C," is an important point that should receive greater emphasis. This statement offers one of the few quantitative estimates of much more challenging limiting warming to 1.5°C is relative to holding warming to 2°C, and this type of comparison is needed to inform policymakers about the trade-offs involved in choosing a more ambitious target. However, this statement needs to be brought into line with the supporting information from the underlying chapter. From the Chapter 2 Executive Summary (page 2-5), "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5°C-consistent pathways (high confidence). Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5°C being about three to four times higher compared to 2°C." (See also Chapter 2, page 2-79, Section 2.5.2.1 Paragraph 2.) The price of emissions discussed in Chapter 2 is the marginal cost of abatement, which is not equivalent to the abatement costs referred to in D2.1. Furthermore, the SPM does not reflect the main thrust of the point in Chapter 2, namely that all modeled 1.5°C-consistent pathways include policies reflecting a high price on emissions. [United States of America]	
8246	19	36	19	37	Would be useful to include absolute cost estimates here too. 2°C pathways are significantly more expensive than others, which is not reflected here. [United States of America]	
8248	19	36	19	37	Suggest to adopt the same qualifying language in Chapter 2 that describes the mitigation costs for limiting warming to 1.5°C compared to 2°C. Specifically, should add "with large variations across models and socio-economic assumptions". [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8434	19	36	19	37	D2.1) Where the number "3-4 times higher" comes from is not clear. Reference is made to Chap. 4.4.5 and on p. 4-89 there is reference to marginal abatement costs in terms of CO2 prices, but this is not the same as saying what total costs will be. Elsewhere in the cited chapters and sections there is a lot of discussion of uncertainty, balancing costs and benefits, co-benefits, etc. These issues are particularly important for LDCs, so the use of overly simplistic statements should be avoided. [Nepal]	
8850	19	36	19	37	Suggest balancing the statement on abatement costs with clear reference to the opportunities of abatement and other action on climate change. [Australia]	
9028	19	36	19	36	Suggest rephrasing to: "Abatement costs for 1.5°C-consistent pathway modelling would be 3-4 times higher, on average, than those for 2°C-consistent pathways". [Australia]	
9062	19	36	19	37	D2.1: The statement on abatement costs being 3-4 times higher for 1.5 compared to 2dC is very misleading and needs to change. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5 consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5 being about three to four times higher compared to 2dC with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues. [cont'd below] [Solomon Islands]	
9064	19	36	19	37	[cont'd] Also include important statement from Ch 2 page 4: ""Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)."" In this context, also the need to reduce ""socially inefficient"" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels [Solomon Islands]	
9188	19	36	19	37	D2.1: The statement on abatement costs being 3-4 times higher for 1.5 compared to 2dC is very misleading and needs to change. The underlying chapter ES does not refer to abatement cost, but to carbon pricing as a necessary policy. That is a very different message. See Chapter 2 page 5: "Policies reflecting a high price on emissions are necessary in models to achieve cost-effective 1.5 consistent pathways. Other things being equal, modelling suggests the price of emissions for limiting warming to 1.5 being about three to four times higher compared to 2dC with large variations across models and socioeconomic assumptions. A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies. Other policy instruments like technology policies or performance standards can complement carbon pricing in specific areas. If cost comparison is included, this should be compared to the increase in GDP". Also needs to clarify that this does not account for any economic benefits from avoided climate damages, co-benefits from avoided air pollution, or economic opportunities arising from redistribution of carbon revenues. [cont'd below] [Nauru]	
9190	19	36	19	37	[cont'd] Also include important statement from Ch 2 page 4: ""Climate damages, avoided impacts, or societal co-benefits of modelled transformations remain largely unaccounted for (in pathway literature)."" In this context, also the need to reduce ""socially inefficient"" fossil fuel subsidies and policies to compensate for unintended distributional effects needs to be included (4-8) as well as evidence on need for evolution of financial systems (4-9). Further, if any costing information is given, they should be contextualized like in the AR5 e.g. by annualized reduction in consumption growth reduction compared to baseline or years delay in reaching the 2100 welfare levels [Nauru]	
9344	19	36	19	37	The message is misleading because it is not clear how much the total costs (abatement and avoided losses of warming) are. [Switzerland]	
958	19	38	19	38	We suggest to reverse D2.1 and D2.2 [France]	
404	19	39	19	42	D2.1) Where the number "3-4 times higher" comes from is not clear. Reference is made to Chap. 4.4.5 and on p. 4-89 there is reference to marginal abatement costs in terms of CO2 prices, but this is not the same as saying what total costs will be. Elsewhere in the cited chapters and sections there is a lot of discussion of uncertainty, balancing costs and benefits, co-benefits, etc. These issues are particularly important for LDCs, so the use of overly simplistic statements should be avoided. [Chad]	
406	19	39	19	42	D2.2) Chapters listed should include {4.4.3, 4.4.4, 4.4.5} [Chad]	
960	19	39	19	42	Be more specific especially with economic actors : add at the end of this paragraph : “Economic actors should draw low-carbon strategies at sectorial levels, consistent with a 1.5°C trajectory.” [France]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1744	19	39	19	43	References cited neither mentioned nor defined the term "innovative" instrument. So it is unclear what instruments are innovative and what instruments are not innovative. So please drop the term "innovative" and leave it to read simply as "non-price and price insturments". [Saudi Arabia]	
2538	19	39	19	4	On subnational involvement and multi-level governance, unfortunately, the report did not add results for non-state mitigation action in the main part in Chapter 4. The study by Roeflsema (2018), for instance, provides useful aggregate numbers, so to only quote Michaelowa and Michaelowa who find "100 of such mitigation initiatives have low effectiveness" is misleading (Chapter 4, p. 61). Would recommend to include additional findings from Roelfsema and UNEP gap report, which estimate the effect could be 1-3 GtCO2eq by 2030 and elevate them to the SPM. [European Union (EU)]	
3828	19	39	19	4	You state that "Limiting global warming to 1.5°C requires enhanced action by countries and non-state actors in the next decade". There are important structural decisions which influence emission pathways and which have to be taken in the next 3 years. The sentence as it currently is suggests that action can be postponed to the next decade in order to achieve the 1.5°C. Please rephrase in a way that clarifies that important decision have to be taken from now on and during the next decade, not "in 10 years", and replace "enhanced action" with "unprecedented action" to clarify the dimension of the challenge. [Germany]	
4180	19	39	19	42	D2.2: Replace the first sentence with stronger language from the ES of chapter 5 (5-6): "Limiting warming to 1.5 would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition. This needs "enhanced institutional capabilities" [Saint Kitts and Nevis]	
4182	19	39	19	43	D2.2: the reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the exec. summary of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient etc. [Saint Kitts and Nevis]	
5304	19	39	19	42	D2.2) Chapters listed should include {4.4.3, 4.4.4, 4.4.5} [Zambia]	
5306	19	39	19	42	D2.2) the paragraph mentiones that integrated policy packages are to be used- involving non-price and price instruments. Chapter 4- ES (page 4-8) specifies what these policy instruments could be: the reduction of socially inefficient fossil fuel subsidiy regimes and innovative price and non-price national and international policy instruments, and would need to be complemented by de-risking financial instruments and the emergence of long-term low-emission assets. It would be good to include these in the SPM. Also as specified in the same paragraph (Chapter 4, page 4-8), and Chapter 2 (page 2-5) it is important to note that price instruments need to be complemented by non-price policy instruments. [Zambia]	
5308	19	39	19	42	Chapter 4, section 4.4.5.6 (page 4-96) has a useful statement on the policy packages that could be used to meet the finance goal of the Paris Agreement: "Carbon prices, regulation and standards, improved information and appropriate financial instruments can work synergistically to meet the challenge of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development', as in Article 2 in the Paris Agreement." It would be good to have this in the SPM. [Zambia]	
5434	19	39	19	42	D2.2: Replace the first sentence with stronger language from the ES of chapter 5 (5-6): "Limiting warming to 1.5 would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition. This needs "enhanced institutional capabilities" [Saint Lucia]	
5436	19	39	19	43	D2.2: the reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the exec. summary of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient etc. [Saint Lucia]	
6282	19	39	19	42	The statement seems to be weak and needs to be made stronger. Suggest to replace the first sentence with stronger language from the ES of chapter 5 (5-6): that is, "Limiting warming to 1.5°C would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition with urgency. This needs "enhanced institutional capabilities". [Fiji]	
6284	19	39	19	43	The reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the ES of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient, etc. [Fiji]	
6550	19	39	19	43	delete this paragraph as it does not convey any useful information [Netherlands]	
6640	19	39	19	42	D2.2) Chapters listed should include {4.4.3, 4.4.4, 4.4.5} [Sudan]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6642	19	39	19	42	D2.2) the paragraph mentiones that integrated policy packages are to be used- involving non-price and price instruments. Chapter 4- ES (page 4-8) specifies what these policy instruments could be: the reduction of socially inefficient fossil fuel subsidiy regimes and innovative price and non-price national and international policy instruments, and would need to be complemented by de-risking financial instruments and the emergence of long-term low-emission assets. It would be good to include these in the SPM. Also as specified in the same paragraph (Chapter 4, page 4-8), and Chapter 2 (page 2-5) it is important to note that price instruments need to be complemented by non-price policy instruments. [Sudan]	
6644	19	39	19	42	Chapter 4, section 4.4.5.6 (page 4-96) has a useful statement on the policy packages that could be used to meet the finance goal of the Paris Agreement: "Carbon prices, regulation and standards, improved information and appropriate financial instruments can work synergistically to meet the challenge of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development', as in Article 2 in the Paris Agreement." It would be good to have this in the SPM. [Sudan]	
6784	19	39	19	42	D2.2: Replace the first sentence with stronger language from the ES of chapter 5 (5-6): "Limiting warming to 1.5 would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition. This needs "enhanced institutional capabilities" [Marshall Islands]	
6786	19	39	19	43	D2.2: the reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the exec. summary of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient etc. [Marshall Islands]	
6924	19	39	19	42	D2.2) Chapters listed should include {4.4.3, 4.4.4, 4.4.5} [Gambia]	
6926	19	39	19	42	D2.2) the paragraph mentiones that integrated policy packages are to be used- involving non-price and price instruments. Chapter 4- ES (page 4-8) specifies what these policy instruments could be: the reduction of socially inefficient fossil fuel subsidiy regimes and innovative price and non-price national and international policy instruments, and would need to be complemented by de-risking financial instruments and the emergence of long-term low-emission assets. It would be good to include these in the SPM. Also as specified in the same paragraph (Chapter 4, page 4-8), and Chapter 2 (page 2-5) it is important to note that price instruments need to be complemented by non-price policy instruments. [Gambia]	
6928	19	39	19	42	Chapter 4, section 4.4.5.6 (page 4-96) has a useful statement on the policy packages that could be used to meet the finance goal of the Paris Agreement: "Carbon prices, regulation and standards, improved information and appropriate financial instruments can work synergistically to meet the challenge of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development', as in Article 2 in the Paris Agreement." It would be good to have this in the SPM. [Gambia]	
7256	19	39	19	4	" The sentence to be reworded to reflect SDGs apply to all countries but the different goals and targets represent different degrees of challenge and ambition for different countries depending on their present state of development and other national circumstances (Osborn et al 2015) . "Limiting global warming to 1.5°C requires enhanced action by countries depending on their present state of development, their different capabilities and resources and other national circumstances and non-state actors in the next decade" Osborn, D., Cutter, A., & Ullah, F. (2015). Universal sustainable development goals. Understanding the transformational challenge for developed countries. Technical Report. London: Stakeholder Forum." [India]	
8250	19	39	19	39	"requires" is policy prescriptive, consider rewording [United States of America]	
8252	19	39	19	39	"enhanced" over what? [United States of America]	
8436	19	39	19	42	D2.2) Chapters listed should include {4.4.3, 4.4.4, 4.4.5} [Nepal]	
8880	19	39	19	41	Suggest re-phrasing as: "Limiting global warming to 1.5°C would require enhanced action by countries and non-state actors in the next decade. Stringent near-term policies to support the transitions required to limit warming to 1.5°C are likely to be more effective if integrated policy packages are used" [Australia]	
9066	19	39	19	42	D2.2: Replace the first sentence with stronger language from the ES of chapter 5 (5-6): "Limiting warming to 1.5 would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition. This needs "enhanced institutional capabilities" [Solomon Islands]	
9068	19	39	19	43	D2.2: the reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the exec. summary of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient etc. [Solomon Islands]	
9192	19	39	19	42	D2.2: Replace the first sentence with stronger language from the ES of chapter 5 (5-6): "Limiting warming to 1.5 would require all countries and non-state actors to strengthen their contributions without delay" and/or from ES of chapter 4: 4-5: "almost all countries would need to significantly raise their level of ambition. This needs "enhanced institutional capabilities" [Nauru]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9194	19	39	19	43	D2.2: the reference to "non-price" innovative mechanisms (e.g. coal phase-out) is important and should be kept, but more detail from the exec. summary of chapter 4 (pp 4-8) should be added, e.g. reduction of fossil fuel subsidies, carbon price alone is not sufficient etc. [Nauru]	
9346	19	39	19	39	Write: " …requires enhanced action by all countries …" [Switzerland]	
9536	19	39	19	4	Suggest removing "in the next decade" from "limiting global warming…requires enhanced action by all countries and non-state actors in the next decade". Internal consistency within the SPM is needed and as shown in Figure SPM.3 there are some scenarios consistent with limiting global warming to 1.5C in which emissions do not decline significantly in the next decade. [Canada]	
286	19	4	19	42	There is no confidence statement attached to the claim "Stringent near-term policies to support the transitions required to limit warming to 1.5°C are more effective when integrated policy packages are used, involving innovative non-price and price instruments." While the claim can be seen as 'common wisdom' of policy studies it may still be prudent to state that 'are generally found to be more effective...' or 'have generally been observed to be...' The point is that so far no country has truly and fully implemented a transition to a system compatible with 1.5C (as noted in D6.2) and thus there is no definitive empirical evidence although there are promising examples of partial progress. [Finland]	
8254	19	4	19	42	The use of the word "innovative" is unclear in this sentence. It would be helpful to provide more specific information on what features can make non-price and price instruments more effective. [United States of America]	
962	19	41	19	41	What is an "innovative" non-price policy? Drop "innovative" [France]	
3830	19	41	19	42	Replace ""non-price ... Instruments" by "instruments putting a price on GHG emissions and regulatory instruments". Policymakers may not know the term "price / non-price instruments". [Germany]	
4932	19	41	19	42	It is unclear to a non-specialist what is meant by integrated policy packages, non-price and price instruments. These should be explained. [United Kingdom (of Great Britain and Northern Ireland)]	
8256	19	41	19	41	"involving non-price and ..." does not seem to follow easily, so move the "are used" to the end of sentence. [United States of America]	
964	19	42	19	42	Add at the end of this sentence : "and when consistent with long-term objectives" [France]	
9348	19	44	19	44	Insert a new paragraph D2.2 bis: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems." {4.4.5} [Switzerland]	
966	19	45	19	46	This misses the message that there is a need for major reallocation of investment portfolio and a financial system aligned to mitigation challenges (cf 2.5.2.2 page 2-83). We suggest to write it as follow : "Limiting the global warming to 1.5°C requires reallocation of global investments, such as in energy sector, transportation, buildings, and water and sanitisation infrastructure, with an additionnal…" [France]	
1746	19	45	19	52	Reforming energy subsidies in line 49 is a sort of fiscal policies mentioned in line 48. It is unclear why the additional emphasis on subsidies. [Saudi Arabia]	
2540	19	45	19	52	The fact that investments for the 1.5 degree pathways are higher is not so relevant as the difference to the BAU investments. It should also be put into relation to possible avoided climate chnage related damage costs. [European Union (EU)]	
2542	19	45	19	52	Surely changing the composition of investment is at least as important as the need to increase the quantity. The headline findings of Ch4 stress the need for a realignment of investment. This could be stated more clearly. Also, as above the statements and numbers need to be put in context of the benefits (avoided costs and damages) that they imply. In particular many of the investments mentioned in mitigation and adaptive capacity in Ch4 (and their underlying policies) appear to be highly synergistic, not only with SDGs and other goals (education, health, disaster risk reduction) but also in terms of sound economic policy (e.g. subsidy reform). [European Union (EU)]	
3832	19	45	19	45	Please replace "water and sanitization infrastructure" by "water and sanitation" or "water, sanitation and waste management" if merited by the literature underlying the report. [Germany]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3834	19	45	19	51	The entire paragraph, while a useful and an important part of the summary, needs to be written in a much more concise way to explain the assessment made. Please specify more clearly what the basis for comparison is in the first sentence: 1.5C-Infrastructure investment will be higher than what? todays level or a future BAU scenario? Given the massive underinvestment in infrastructure and current global trends in urbanisation, population etc., wouldn't any future infrastructure spending be expected to be higher than "today". And are this all investments or only specific, climate-resilient investments? Are the percentage points incremental investment compared to BAU or 2C case (or today?), and (again) for all infrastructure or "just" the climate resilient part? Similarly, in the last sentence, the basis for the comparison is not clear to us: Investments are "expected to double" and fossil-fuel extraction (should it not be "investment in extraction?) to "decrease by about a quarter" in 1.5°C consistent pathways compared to the current investments/extraction or compared to 2°C pathways? From Chapter 2 page 2-83 we learn that these changes are seen by 1.5 pathways compared to the paths consistent with the current NDCs, which are in turn not consistent with 2°C global warming. Hence, doubling the investments and decreasing fossil-fuel extraction in the next two decades are not only necessary to limit to 1.5°C warming but also 2°C warming, which is very relevant to policy makers. We therefore urge the authors to be more specific about whether these changes are only necessary for 1.5°C, and amend this very important paragraph, in order to be more concise. [Germany]	
3836	19	45	19	52	Paragraph D2.3 is limited to investment issues and does not take into account further options in regard to fiscal policy options, namely a redirection of the annual capital revenues in the order of 5% to 10%, which seems to be quite innovative and significant as discussed in Chapter 4. Therefore we suggest to insert this issues as an example in addition to the statement on investments in low-carbon energy technologies, which is rather state-of-the-art thinking: "Estimates suggest that, in addition to climate-friendly allocation of public investments, a potential redirection of 5% to 10% of the annual capital revenues is necessary". (cf. ES CH4, p.9 1st para) [Germany]	
4056	19	45	19	52	These examples are mostly related to economical insentives. Please consider to also include more types of policies, for instance different types of regulations and public awareness initiavites if appropriate. [Norway]	
4184	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Saint Kitts and Nevis]	
4186	19	45	19	52	D2.3: This statement compared investment in 1.5 pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5 pathway with other pathway such as 2dC or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5 requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Saint Kitts and Nevis]	
4612	19	45	19	47	There should be a clear reference to the concrete amount of investment needs for achieving 1.5 degrees (page 4-86, 4.4.5.1 of Chapter 4). 1.7-2.5% is not the share out of global investments, but global GDP. It should also be stated that this figure refers only to energy investment and the investment needs would expand by a factor of three if transport and other infrastructures are included. D.2.3 Global investments in energy, transportation, buildings, and water and sanitisation infrastructure are higher in most 1.5°C-consistent pathways compared to today. Investment needs in energy systems are projected to be around 2.38 trillion USD between 2016 and 2035, representing between 2.5% of world GDP in MER and 1.7% of world GDP in PPP. Including investments in transportation and other infrastructures would increase the investment needs by a factor of three. [Japan]	
5002	19	45	19	52	In this paragraph or elsewhere would add additional important context to mention the risks of stranded assets (whether in that language or otherwise) - reflecting the finding in the underlying report that some carbon-intensive infrastructure will have to be retired early. [United Kingdom (of Great Britain and Northern Ireland)]	
5148	19	45	19	45	D2.3. In order to facilitate the necessary transition, global investments in energy, .. [Hungary]	
5150	19	45	19	52	add "industrial" after "buildings," [Hungary]	
5438	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Saint Lucia]	
5440	19	45	19	52	D2.3: This statement compared investment in 1.5 pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5 pathway with other pathway such as 2dC or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5 requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5800	19	45	19	52	The statements on changing investments on different sectors, low-carbon technologies, energy efficiency and fossile-fuel extraction are very aggregated. Further differentiation could be useful for example coal vs. oil vs. gas, reforming subsidies, etc. Chapters 2 and 4, furthermore, raise the issue of stranded assets and suchlike (sections 2.5.2.2, 4.2.2.3, 4.4.5.1), which should be relevant to raise viz. investments and investors. [Sweden]	
6286	19	45	19	52	This statement compared investment in 1.5°C pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5°C pathway with other pathway such as 2°C or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5°C requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Fiji]	
6552	19	45	19	45	sanitisation --> sanitation [Netherlands]	
6554	19	45	19	47	What is the difference with 2 degrees? That would be interesting to know. [Netherlands]	
6556	19	45	19	52	add "industrial" after "buildings," [Netherlands]	
6788	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Marshall Islands]	
6790	19	45	19	52	D2.3: This statement compared investment in 1.5 pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5 pathway with other pathway such as 2dC or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5 requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Marshall Islands]	
7208	19	45	19	5	Refer to the underlying report: Chapter 4 (75,11,75,15), (80,1,80,2) - The report cites ending of fossil fuel subsidies as an effective means of transitioning to a low carbon future. It needs to be highlighted that only inefficient fossil fuel subsidies need to be abloished. So long as the subsidies which are designed to socially protect the poorest and most marginalized people, remain relevant, abolishing them will only lead to exacerbating economic inequalities. [India]	
7212	19	45	19	5	Refer to the underlying report: Chapter 5 (36,17,36,25) - The report indicates that the scenario studies reveal an increase in energy cost due to stringent climate policy - which will slow down the transition to clean cooking fuels. It needs to be highlighted that addressing climate concerns at the cost of inducing soical harm, particularly to the poorest and the most vulnerable sections would be undesierable and against the principles of equity embedded in the UNFCCC. No climate action should lead to lost opportunities for a decent standard of living for developing communities. [India]	
7216	19	45	19	47	Estimation of additional ecomony wide investment requirement at the global level has potential to be misinterpreted. Better option is to state that investment requirement will vary from country to country and the developing countries will have to incur dispropotionately high investment. [India]	
7236	19	45	19	52	This is an important bullet but is currently unclear. In line 46, does the "additional" refer to a baseline of current investment levels? Or a moving baseline of expected investment levels from the present to 2035? How does this number compare to the additional investment required to reach 2 degree C? [India]	
7246	19	45	19	51	Para D2.3 should be removed. It does not faithfully represent the text and conclusions of the cited chapters. Whereas the chapters emphasize the absence of sufficient information and studies, the para as formulated here draws opposite conclusions. See for example Box 4.8 which states "The peer-reviewed literature that estimates the investment needs to scale up the response to limit warming to 1.5°C is limited" (Also see Section 4.6). Further "While total incremental investment for a 2°C-consistent pathway, including for transportation and other infrastructure, is estimated at 2.5% of global GFCF, there is no comprehensive study or estimate of these investments for a 1.5°C limit (BOX 4.8)". [India]	
8258	19	45	19	45	Do the authors mean "sanitation"? [United States of America]	
8260	19	45	19	52	Paragraph D2.3 should compare the 1.5°C pathways to 2°C pathways. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8262	19	45	19	52	The central claim in D2.3 that 1.5°C scenarios would entail "an additional 1.7% to 2.5% of annual economy-wide investment required from the present to 2035 rests almost entirely on the new discussion in 4.4.5 and Box 4.8, which has been substantially revised since the Second Order Draft. These numbers appear to derive from Box 4.8 Table 1, which is very poorly explained. The section notes that these numbers represent "around 2.38 trillion USD (in 2010 USD)" which represents 1.7 percent of world GDP in PPP terms and 2.5% (with an unexplained range of 1.6% to 4%) using market exchange rates. In general, the discussion in the box and the related discussion in the Chapter 4 Executive Summary contains numerous statements of potentially high importance for which the basis and sourcing of claims is unclear. The text in the box treats "mitigation investments" and "energy investments" as synonymous, ignoring the role of non-energy mitigation strategies. The text is also in some places focused on 2°C rather than 1.5°C scenarios. Given its salience, Box 4.8 and section 4.4.5.1 should be carefully revised for further IPCC review, or alternatively Box 4.8 and the quantitative statements in 4.4.5.1 for which references are not clearly provided should be deleted. This is a major problem for the SPM, as it is very important to represent the cost of 1.5°C scenarios, but the underlying material needs clarification and government review of the clarified information. [United States of America]	
8638	19	45	19	52	Messaging of the need for "realignment of investment" is critically important but can seem less important than the need for new investment [Ireland]	
8668	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Grenada]	
9070	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Solomon Islands]	
9072	19	45	19	52	D2.3: This statement compared investment in 1.5 pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5 pathway with other pathway such as 2dC or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5 requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Solomon Islands]	
9196	19	45	19	52	D2.3: the non-exhaustive list of "policies and measures" is not explicit in the referenced chapters and only covers market-based solutions. It fails to mention even the most basic option, which is "regulation" (4.4.5.6). Other alternatives are "improved information" (4.4.5.6), "demonstration projects and education" (FAQ 4.1, pp. 4-119). The IPCC chapters fails to mention "financial policy and regulation" explicitly, even though this is problably one of the most important types of policy to be implemented in order to comply with PA art 2.1(c). [Nauru]	
9198	19	45	19	52	D2.3: This statement compared investment in 1.5 pathway with todays level. What would be relevant is to add a comparison of invesments in 1.5 pathway with other pathway such as 2dC or reference/no climate. It needs to be reframed to highlight the necessary shift in investment. See ES chapter 2: 2-5: Limiting warming to 1.5 requires a marked shift in investment patterns. In addition, information needs to be added on need for investment in infrastructure and buildings and redirection of financial flows (ES chapter 4, 4-8). [Nauru]	
9538	19	45	19	46	Section D2.3 could be clearer. Revise the text to: “Increased global investments in energy…..infrastructure are needed in most 1.5C-consistent pathways compared to today, with an additional….to 2035.” [Canada]	
9540	19	45	19	52	Section D2 of the SPM should better reflect the IPCC report's emphasis (in section 4.4.5) on the scale of the shift that is required in global investment flows to limit global warming to 1.5°C. We recommend adding a sentence to this effect to SPM Section D2.3, to provide a segue to the last sentence, as follows: "Moreover, consideration must be given to how these instruments and policies can be aligned with one another in order to meet the challenge of making global investment flows consistent with a low greenhouse gas-emission pathway." [Canada]	
4258	19	46	19	46	D2.3 mentions that the annual economy-wide investment additionally required from the present to 2035 in most 1.5°C-consistent pathways are 1.7%?2.5%, in which the data lack description in specification, definition, source and precondition, hence tending to mislead policymakers into the belief that to be 1.5°C-consistent would require very limited additional efforts. So it is suggested to delete “with an additional 1.7%?2.5%”. According to Comment No 16, it is suggested that the text on investment in this paragraph be relocated to C4.3 rather than be repeated here. [China]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4934	19	46	19	47	It needs to be clearer what these percentages relate to - current levels? GDP? Could this give more information in the summary on the geographic, sector, technology split of this amount, even if qualitative? There possibly also should be more reference to the incremental costs discussion from chapter 4 (Box 4.8), and how this relates to the above figure. For example, does the range include non energy sectors and does it cover 1.5 degree and/or 2.0 degree pathways (Box 4.8 from chapter 4 mainly refers to the incremental mitigation costs required to stay below a 1.5 degree pathway, while the OECD estimates are for 2.0 degree pathways)? [United Kingdom (of Great Britain and Northern Ireland)]	
8264	19	46	19	46	Unclear what the percentages here are additional to. The whole economy or investments in these particular sectors? [United States of America]	
288	19	47	49	19	The claim "Such changes can be enabled by a portfolio of policies and measures, including pricing instruments, fiscal policies, technology policies, performance standards and reforming of energy subsidies" should be complemeneted with a statement saying something like "The development of such portfolios will require policy experimentation to support innovative policy designs". The SPM should make clear that policy portfolios cannot be developed simply by scrambling a set of policy instruments that sound useful and have been shown individually to have some desirable properties. [Finland]	
968	19	47	19	47	We suggest to add this sentence after « 2035 » taken from Box4.8 in order to give other relevant information concerning investments : "The mean incremental share of annual mitigation investments to stay well below 2°C is 0.36% (between 0.2–1%) of global Gross Domestic Product (GDP) over 2015–2035. Such changes..." [France]	
3838	19	47	19	49	Please include in the list of policies and measures "de-risking instruments to mobilize private climate investment" (cf. Section 4.4.5.4). [Germany]	
290	19	49	19	5	"...investments in low-carbon energy technologies and energy efficiency is expected to roughly double..." should read: "...investments in low-carbon energy technologies and energy efficiency are expected to roughly double..." [Finland]	
2544	19	49	19	52	The last sentence is misleading. Rephrase. It should state the "expected" investments in low carbon and fossil fuel technologies AND the investments needed for 1.5°C & 2°C in comparison. 'Expected' investment for 1.5°C is highly misleading. [European Union (EU)]	
4936	19	49	19	51	Currently phrased "is expected to roughly double in 1.5ºC consistent pathways". Elsewhere it is phrased just as "roughly doubles in 1.5ºC consistent pathways", i.e. not saying "expected to", which implies that is what is actually on course to happen. [United Kingdom (of Great Britain and Northern Ireland)]	
5802	19	49	19	52	How would this compare to a 2oC-consistent pathways? What is the implied need of increased ambition? [Sweden]	
6558	19	49	19	51	Add after "decades": "required" ; replace "is" by "are" [Netherlands]	
8500	19	49	19	51	This could be bold [Zimbabwe]	
8640	19	49	19	52	Statement on expected doubling of investments is misleading and should identify Business As Usual invesetment along with investments needed for 1.5 degree and 2 degree pathways [Ireland]	
1748	19	5	19	52	Could not trace the doubling of energy efficiency mentioned in line 50 through the sections 2.5.2, 4.4.5 or Box 4.8 -- please double check? [Saudi Arabia]	
4622	19	5	19	5	investments in low-carbon energy technologies and energy efficiency is expected ==> investments in low-carbon energy technologies and energy efficiency are expected [Japan]	
8266	19	5	19	51	Replace "is" with "would be"; "decreases" with "would decrease" [United States of America]	
8754	19	5	19	5	Middle of the line says "energy efficiency is expected", it should be "energy efficiency are expected" [Maldives]	
970	19	51	19	51	We guess that it means "fossil-fuel extraction investments" instead of "fossil-fuel extraction" ? If our interpretation is correct, we suggest to add "investments" in the expression. [France]	
4938	19	51	19	51	It is unclear whether this line refers to the amount of fossil fuel extraction decreasing by a quarter, or the investment into fossil fuel extraction going down by a quarter. [United Kingdom (of Great Britain and Northern Ireland)]	
6854	19	51	19	51	Delete "with fossil-fuel extraction decreases by about a quarter". [United Arab Emirates]	
9350	19	51	19	51	Write: " … fossil-fuel extraction and use decreases …" [Switzerland]	
9352	19	51	19	51	It is not clear why the decrease in fossil-fuel is only by about a quarter. This message is not compatible with other messages of the SPM that indicate major transformations in the energy sector for 1.5 degrees-consistent pathways. [Switzerland]	
2546	2	1	2	9	Paragraphs D2.4 and D2.5 provide very generic/common wisdom messages. For example innovation policies aim to boost commercialisation by definition, thus the added value of such statement is questionable. We propose to eiher delete or re-phrase with a more specific message. [European Union (EU)]	
2548	2	1	2	4	This is a generic statement that is true for any innovation policy. What about climate-related innovation policies? Do we have examples or ex-post evaluation of innovation policies that proved effective in the climate domain ? That would be a very useful information. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3840	2	1	2	14	These paragraphs address more ore less generic principles of how to establish new policy directions. Either provide more specific information on the current situation in comparison to the upscaling required for 1.5°C and for 2°C or integrate/abridge these paragraphs. [Germany]	
3842	2	1	2	14	The paragraphs D2.4.-2.6. are mainly focusing on the public/ governmental and private sphere (information, acceptability, education and innovation policy), and do not include the necessary focus on mitigation and corresponding instruments in the area of industry, business and finance. This makes chapter D2 seem biased and incomplete. Please expand information from chapter 4 and 2 on the need for mitigation and transformation in the industry, business and finance sectors (including driving factors/ dynamics, barriers and possible instruments). [Germany]	
3844	2	1	2	14	Para D.2.4 and D.2.5 miss confidence qualifiers, whereas D2.5 puts "high confidence" on a phrase that states "… can accelerate…" which is not really a factual statement. Please revise. [Germany]	
4058	2	1	2	2	This sentence can be misunderstood. The second part, starting with "as well as on the degree", is confusing. Please consider to rephrase the sentence and make clear which factors that must be combined (only R&D and incentives for market uptake?). Also please consider whether the term "as well as on the degree of cooperation" is appropriate in this context. [Norway]	
4390	2	1	2	2	This sentence does not seem to be clear. What's the relation between 'effective innovation policies' and 'the degree of cooperation between governments and the private sector'. My suggested sentence on the basis of my understanding is as follows; ? Effective innovation policies combine support for research and development and incentives for market uptake, and the policy effectiveness depends on the degree of cooperation between governments and the private sector. or ? Effective innovation policies combine support for research and development and incentives for market uptake through cooperation between governments and the private sector. [Republic of Korea]	
4392	2	1	2	4	Insert a sentence. ? More effective technology innovations are needed to accomplish 1.5?-consistent pathways, these include development of disruptive technologies and integration/convergence among climate mitigation and adaptation technologies. [Republic of Korea]	
4394	2	1	2	4	More robust technological innovation is needed to achieve the 1.5?. Innovation is required through fusion of reduction and adaptation technologies including 'Disruptive Technology'. [Republic of Korea]	
4940	2	1	2	4	In contrast to other statements in the SPM, there is no confidence assessment associated with this. Additionally, this statement is very generalised and bland to the point of not providing any significant insight to policy makers. It's trivially obvious that innovation policy can contribute to the adoption of new technologies. Is there any point in stating this? Please consider the value added by the inclusion of this statement and if it is still deemed necessary, please add a confidence statement. [United Kingdom (of Great Britain and Northern Ireland)]	
5804	2	1	2	8	Shoud provide confidence language also here. How robust are the findings? [Sweden]	
8268	2	1	2	4	Statement D2.4 is vague with no value-added information relative to 1.5°C. Suggest deleting. [United States of America]	
8270	2	1	2	4	The syntax of Paragraph D2.4 is not correct; it should be revised so that it is intelligible. [United States of America]	
8272	2	1	2	14	None of these statements are specific findings related to 1.5°C of global warming. They should be edited to provide specific findings or removed. [United States of America]	
8852	2	1	2	4	Suggest this statement be more specific by referencing the likely innovation and R&D required in the particular sectors and technologies most relevant to the SPM, for example, in energy, carbon dioxide removal, agriculture, and water resource management. [Australia]	
9542	2	1	2	1	Recommend revising the statement to: "Effective innovation policies [add: often] combine support for research…". [Canada]	
972	2	2	2	2	"Private sector" could be replaced by "non-state actors", as the commitments of civil society, scientific organizations, ... are also necessary. [France]	
3846	2	2	2	2	Please replace "as well ...degree of" by "and mobilize" [Germany]	
8702	2	2	2	2	Delete "on the degree of" (for grammatical logic) [New Zealand]	
9544	2	2	2	2	To clarify this text, the words "on the degree of" should be removed and "cooperation" replaced with "collaboration." [Canada]	
4396	2	3	2	4	Both national and international innovation policies can contribute not only to the commercialisation and widespread adoption but also to the development of new technologies. Therefore, We suggest the change of the sentence by inserting the 'early stages' of technology cycle. ? Both national and international innovation policies can contribute to the development, commercialisation and widespread adoption of new technologies. [Republic of Korea]	
8502	2	3	2	4	Could include favourable financial flows to developing countries [Zimbabwe]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5152	2	4	2	4	widespread adoption of new technologies that contribute to effective mitigation and adaptation actions. [Hungary]	
6560	2	5	2	5	Insert a new Headline statement covering paragraphs D2.5 and D2.6,. Something like: " Human behaviour and public acceptance of policies can be a barrier to achieving the 1.5C limit. Ample attention is required from governments to involve the public in decision making and to promote behavioural change." [Netherlands]	
292	2	6	2	8	The text "policy to limit global warming to 1.5°C and to adapt to the consequences, and depends on the evaluation and distribution of expected policy consequences and perceived fairness of decision procedures." should be changed to e.g. "policies [to be consistent with e.g. D2.4 using plural] to limit global warming to 1.5°C and to adapt to the consequences, and depends i.a. on the design of the policies, the [...] distribution of expected consequences and their perceived fairness as well as the decision procedures. [The point is that 'evaluation' is only a way of determining the consequences. The perceived fairness may or may not agree with some 'objective' way of judging fairness as strong lobbying groups are likely to affect also public acceptability] [Finland]	
974	2	6	2	6	We suggest to add this in order to clarify this point : "Public appropriation of climate change challenges, and acceptability of synergies and trade-offs, can enable …" [France]	
4066	2	6	2	8	In the spirit of shortening the SPM, this paragraph could be considered deleted. [Norway]	
4942	2	6	2	8	In contrast to other statements in the SPM, there is no confidence assessment associated with this. Additionally, this statement is very generalised and bland to the point of not providing any significant insight to policy makers. It is trivially obvious that public acceptability is important. Is there any point in stating this? If you still think yes, please include a confidence statement. [United Kingdom (of Great Britain and Northern Ireland)]	
5154	2	6	2	8	Add a sentence on the importance of engaging the public in decision making processes to enhance acceptanbility of policies and interventions. [Hungary]	
5990	2	6	2	8	Proposition to add this sentence at the end of D2.5 : "Managing the impact on workers in economic sectors that are subjects to rapid changes related to decarbonization (like mining) is important for acceptability, this can be done in an inclusive way in the context of a 'just transition'." (on the basis of messages from section 5.4.1.2) [Belgium]	
6562	2	6	2	8	Add a sentence on the importance of engaging the public in decision making processes to enhance acceptanbility of policies and interventions. [Netherlands]	
7262	2	6	2	8	Remove D2.5. This is a catch all sentence that applies to any target for limiting temperature rise and has no specific relevance to the 1.5 deg. C target alone. [India]	
9354	2	6	2	6	Write: "Public information and consummers' choices can enable …" [Switzerland]	
9546	2	6	2	6	Recommend replacing the term "acceptability" with "acceptance" in order to improve the clarity and readibility of this sentence. Also recommend replacing the term "policy" with "policies and measures" to correct a minor editorial error and improve the clairty of this sentence. [Canada]	
8274	2	7	2	7	Split into 2 sentences: "...consequences. Acceptability depends...." [United States of America]	
8276	2	8	2	8	It is unclear what "decision procedures" means; moreover, is the issue the perceived fairness of the "procedures" that are used or also just the decisions/approaches that are taken (leaving aside the procedures). Consider clarifying. [United States of America]	
976	2	1	2	14	D2.6: Length of the sentence impedes understanding. [France]	
3848	2	1	2	14	We suggest reordering the information provided in the paragraph and separating the two statements. Please start with the most important issue and then provide more detail: "D2.6. Wide scale behaviour changes are assumed in 1.5°C-consistent pathways to adapt to and limit global warming to 1.5°C (confidence statement). This change can be accelerated by education, information and feedback, and community approaches that rely on Indigenous and local knowledge, when combined with the policies mentioned in D2.3 and tailored to motivations and circumstances of specific actors and contexts (confidence statement). {1.1, 1.5, 4.3.5, 4.4.1, 4.4.3, Box 4.3, 5.5.3, 5.6.5}. This would also allow to provide confidence level to the statements of the paragraph. [Germany]	
4944	2	1	2	14	Indigenous knowledge is of course very important, but could you be clearer as to how it is able to catalyse wide scale (as opposed to local) transformation? [United Kingdom (of Great Britain and Northern Ireland)]	
5156	2	1	2	1	D2.6. Education, information, public awareness and feedback, and [Hungary]	
5238	2	1	2	1	Add, before "that rely" the words "including those". This paragraph could be read that only education and info from indigenous peoples and local communities can help fighting climate change. It is undeniable that their knowledge helps, but other types of knowledge, information, education and feedback shouldn't be excluded [Spain]	
7264	2	1	2	14	Statement D2.6 to be rephrased as : “Education, information and feedback, and community approaches that tackle climate change scepticism as well as rely on Indigenous and local knowledge, and tailored to motivations and circumstances of specific actors and contexts depending on their present state of development, their different capabilities and resources and other circumstances, can accelerate the wide scale behaviour changes assumed in 1.5°C-consistent pathways to adapt to and limit global warming to 1.5°C. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8278	2	1	2	1	It would be better to refer to approaches that are "informed by" Indigenous and local knowledge; as some successful approaches may rely on a blend of this knowledge and other sources of information. [United States of America]	
9356	2	1	2	11	Contrary to the IPBES, the IPCC has no methodology to include Traditionnal Local Knowledge in its works. Therefore, the part of the sentence " … that rely on Indigenous and local knowledge" raises a number of methodological questions and puts in question part of the D2.6 statement. [Switzerland]	
9548	2	1	2	1	Suggest changing "...that rely on Indigenous and local knowledge…" to "…that integrate Indigenous knowledge and local knowledge...", since it will better demonstrate the value of proactive engagement of Indigenous peoples and their knowledge in responding to climate change, as referred to in chapters 4 and 5 (e.g. 4.1, 4.4 and 5.3). [Canada]	
9550	2	1	2	11	Please change 'Indigenous and local knowledge' to Indigenous knowledge and local knowledge so that it is clear that the two knowledge systems are separate. The Inuit Circumpolar Council feels strongly that Indigenous Knowledge and local knowledge should not be lumped together. They are very different and distinct. Indigenous knowledge is based on a specific culture and knowledge system, has its validation process and is passed forward from generation to generation, often thousands of years old. Local knowledge is aqcuired from experiences and observations made by living in a specific place, but is not necessarily based on a knowledge system or a specific culture. These terms cannot be used interchangeably. Please therefore refer to Indigenous knowledge and local knowledge separately. [Canada]	
6564	2	12	2	13	"wide scale behaviour changes assumed in 1.5C-consistent pathways" reads as if all 1.5C pathways assume behaviour change. Is that indeed the case? [Netherlands]	
5806	2	13	2	13	"to adapt to and limit global warming to 1.5oC" would seem to be redundant. Delete? [Sweden]	
978	2	14	2	14	Chapter 4.3.5.5 is missing in the references of D2.6. It underlines how indigenous knowledge is crucial for adaptation. [France]	
5992	2	15			Proposition to add a new § D2.7 : "Pathways that presents lower challenge for adaptation are characterized by high levels of human development and reduced levels of population growth. Higher female educational attainment in the future is an important parameter for adaptation in the context of sustainable development and efforts to eradicate poverty." (on the basis of messages from section 2.3.1.1) [Belgium]	
408	2	16	2	19	D2.2) the paragraph mentiones that integrated policy packages are to be used- involving non-price and price instruments. Chapter 4- ES (page 4-8) specifies what these policy instruments could be: the reduction of socially inefficient fossil fuel subsidiy regimes and innovative price and non-price national and international policy instruments, and would need to be complemented by de-risking financial instruments and the emergence of long-term low-emission assets. It would be good to include these in the SPM. Also as specified in the same paragraph (Chapter 4, page 4-8), and Chapter 2 (page 2-5) it is important to note that price instruments need to be complemented by non-price policy instruments. [Chad]	
1704	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Belize]	
1750	2	16	2	19	Policy makers will be looking for a statement telling on how much the need for adaptation will be reduced under 1.5 °C comapred to 2 °C more than how to adapt to the residual impacts under 1.5 ?C. The focus of this SPM statement seems to be on adapting to the residual impacts rather than on the incremental/avoided impacts [Saudi Arabia]	
2550	2	16	2	19	This sentence and following ones would benefit from giving some examples and quantification. Most statements remain rather vague. [European Union (EU)]	
3850	2	16	2	19	A similar statement comparing adaption for 1.5 °C and for 2°C would be of interest for decision makers. Are synergies higher when adaptation is "only" necessary for 1.5°C? Do trade-offs increase with the amount of adaptation necessary? Does the extent to which adaptation is possible change with the pathways? [Germany]	
4188	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Saint Kitts and Nevis]	
5310	2	16	2	19	There is no mention of how the adaptation needs will be lower in a 1.5°C world in the SPM, therefore this needs to be lifted to the SPM, perhaps as a separate point under D3. Wording can be taken from Chapter 4, page 4-5: "Adaptation needs will be lower in a 1.5°C world compared to a 2°C world (high confidence)" [Zambia]	
5442	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Saint Lucia]	
5482	2	16	21	9	Given the relevance of mitigation it is suggested to reverse the order of D3 and D4. [Austria]	
6646	2	16	2	19	There is no mention of how the adaptation needs will be lower in a 1.5°C world in the SPM, therefore this needs to be lifted to the SPM, perhaps as a separate point under D3. Wording can be taken from Chapter 4, page 4-5: "Adaptation needs will be lower in a 1.5°C world compared to a 2°C world (high confidence)" [Sudan]	

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6792	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Marshall Islands]	
6852	2	16	2	18	All actions entailed in this paragraph should be decided on the basis of national circumstances. Such actions should include identifying which fossil fuel subsidies are "inefficient" and considering how to rationalize inefficient subsidies if they exist at all. Besides the reference to naitonal circumstances there should also be a reference to developing countries highlighting their special circumstances. [United Arab Emirates]	
6930	2	16	2	19	There is no mention of how the adaptation needs will be lower in a 1.5°C world in the SPM, therefore this needs to be lifted to the SPM, perhaps as a separate point under D3. Wording can be taken from Chapter 4, page 4-5: "Adaptation needs will be lower in a 1.5°C world compared to a 2°C world (high confidence)" [Gambia]	
7266	2	16	2	34	Remove the entire section D3 including D3.1, D3.2, and D3.3. The statements can fit virtually any temperature goal of 1.5 and above. They do not also offer any comparison of 1.5 and 2 deg. C. [India]	
8670	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Grenada]	
8734	2	16			Unclear whether "mostly beneficial" is intended to mean "most adaptation is beneficial for sustainable development and poverty reduction", or "benefit for sustainable development and poverty reduction is the main benefit of adaptation" [New Zealand]	
9200	2	16	2	19	D3: the term "mostly" is misleading and not very informative It would be more useful to specify when adaptation is beneficial for sustainable development and poverty eradication (i.e. when adaptation measures are carefully managed). [Nauru]	
9358	2	16	2	19	These statements are not specific to 1.5 degrees. [Switzerland]	
9552	2	16	2	16	Recommend replacing "and is mostly beneficial for sustaniable development and poverty reduction" with "has many synergies with sustainable development goals" because "is mostly"has no confidence qualifier and thus implies uncertainty. [Canada]	
4398	2	17	2	18	What do you mean by trade-offs? If I look at D4.1, it reads “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed”. If trade-offs and negative consequences are different, then, I suggest to delete a bracket and re-write this sentence to: ? There can also be negative consequences or trade-offs with some of the UN SDGs if actions are not context-specific and managed carefully. [Republic of Korea]	
6188	2	17	2	19	More clarity is needed in the sentence "There can also be negatie consequences (trade-offs)with some of the UN SDGs if actions are not context specific and managed carefully" Not clear what is meant?, Which actions? [United Republic of Tanzania]	
9030	2	17	2	17	Suggest rephrasing to: "There can also be adverse consequences …" [Australia]	
9554	2	17	2	17	Suggest replacing "negative consequences" with "tradeoffs" to be consistent with figure SP3. [Canada]	
8280	2	18	2	18	SDGs should be replaced by "sustainable develoment" [United States of America]	
8282	2	18	2	18	Replace "with" with "for achievement of". [United States of America]	
294	2	21	2	23	Difficult to comprehend/cryptic. Concepts of "incremental adaptation" and "transformational adaptation" could be opened a bit. [Finland]	
1752	2	21	2	24	It is unclear what adaptation is meant here: there is adaptation to the impacts of 1.5 °C, and there is adaptation to the deep and long-term societal changes needed to limit warming to 1.5 °C [Saudi Arabia]	
4190	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Saint Kitts and Nevis]	
4946	2	21	2	24	Ch4 p111 amongst other sections states that 'Need for transformational adaptation at 1.5°C and beyond remains largely unexplored'. This feels inconsistent with underlying report/high confidence may not be justified. [United Kingdom (of Great Britain and Northern Ireland)]	
5444	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Saint Lucia]	
6288	2	21	2	24	The statement states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Fiji]	
6794	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Marshall Islands]	
8284	2	21	2	21	"For 1.5-consistent pathways, both incremental and ..." drop the 1.5 clause in middle. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8286	2	21	2	24	This finding is not specific to 1.5°C of global warming. [United States of America]	
8288	2	21	2	24	The sentence does not accurately summarize what is said about the relationship between incremental and transformational adaptation in the document, particularly section 4.2.2.2 which talks about the need for transformational adaptation "in some regions and places." The sentence needs to be rewritten to acknowledge that the level of adaptation needed will vary across different contexts. [United States of America]	
8672	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Grenada]	
9032	2	21	2	21	Suggest defining: "incremental and transformational"' for the benefit of policymakers. [Australia]	
9074	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Solomon Islands]	
9202	2	21	2	24	D3.1 states that adaptation involving "deep and long-term structural changes that influence sustainable development, poverty reduction and foster equity" could be made more clear by specifying what "influence" means, i.e. do these changes help or hinder sustainable development? [Nauru]	
9556	2	21	2	21	Recommend that the text be changed to the following: "Incremental and transformational adaptation reduce vulnerbaility to 1.5 global warming and involve deep and long-term societal changes that influence sustainable…..". [Canada]	
8290	2	22	2	23	Should read "sustainable development and poverty reduction, and foster equity" [United States of America]	
7272	2	23	2	23	Says about incremental and transformational adaptation fostering “equity”. This appears to be more in a national context than international. Equity should be introduced in some places that talks of emissions reduction as well as adaptation in the international context. [India]	
8674	2	24	2	26	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Grenada]	
3852	2	26	2	29	Please add resilient infrastructure development to the list of adaption options, which is being discussed across chapter 5. [Germany]	
4192	2	26	2	34	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Saint Kitts and Nevis]	
4194	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Saint Kitts and Nevis]	
5240	2	26	2	29	adaptation options will have sinergies with the SDGs mentioned in line 27, but not only on those. We suggest adding "in particular" before "for agriculture, health,..." [Spain]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5446	2	26	2	34	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Saint Lucia]	
5448	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Saint Lucia]	
6290	2	26	2	34	It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement need to be more clear and may mislead; as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs. Adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together in this context, i.e. where are synergies and where are trade-offs dominating. Therefore, D3.3 needs rewording have the clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management)...continued below. [Fiji]	
6292	2	26	2	34	Further to above, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically sound appropriate, and seems to contradicts.....implying opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; Suggest reforumlating. [Fiji]	
6796	2	26	2	34	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Marshall Islands]	
6798	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Marshall Islands]	
8292	2	26	2	26	Strike comma following "warming"; it is not correct syntax as written. [United States of America]	
8294	2	26	2	29	The sentence should say "may have" rather than "have," given that trade-offs between these objectives can exist as stated earlier on this page (lines 16-19) and in section 4.3 (p. 4-17) of the draft. Otherwise, a high confidence level is not appropriate for such a statement. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8676	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Grenada]	
9076	2	26	2	34	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Solomon Islands]	
9078	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Solomon Islands]	
9204	2	26	2	34	D3.3: It is stated that agricultural adaptation and food security can result in trade-offs with 7 different SDGs. This statement is misleading as it implies that all forms of agricultural adaptation have the potential to have negative impacts on SDGs, when a much clearer message from the report is that climate change impacts on agriculture will have significant impacts on a number of SDGs, and adaptation can reduce these impacts (as stated in D3.2). It is not clear how D3.3 and D3.2 fit together, i.e. where are synergies and where are trade-offs dominating. D3.3 needs substantial rewording for clarity, and the potential for trade-offs should not be given equal weighting to the synergies with SDGs as the report contents show that synergies are the more significant (and trade-offs can be avoided through careful management). [cont'd below] [Nauru]	
9206	2	26	2	34	[cont'd] Further, it is not clear how D3.3 is supported by evidence from 4.3.3 (urban infrastructure transitions) or evidence from 4.5.4 as currently indicated. The further reference to 5.3.2 to support D3.3 is not scientifically appropriate quoting as 5.3.2 is generally saying the opposite, that "well adapted agricultural systems contribute to safe drinking water, health, biodiversity and equity goals" and "climate-smart agriculture has synergies with food security"; 5.3.2 only supports the more limited argument that MISMANAGED adaptation has trade-offs on some these SDGs (mainly on 1, 3, 6 and to lesser extent on 5, 14 and 15), particularly from overuse of fertilizer and pesticides, and irrigation, and changing crop mixes. Similarly, cross-chapter box 6 does not seem to support the statement and cross-chapter box 7 is about mitigation rather than adaptation, leaving it unclear how it supports the statement. The current SPM D3.3 is misleading and not supported by most of the references offered in support. Suggest reforumlating and at least including "if not carefully managed" to clarify the point and reference that with 5.3.2. [Nauru]	
8296	2	27	2	29	This sentence would be more useful if placed in the broader context of whether in general such adaptation measures are cost-effective or not. It would also be valuable to highlight whether these are primarily designed as climate adaptation measures or, for example, as health measures with a climate adaptation co-benefit, and therefore with a higher overall utility for both sustainable development and climate change. [United States of America]	
8632	2	27	2	27	Could add "and emission reductions" along with "agriculture, health, urban sectors and ecosystems" [Ireland]	
5808	2	28	2	28	"with potential for scaling up" is unclear - what is implied here? Untapped potential? Replace other measures? Large uncertainty "upwards"? [Sweden]	
8298	2	28	2	28	What is meant by "social security"? [United States of America]	
9360	2	28	2	29	The statement is not specific to 1.5 degrees. [Switzerland]	
296	2	31	2	34	Could these "trade-offs" be elaborated a bit more, as we understand that adaptation actions mostly have syntergies with SDGs? [Finland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
410	2	31	2	34	Chapter 4, section 4.4.5.6 (page 4-96) has a useful statement on the policy packages that could be used to meet the finance goal of the Paris Agreement: "Carbon prices, regulation and standards, improved information and appropriate financial instruments can work synergistically to meet the challenge of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development', as in Article 2 in the Paris Agreement." It would be good to have this in the SPM. [Chad]	
980	2	31	2	31	unclear - replace "and securing provision of food security" by "while ensuring food security…" [France]	
2552	2	31	2	33	This sentence suggests that agricultural adaptation and ensuring food security is in conflict with 7 (other) SDGs. Would it not be appropriate to add a qualifier, such as "if not carefully managed"? [European Union (EU)]	
4060	2	31	2	34	The language seems to suggest that there is only a negative trade-off, since synergies are not mentioned. Is that intentional - in the long run would such a relationship be based on scientific findings - e.g. one would think that climate action and health and well-being would be areas where there also can result in synergies with agricultural adaptation and food security [Norway]	
4400	2	31	2	33	(1) More explanation on 'trade-offs' seems necessary. Does this current sentence mean that actions on agricultural adaptation and food security can negatively impact health, well-being, gender equality, climate action, water, resilient infrastructure, marine and terrestrial ecosystem? Though simple, a little bit of information seems necessary. D4.3 is a good example of explanation on some examples. (2) Consistency in the writing on D3.3 is needed on the basis of D4.1. [Republic of Korea]	
4624	2	31	2	34	Trade-offs between adaptation to protect human health (which is related to SDG 3) and the SDG 7 (energy consumption) are described in the Executive Summary of Chapter 5 but not in D3.3. To keep D3.3 consistent with the Executive Summary of Chapter 5 (5-5), suggest inclusions of trade-offs between adaptation to protect human health and SDG 7. [Japan]	
4626	2	31	2	34	In the original section 5.2.1, it reads "agricultural adaptation to enhance food security" but "agricultural adaptation and enhancing food security" as described in D 3.3. Therefore in SPM D3.1, "and" should be replaced with "to" to keep consistency with the original text. Also we would request including a few examples of trade-offs between agricultural adaptation agricultural adaptation and seven SDGs (e.g. 5.3.2), in subsection D3.3. [Japan]	
4948	2	31	2	34	Are there ways to ameliorate these negative trade-offs? If so could we mention here. [United Kingdom (of Great Britain and Northern Ireland)]	
5242	2	31	2	34	we agree with the content of the paragraph, but, why we should single out one sector? We understand the relation with a number of SDGs, but this is also true for other sectors (water resources, health,...). We would like to see other sectors here, or delete this one. [Spain]	
5312	2	31	2	34	D3.3) It is surprising that so much specific focus is given to negative effects of agricultural adaptation, while positive effects are not covered in such great detail (even though the positives should outweigh the negatives in any properly designed adaptation measure). If negative effects are discussed then they should be placed in context - negative effects can be avoided and positive effects enhanced through careful planning that includes consideration of the SDGs, and adaptation is needed to reduce the adverse impacts of climate change on the SDGs. [Zambia]	
6164	2	31	2	34	D3.3 - needs to say why and how there are trade-offs and how do these compare with the 2C scenario where there are more damages [Estonia]	
6190	2	31	2	34	D3.3 is Some how confusing, It is only negatively stated. Our expectation is, If stringent and effective adaptation Measures and securing provision for food security are taken , will facilitate the implementation of the SDGs and not otherwise. Clarity is needed. [United Republic of Tanzania]	
6648	2	31	2	34	D3.3) It is surprising that so much specific focus is given to negative effects of agricultural adaptation, while positive effects are not covered in such great detail (even though the positives should outweigh the negatives in any properly designed adaptation measure). If negative effects are discussed then they should be placed in context - negative effects can be avoided and positive effects enhanced through careful planning that includes consideration of the SDGs, and adaptation is needed to reduce the adverse impacts of climate change on the SDGs. [Sudan]	
6856	2	31	2	31	Rephrase "securing prvision of food security". [United Arab Emirates]	
6932	2	31	2	34	D3.3) It is surprising that so much specific focus is given to negative effects of agricultural adaptation, while positive effects are not covered in such great detail (even though the positives should outweigh the negatives in any properly designed adaptation measure). If negative effects are discussed then they should be placed in context - negative effects can be avoided and positive effects enhanced through careful planning that includes consideration of the SDGs, and adaptation is needed to reduce the adverse impacts of climate change on the SDGs. [Gambia]	
7270	2	31	2	34	The paragraph gives the view that there are tradeoffs between adaptation and seven SDGs. It gives an impression that adaptation is bad. It is not easy to think of many adaptation strategies that may damage SDGs. Instead it could be stated that some strategies could potentially lead to trade offs. [India]	
8300	2	31	2	31	"securing provision of food security" can certainly be said more simply. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8302	2	31	2	34	The claim expressed in D3.3 that agricultural adaptation results in trade-offs with seven SDGs is not well supported in the text and the underlying papers. For example, several of the sources cited regarding gender implications of agricultural adaptation appear to be critiques of binary approaches to gender identification rather than critiques of agricultural adaptation per se. These critiques would appear to apply to SDG 5 itself, so it could not necessarily be drawn from these papers that agricultural adaptation means a trade-off with SDG5. It is also unclear how adaptation would be in conflict with SDG13. Recommend deleting D3.3 or replacing it with an alternative paragraph that discusses stronger examples of adaptation strategies in conflict with SDGs. The statement in 5.3.2 (p. 5-17) that "Climate-smart agriculture may not be gender-sensitive" should also be deleted, as (1) this is not unique to climate-smart forms of agriculture but the sentence suggests to the reader that it may be; and (2) the cited literature does not appear to support this claim, but rather appears to take issue with methodological approaches in gender analysis. 5.3.2 concludes with a sentence on p. 5-19 that asserts that agricultural adaptation strategies to enhance food security can cause negative impacts; this should be specifically explained and supported. [United States of America]	
8634	2	31	2	34	Could reword to elaborate on possible co-benefits of changes in land management practices rather than imply they will be negative [Ireland]	
8742	2	31	2	34	Agricultural adaptation and securing provision of food if not context-specific and managed /…/ can result in trade-offs with seven SDGs,…Explanation: Trade-offs in regard to seven SDGs, which is a statement with high confidence, are not sufficiently explained, not clearly put into context for the message to get across. More needs to be said about the trade-offs' occurring circumstances (is this valid for all agricultural production/provision of food, how is agricultural adaptation and climate action not positively related and how is it that in point D3.2 synergies are mentioned with SDGs for adaptation, health and ecosystems) and thus potential limits to adaptation in this regard needs to be put forward. [Slovenia]	
8866	2	31	2	33	Suggest including a statement on the risks of land degradation likley to occur under agricultural intensification to meet food security concerns. [Australia]	
9034	2	31	2	31	Suggest rephrasing to: "Agricultural adaptation and ensuring food security with 1.5oC global warming …" [Australia]	
9558	2	31	2	34	The main message in D3.3 suggests that agricultural adaptation and securing food security can result in tradeoffs with 7 SGDs. However, there is evidence that food security efforts can simultaneously support/ advance, for instance, gender equality. Please clarify the main point in this paragraph in order to increase utility for policy makers. [Canada]	
9618	2	31	2	34	This paragraph is very important for African countries , more clarification is needed regarding the resulting trade-offs [Madagascar]	
2554	2	32	2	32	Please add after … in trade-offs 'and/or synergies' [European Union (EU)]	
3854	2	32	2	35	The headline statement D6 seems to be valid for mitigation as well. If read out of context, it might seem surprising that international cooperation is highlighted for adaptation while it is at least as important for mitigation. [Germany]	
5158	2	32	2	32	result in trade–offs with many SDGs, including those related to poverty, hunger, health and wellbeing, [Hungary]	
6566	2	32	2	32	How does food security results in trade-offs with health and wellbeing? Isn't food security important for health (i.e. synergy)? [Netherlands]	
6858	2	32	2	33	Provide SDG numbering (note the format in D4.1.) [United Arab Emirates]	
8304	2	32	2	32	The focus here should be on the sectors not the number of SDGs. The authors should focus on the actions/outcomes that the goals refer to, so revise to say: "...result in tradeoffs to sustainable development, including health..." [United States of America]	
8306	2	32	21	7	There are inconsistencies in how the SDGs are referred to. Some by number and some only by the SDG itself. [United States of America]	
9362	2	32	2	32	Write: " …trade-offs with some SDGs, …" [Switzerland]	
982	2	33	2	34	Add a reference to chapter 4.3.2.1 "Agriculture and food" [France]	
412	2	36	2	52	There is no mention of how the adaptation needs will be lower in a 1.5°C world in the SPM, therefore this needs to be lifted to the SPM, perhaps as a separate point under D3. Wording can be taken from Chapter 4, page 4-5: "Adaptation needs will be lower in a 1.5°C world compared to a 2°C world (high confidence)" [Chad]	
4062	2	36	21	9	It could also be mention in a paragraph under D4 that incremental and transformational mitigation is needed, as is done in D3 for adaptation. [Norway]	
4196	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Saint Kitts and Nevis]	
5160	2	36	2	37	As figure SPM 4 shows the co-benefits of 1.5 ° C scenarios for SDGs are broader and stronger tha the trade-offs. This should be reflected in the text. Replace "multiple" in line 36 with "strong" and insert "some" before "trade-offs" in line 37. [Hungary]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5314	2	36	2	52	D4 seems to be better phrased than the corresponding statement in the Exec Summ of Chap. 2, p. 2-7. However, it still provides equal emphasis to the negative and positive effects of following at 1.5°C pathway, even though the figure SPM-4 shows that the positives outweigh the negatives. [Zambia]	
5450	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Saint Lucia]	
6294	2	36	2	38	This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5°C and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Fiji]	
6568	2	36	2	37	As figure SPM 4 shows the co-benefits of 1.5 scenarios for SDGs are broader and stronger than the trade-offs. This should be reflected in the text. Replace "multiple" in line 36 with "strong" and insert "some" before "trade-offs" in line 37. [Netherlands]	
6650	2	36	2	52	D4 seems to be better phrased than the corresponding statement in the Exec Summ of Chap. 2, p. 2-7. However, it still provides equal emphasis to the negative and positive effects of following at 1.5°C pathway, even though the figure SPM-4 shows that the positives outweigh the negatives. [Sudan]	
6800	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Marshall Islands]	
6934	2	36	2	52	D4 seems to be better phrased than the corresponding statement in the Exec Summ of Chap. 2, p. 2-7. However, it still provides equal emphasis to the negative and positive effects of following at 1.5°C pathway, even though the figure SPM-4 shows that the positives outweigh the negatives. [Gambia]	
7268	2	36	2	38	Refer to underlying report, chapter 1, page 20, fig. 1.4 : The X and Y axes of bottom 3 panels need to be titled. [India]	
8438	2	36	2	52	D4 seems to be better phrased than the corresponding statement in the Exec Summ of Chap. 2, p. 2-7. However, it still provides equal emphasis to the negative and positive effects of following at 1.5°C pathway, even though the figure SPM-4 shows that the positives outweigh the negatives. [Nepal]	
8678	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Grenada]	
9080	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Solomon Islands]	
9208	2	36	2	38	D4: This text refers to figure SPM 4. Figure SPM 4 shows much more synergies than tradeoffs. This should be reflected in this statement, which seems to imply a balance of synergies and tradeoffs. Also a statement on synergy of achieving 1.5 and avoiding impacts of higher warming on SDG should be added. Furthermore, the statements under D4 need explicit reference to co-benefits of stringent mitigation action for air pollution and health, stopped deforestation and ecosystem restauration (not mentioned anywhere...) and energy security and access. [Nauru]	
6862	2	38	2	38	Abbreviate "sustainable development goals" if this refers to the UN SDGs to avoid confusions. [United Arab Emirates]	
298	2	4	2	45	Suggest put the number (of SDG) in the brackets instead of the text. It makes it easier for reader to understand, e.g. … for DGSs concerning health (3), clean energy (7), cities and communties (11)… Also, if there is conicise way of explaining how SPM4 supports this para, it would be help the reader to interpret SPM4. [Finland]	
984	2	4	2	42	This list should be supplemented by SDG 15 (terrestrial ecosystems) and SDG 16 (peace, justice, ...). [France]	
1754	2	4	2	45	There is obvious unbalance in the statement favoring "synergies" and undermining "trade-offs". The use of the phrase "indicate robust" with synergies while the phrase "can have" with trade-offs in addition to the condition "if not carefully managed" is a clear example. [Saudi Arabia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2556	2	4	2	45	Is it really valid to suggest that certain SDGs have mainly synergies with mitigation while others have mainly trade-offs? Figure SPM4 appears to show a more nuanced picture with multiple synergies (and trade-offs) across the board. Surely the D3 caveat about needing to act in a context-specific, carefully managed way is the most appropriate. There can certainly be major synergies with SDGs 1, 2, 6, or 7 if the pathway is well managed, as well as tradeoffs with health, clean energy, cities and communities, responsible consumption and production, and oceans if the 1.5°C pathway is badly managed. Saying "if not carefully managed" looks banal and generic (what is the level at which the management becomes careful?); it might be more appropriate to say,"potential trade-offs or negative side-effects have to be taken into account when designing stringent mitigation actions compatible with 1.5°C". [European Union (EU)]	
3856	2	4	2	45	The criteria for the choice of synergies and trade-offs should be explained, is it the robustness or the strength of the interaction? It is not clear how to link these statements to figure SPM.4 (which should be referenced in D4.1). Please revise. [Germany]	
3858	2	4	2	45	Please make clearer that the synergies and trade-offs listed under D4.1 originate from IAM/integrated pathways literature while Figure SPM.4 is based on broad literature review. [Germany]	
4198	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Saint Kitts and Nevis]	
4260	2	4	2	45	Here a very important and relevant SDG is missing, i.e., SDG 15 (life on land). It covers critical issues of terrestrial ecosystem management, carbon flux, and climate effects of land-use changes. Please add SDG 15 and discuss its role in carbon sequestration and biophysical climate effects. These issues are main parts in SRCCL report. You may also review its FOD and keep consistency. [China]	
4628	2	4	2	45	We would suggest that the statements in D4.1 and Executive Summary of Chapter 5 be kept consistent as we received the impression that Subsection D4.1 and the Executive Summary in Chapter 5 laid emphasis on different SDGs. For example, synergies between 1.5°C pathways and SDGs 11 (cities and communities) and 14 (oceans) are particularly mentioned in D4.1, though there is less mention of SDGs 11 and 14 compared to SDGs 3 (health), 7 (sub goal of clean energy) and 12 (responsible consumption and production) in the Executive Summary of Chapter 5. [Japan]	
4950	2	4	2	51	These two points feel somewhat repetitive and could be condensed together to be more friendly to the non-expert. Suggest the following revised wording: "1.5°C-consistent pathways have robust synergies with the SDGs, particularly for health, clean energy, cities and communities, responsible consumption and production, and oceans (very high confidence). Stringent mitigation actions may have trade-offs particularly around povery, hunger, water, and energy access (high confidence). The pathways with strongest synergies and weakest trade-offs with the SDGs are those which achieve low carbon energy, and low material consumption and GHG-intense food consumption (high confidence). These can be achieved with high economic growth (high confidence)." [United Kingdom (of Great Britain and Northern Ireland)]	
5452	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Saint Lucia]	
5810	2	4	2	45	To some extent, it eludes the reader how the text reflects the figure. By going with the number and shadings, it would seem, for example, that also SDGs 8-9 would need to be indicated. [Sweden]	
6296	2	4	2	45	The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Fiji]	
6802	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Marshall Islands]	
8308	2	4	2	44	The text should refer precisely to SDGs if it is appropriate to reference them. There are no SDG "sub-goals". [United States of America]	
8636	2	4	2	45	D4.1 makes no reference to co-benefits or the existence of win-win scenarios [Ireland]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8680	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Grenada]	
9082	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Solomon Islands]	
9210	2	4	2	45	D4.1: The statement that “stringent mitigation actions compatible with 1.5°C can have trade-offs or negative side-effects if not carefully managed“ is unbalanced and misses the relevant context provided in D4.4 as well as a link to climate resilient development pathways (D5). Suggestion is to merge D4.1 and D4.4. Furthermore, context on co-benefits of stringent mitigation action e.g. on SDGs including such as reduced air pollution, stopped deforestation (Ch 4 ES), increased energy access etc. need to be strengthened. [Nauru]	
9560	2	44	2	44	Suggest replacing "negative consequences" with "tradeoffs" to be consistent with figure SP3. Also it is unclear what "if not carefully managed" implies. Provide additional information on what carefully managed means. Finally, it is unclear which part of the sentence the confidence qualifier applies to. [Canada]	
1756	2	47	2	51	Need to be carfeful to note that "high economic growth" here is an input not an output. i.e. high economic growth is an assumption in the so constructed pathway rather than the pathway that is conistent with 1.5 °C endogenously gave rise to high economic growth. [Saudi Arabia]	
2558	2	47	2	51	D4.2, D2.1 & B5.5 appear to send mix messages regarding economics & cost implications of climate change and climate action. See general comment on costs/economics. [European Union (EU)]	
3860	2	47	2	51	If taken out of context or read by a less informed audience, this paragraph might be perceived to suggest that it was feasible to achieve 1.5C without any challenges and trade-offs. This paragraph carries important content about the general characteristics of the most sustainable pathways, which we strongly support. However it should be put into context. We would therefore suggest to insert a short second sentence after "with high economic growth" stating that such pathways show very high emission reduction and transition rates starting immediately, and rely on behavioural changes and protection of natural sinks on planetary scale. Please also insert in the first sentence, ln. 49 after (high confidence) "reduce dependence on CDR" and then continue with "and can be achieved with high economic growth (high confidence). [Germany]	
4064	2	47	2	51	This is very important information and should be consider to be a headline statement [Norway]	
4262	2	47	2	51	The finding in D4.2 that 1.5°C-consistent pathways can be achieved with high economic growth lacks support from the underlying report. The description of the economic growth in different scenarios in Chapter 2 of the underlying report (Figure 2.4) is a scenario-based assumption rather than a finding, which is in no position to explain how to maintain high economic growth at 1.5°C. And according to Chapter 5, there is a trade-off between poverty eradication and industrialization and emission reduction. So it is suggested to delete “and can be achieved with high economic growth.” At the same time, it is suggested to reformulate “1.5°C-consistent pathways that achieve low carbon energy and material consumption, and low GHG-intensive food consumption have most pronounced synergies and the lowest number of trade-offs with respect to sustainable development and the SDGs (high confidence)” as “1.5°C-consistent pathways aimed at achieving low carbon energy and material consumption, and low GHG-intensive food consumption have more pronounced synergies and the lower number of trade-offs with respect to sustainable development and the SDGs (high confidence)” [China]	
4402	2	47	2	51	To achieve synergy with SDGs, we need to pursue a circular economy that maximizes material productivity with energy efficiency. 1.5?-consistent pathways that achieve low carbon energy and material consumption, and low GHG-intensive food consumption have most pronounced synergies and the lowest number of trade-offs with respect to sustainable development and the SDGs and can be achieved with high economic growth (high confidence). ? 1.5?-consistent pathways that achieve low carbon energy and material consumption, and maximum resource utilization to circular economy have most pronounced synergies and the lowest number of trade-offs with respect to sustainable development, and the SDGs can be achieved with high economic growth. [Republic of Korea]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4630	2	47	2	51	The report states that mitigation actions focusing on demand side could have higher synergies with SDGs. It is not appropriate to include low carbon energy consumption since it could also include supply side. Without any evidence in this report that these policies could result in high economic growth, such misleading sentence should be deleted. In addition, there should be a clear reference to the uncertainties regarding climate-SDG interactions (page 2-85-86 in Chapter 2). D4.2. 1.5°C-consistent pathways with emphasis on mitigation actions in energy demand sectors and behavioral response options could advance multiple SDGs simultaneously. (high confidence) The combined evidence indicates that the chosen mitigation portfolio can distinctly have an impact on the achievement of other societal policy objectives. However, there is uncertainty regarding the specific extent of climate-SDG interactions. {2.4.3, 2.5.1, 2.5.3, Figure 2.4, Figure 2.28, 5.4.1, 5.4.2, Figure 5.4} [Japan]	
4952	2	47	2	51	This seems to be the key point here - policymakers will want to know what type of pathways are most compliant with the SDGs, and this sentence spells what they are. This should therefore be one of the key messages in bold (perhaps instead of lines 36-38, which doesn't give any illuminating information). [United Kingdom (of Great Britain and Northern Ireland)]	
6570	2	47	2	51	Make D4.2 bold as it is a key policy message from the stylized scenarios; suggested to merge with D4. [Netherlands]	
7260	2	47	2	51	D4.2 should be deleted. There is limited agreement in literature on whether changes in production system (supply side) or consumption patterns (Demand side) will have greater synergies than trade-offs. Chapter 5, Section 5.7 explicitly recognizes that "Limited literature has systematically evaluated context-specific synergies and trade-offs between and across adaptation and mitigation response measures in 1.5°C-compatible pathways and the SDGs. This hampers the ability to inform decision-making and fair and robust policy packages adapted to different local, regional, or national circumstances. More research is required to understand how trade-offs and synergies will intensify or decrease, differentially across geographic regions and time, in a 1.5 degree C warmer world and as compared to higher temperatures". So the conclusion of high confidence in D4.2 is misleading. [India]	
8310	2	47	2	47	Drop comma in this line; the clause is highly restrictive. [United States of America]	
8312	2	47	2	47	What is meant by low carbon energy and MATERIAL CONSUMPTION? [United States of America]	
8642	2	47	2	51	The message of D4.2 in relation to low-GHG-intensive food consumption is a very important one and should be highlighted more strongly in the Report [Ireland]	
2560	2	48	2	48	Please add after 'low GHG-intensive food consumption' for example plant rich and meat-reduced diets [European Union (EU)]	
6572	2	49	2	5	It is the first and only time that something is said about the economic impact, but is this 'high economic growth' higher or lower than in a two degrees world. That is what people want to know. And what is the role of damage from climate change in this? Lack of information on overall economic impacts: abatement cost, adaptation cost, remaining damages are all relevant. [Netherlands]	
8314	2	49	2	49	Full stop after confidence, begin: "Such pathways can be achieved ..." [United States of America]	
8316	2	5	2	5	More evidence is needed for this finding. How is economic growth achieved? [United States of America]	
3862	2	52	2	52	Please insert language addressing both the risk from CDR measures in general, and the importance of behaviour modification and options in energy demand as necessary elements of mitigation measures including the potential both to avoid CDR / BECCS and to achieve SDGs after D.4.2 in order to achieve a more balance representation, highlighting the important role of appropriate design and good implementation. We would recommend you draw from material in Chapter 5, Executive Summary Page 5: "The impacts of Carbon Dioxide Removal (CDR) options on SDGs depend on the type of options and the scale of deployment (high confidence). If poorly implemented, CDR options such as bioenergy, BECCS and AFOLU would lead to trade-offs. Appropriate design and implementation requires considering local people ?s needs, biodiversity, and other sustainable development dimensions (very high confidence) {5.4.1.3, Cross-Chapter Box 7 in Chapter 3}." and "Appropriately designed mitigation actions to reduce energy demand can advance multiple SDGs simultaneously. Pathways compatible with 1.5°C that feature low energy demand show the most pronounced synergies and the lowest number of trade-offs with respect to sustainable development and the SDGs (very high confidence). (…) Low demand pathways, which would reduce or completely avoid the reliance on Bioenergy with Carbon Capture and Storage (BECCS) in 1.5°C pathways, would result in significantly reduced pressure on food security, lower food prices, and fewer people at risk of hunger (medium evidence, high agreement) {5.4.2, Figure 5.4}." [Germany]	
4404	21				There are no the pace of the development, deployment of adaptation and mitigation options and options for implementing far-reaching and rapid change. [Republic of Korea]	
414	21	1	21	4	D3.3) It is surprising that so much specific focus is given to negative effects of agricultural adaptation, while positive effects are not covered in such great detail (even though the positives should outweigh the negatives in any properly designed adaptation measure). If negative effects are discussed then they should be placed in context - negative effects can be avoided and positive effects enhanced through careful planning that includes consideration of the SDGs, and adaptation is needed to reduce the adverse impacts of climate change on the SDGs. [Chad]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
986	21	1	21	2	This sentence is too vague, and can be used as a reason for inaction. For avoidance of doubt, we suggest to formulate it as follow : "Even if mitigation measures of 1.5°C-consistent pathways can create risks for development for some regions, sectors or periods, for example ..., oil and gas, policies that promote diversification…" [France]	
2562	21	1	21	4	This statement that 'Mitigation measures of 1.5°C-consistent pathways can create risks for developmentis also very misleading. It is true that some jobs are lost when transitioning out of a technology, but it is also true that new technologies offer job opportunities. Typically, these jobs require higher education so the message that needs to be made is that the: a) there are large job opportunities in renewable energy; and b) job losses due to energy transition need to be flanked by social programs to offset losses and build capacity. It is clear from previous statements such as in section D.4 that any mitigation measure is associated with synergies and trade-offs [European Union (EU)]	
3864	21	1	21	3	You write that "Mitigation measures of 1.5°C-consistent pathways can create risks for development...". As this statement depends on a lot of conditions and can be challenged /questioned in many respects (i.e. is not correctly formulated in such a general way), we suggest to reformulate it in the following way: "Mitigation measures of 1.5 consistent pathways can create economic risks." Please also consider to amend this paragraph with some language that notes the economic (and other) risks to SD from unabated climate change. We refer to AR5SYR SPM 3.2 p 19 stating "Mitigation involves some level of co-benefits and risks, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change. [...]". While these issues are being addressed in other parts of the SPM, the current paragraph, if taken out of context, could be misinterpreted. In addition, please include a statement on climate-related financial risks, see e.g. ES of chapter 4, 4-16, 4-35, 4.4.5.4. [Germany]	
4070	21	1	21	3	D4.3: Is it possible to include other examples in order to be more balanced. We recoganize that this is one of a few places where it is used an example. [Norway]	
4200	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Saint Kitts and Nevis]	
4954	21	1	22	4	The paragraph addresses risks for development of, for example, decline in fossil fuel use, but not the opportunities or benefits this or diversification of the energy sector might provide (it mentions facilitation however). For example, box 5.2 notes that 'the potential for renewables deployment is large and deployment is happening and positive economic benefits can be envisaged' [United Kingdom (of Great Britain and Northern Ireland)]	
5162	21	1	21	4	This paragraph fits much better in section D2 on investments ad costs. Move it to that section after D2.1 (which should be moved to after D2.4, as suggested in the commnts above). As this paragraph deals with the risk of stranded assets, it would be good to insert those words and also to make clear this particularly applies to fossil producing and exporting countries. The following rewording is suggested: insert "This particularly calls for avoiding investments in fossil fuel production that woul lead to stranded assets." after "coal, oil and gas (high confidence)" [Hungary]	
5316	21	1	21	4	D4.3) This statement gives a very negative view of the impact of mitigation on development, but there are many positive impacts of mitigation on development, e.g. those countries that are heavily dependent on fossil fuel imports can reduce their import dependence through domestic renewable energy generation and avoid the creation stranded assets from lock-in to fossil fuel infrastructure. [Zambia]	
5454	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Saint Lucia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5994	21	1	21	4	We wonder if it is appropriate to consider the revenue and employment generated by the fossil fuel industry separately from the health benefits that are associated to the reduction of fossil fuel use. Both have impacts on risks for (economic) development. We suggest deleting this paragraph, or supplementing it with information about the synergies with SDGs. If this cannot be done, than a minimum is to reformulate in accordance with summary in chapter 5: 'mitigation measures of 1.5°C consistent pathway can create risk for sustainable development in countries with high dependency on fossil fuels. Targeted policies that promote diversification of the economy and the energy sector can facilitate this transition" [Belgium]	
6298	21	1	21	4	The first sentence is generalised mitigation measures that can create risks for development, which isnot actually correct as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc needs to highlighted. [Fiji]	
6574	21	1	21	4	Statement seems at odds with statement D1 which states that additional reductions beyond NDCs can contribute to achieving SDGs [Netherlands]	
6576	21	1	21	4	This paragraph fits much better in section D2 on investments ad costs. Move it to that section after D2.1 (which should be moved to after D2.4, as suggested in the comments above). As this paragraph deals with the risk of stranded assets, it would be good to insert those words and also to make clear this particularly applies to fossil producing and exporting countries. The following rewording is suggested: insert "This particularly calls for avoiding investments in fossil fuel production that woul lead to stranded assets." after "coal, oil and gas (high confidence)" [Netherlands]	
6652	21	1	21	4	D4.3) This statement gives a very negative view of the impact of mitigation on development, but there are many positive impacts of mitigation on development, e.g. those countries that are heavily dependent on fossil fuel imports can reduce their import dependence through domestic renewable energy generation and avoid the creation stranded assets from lock-in to fossil fuel infrastructure. [Sudan]	
6804	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Marshall Islands]	
6860	21	1	2	4	Most of the economic findings based on recongized models showes that emission reductions in developed countries, which imply curbs on fossil fuel based energy use, would result in substantial costs that would inhabit economic growth in oil producing developing countries and negatively affect trade, investemnt, competeviness, employment and lifestyles in individual nations and regions. According to UNFCCC, developed countries should assist developing countries in diversifying their economy and build their capcities. [United Arab Emirates]	
6936	21	1	21	4	D4.3) This statement gives a very negative view of the impact of mitigation on development, but there are many positive impacts of mitigation on development, e.g. those countries that are heavily dependent on fossil fuel imports can reduce their import dependence through domestic renewable energy generation and avoid the creation stranded assets from lock-in to fossil fuel infrastructure. [Gambia]	
7292	21	1	21	4	This may not be true for all the countries and sectors. So it is suggested to state - decline in use of coal, oil and gas may lead to economic losses in some countries and regions since shift to SPV from coal will lead to higher economic development with increased employment. [India]	
8318	21	1	21	4	The economic risks of the rapid reductions of GHG emissions go beyond impacts on fossil fuel dependent economies. There should be a discussion of the impacts on countries with significant investments in infrastructure (those related to so-called "locked-in" emissions) and how such pathways may inhibit energy access. [United States of America]	
8440	21	1	21	4	D4.3) This statement gives a very negative view of the impact of mitigation on development, but there are many positive impacts of mitigation on development, e.g. those countries that are heavily dependent on fossil fuel imports can reduce their import dependence through domestic renewable energy generation and avoid the creation stranded assets from lock-in to fossil fuel infrastructure. [Nepal]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8682	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Grenada]	
8704	21	1	21	1	Delete "development" and replace with "economic growth". While the potential impact of climate change mitigation on economic growth is straightforward and comparatively predictable, development is comparatively much more complex process. Mitigation can influence choices between different development pathways - all of which present both risks and opportunities for longer-term development outcomes. [New Zealand]	
9084	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Solomon Islands]	
9212	21	1	21	4	D4.3 The first sentence uses a very generalistic statement that mitigation measures can create risks for development, which is misleading as it is only the case for strongly fossil fuel dependent economies, and neglects the many examples where mitigation measures can advance sustainable development. A more specific statement that covers challenges and benefits of reducing fossil fuels would be more useful. This could include risks for "countries with a high dependency on fossil fuels for revenue and employment generation" (pp 5-6), including those caused by "stranded assets, assets left underground and early phasing-out of large infrastructure already under constructure" (pp 5-23 to 5-24), as well as the benefits of a shift to renewables for those countries that depend on imports of fossil fuels. At the same time, the advantages of early economic diversification for fossil fuel dependent economies to reduce risks for stranded assets etc need to highlighted. [Nauru]	
9364	21	1	21	4	Rewrite the paragraph as: "Policies that promote diversification of the economy and the energy sector can facilitate the transition to less use of coal, oil and gas and therefore lower the risks that mitigation measures of 1.5°C-consistent pathways can create for development (high confidence). {5.4.1, Box 5.2}" [Switzerland]	
8320	21	2	21	2	Put comma after "example". [United States of America]	
988	21	3	21	4	This sentence is very important and should be kept in the future version of the SPM. We suggest to add this sentence in order to strengthen this statement, if not already added to B5.5 : "Limiting warming to 1.5ºC instead of 2ºC would save 1.5–2.0% of Gross World Product (GWP) by mid-century and 3.5% of GWP by end-of-century. {3.5.2.4}" OR elements of {3.5.3} [France]	
5244	21	3	21	3	delete reference to "energy sector". Economic diversification is relevant for all sectors, not only energy (although we recognize the importance of the energy sector in some countries). [Spain]	
7276	21	4	21	5	Refer underlying report, Chapter 4 (9,19,9,19), (16,6,16,6), (94,52,94,52); Chapter 5 (5,32,5,32), (6,42,6,44), (48,8,48,11) - There are numerous instances of reference of decarbonization of production and consumption, and specifically so for the electricity system. It must be noted that even today, while huge strides are being made for adoption of renewable energy technologies, fossil fuels continue to dominate electricity systems across the globe - including in developed countries. This coupled with the fact that proven large scale CO2 removal/ sequestration technologies are not available, limits the potential of decarbonsiation of the electricity system, at least in the foreseeable future. Needless to say, for developing countries, the potential is even further diminished due to financial, technology, capacity and energy security constraints. In this view, decarbonization must not exacerbate economic and social injusitices. Even as several developing countries have also committed to low carbon growth, the pursuit of complete decarbonization, must not misplace the principles associated with equitable access to sustainable development in view of historic emissions and fair sharing of carbon space. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
990	21	6	21	9	D4.4 : We suggest to add this sentence to this point : "Synergies can be maximized, and risks of trade-offs limited or avoided through an informed choice of mitigation strategies. Particularly pathways that focus on lowering demand show many synergies and few trade-offs. {2.4, 2.5.3, Table 2.5}" [France]	
3866	21	6	21	9	There is a reference made to the "overall mitigation investments" in 1.5° C consistent pathways. It would be very useful if these investment needs could be further quantified. While we did find a statement quantifying costs of redistributive policies on p. 5-28 "Investment costs of the re-distributional measures in 1.5°C pathways (on average around 120 billion per year to 2030; Figure 5.5) are much smaller than the mitigation investments of 1.5°C pathways (McCollum et al., 2018)." there is no clear reference to "overall mitigation costs". Please specify. [Germany]	
3868	21	6	21	9	Please define "redistributive policies" for non-experts, e.g. why "re"-distribution - this would imply the reinstallation of a previous situation. In addition, is this referring to the situation within or across countries? [Germany]	
3870	21	6	21	9	Please reformulate this statement in a more balanced way. If taken out of context, or for a broader audience, this paragraph could create the misleading impression that trade-offs for a range of SDGs would result from climate change mitigation rather than from unabated climate change, and that these could be resolved solely by redistributional policies. However, climate change is a risk amplifier (AR5 WG2) which has negative implications for most SDGs. The risks and damages that can be avoided through climate change mitigation will be greatly beneficial, for a global warming of 1.5C even more so than for 2C. cf. also AR5 SYR SPM 3.2 p 19 "Mitigation involves some level of co-benefits and risks, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change." [Germany]	
4068	21	6	21	9	Can redistributive policies also give synergies? Here it is only mentioned "resolve trade-offs". [Norway]	
7286	21	6	21	6	Page 21, Line 6 talks of “redistributive policies” shielding the poor and vulnerable can take care of a lot of problems and be a trade off for a range of SDGs. There could be an inherent problem with such an approach. The recognition of the historic responsibility of developed countries is completely missing. Also, the SPM is replete with references to SDGs, more so on adaptation. While important, one should not lose focus of the UNFCCC since financing for adaptation is a legal obligation of developed countries. It is vital that the UNFCCC and Paris Agreement are reflected. [India]	
7296	21	6	21	9	Comparision of investment needed for achieving SDGs with 1.5 deg C consistent pathways is not justified. This articulation has potentioal to be misinterpreted as if there is minimal financial requirement for achieving SDGs and does not entail support through means of implementation from the developed countries. This will put undue pressure of developing economies. [India]	
8322	21	6	21	7	Strike "redistributive"; it is not necessary to focus here on the subset of policies that are redistributive. These may also lack social/political acceptability in some countries and contexts. [United States of America]	
8324	21	6	21	9	Section 4.4.5.1 (on p. 4-89) makes some important qualitative points related to energy intensive industries, the distributional implications of higher energy costs, and stranded assets, which should be considered for discussion here. [United States of America]	
8326	21	6	21	9	The statement that investment needs are only a small fraction of overall mitigation investments should be reframed in a neutral and quantitative way, drawing on Figure 5.5. [United States of America]	
992	21	7	21	7	The reduction of inequalities should also be mentionned. "...particularly hunger, poverty, energy access and reduction of inequalities." [France]	
4406	21	7	21	8	Redistributive policies are important. The sentence, starting with ‘investment needs’, needs additional information. Investment needs are only a small fraction of the overall mitigation investments in 1.5°C-consistent pathways. More fraction of investment is needed or more judgemental substance is needed. One more sentence is needed. [Republic of Korea]	
300	21	11			Could definition/explanation of "climate-resilient development pathways" added (e.g. to Definitions in pages 3-4) [Finland]	
994	21	11	21	13	D5 should also refer to box 5.1 "Ecosystem- and community-based practices in drylands". [France]	
1874	21	11	21	13	This sentence seems to imply high feasibility of limiting warming to 1.5C, a conclusion that stands in contrast to e.g. statement A5. The references given do not really shed light on where this optimistic message comes from? In order to not misunderstand the message, at least it should be stated clearly what a "climate-resilient development pathway" is. [Denmark]	
2564	21	11	21	14	D.5 should be a high level key message [European Union (EU)]	
2566	21	11	21	13	Statement D5 (high confidence over 1.5°C-consistent development pathways) seems to be in contradiction with earlier statements such as A5 - which could not even commit to stating whether or not such development is feasible. [European Union (EU)]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2568	21	11	21	3	Statements in section D5 are extremely general and, while probably true, do not seem to draw from any particular scientific findings. Please use concrete findings or examples from literature to highlight the points being made. [European Union (EU)]	
3872	21	11	21	13	Is this a substantial statement - or just the definition of climate-resilient development pathways? This headline statement does not fully cover the following statements D5.1-D5.3. Please review and consider to include the aspects of D5.2.that an integrative and systemic approach is required and the aspect of D5.3 that this needs a joint planning to benefit all affected populations. [Germany]	
4632	21	11	21	11	Single quote of 'climate-resilient development pathways' helps clear understanding as defined in the Glossary. However, "can limit warming to 1.5°C (...)" seems to be misleading because climate change mitigation has not only "synergetic" but also "trade-off" relationships with SD, poverty eradication or inequality reduction. Based on underlying paragraphs (page 47 of Chapter 5 and the Executive Summary of Chapter 1 in the Final Government Draft), we would suggest to replace the statement as follows: 'Climate-resilient development pathways' describe trajectories that aim to limit warming to 1.5°C, adapt to the associated consequences, and strengthen sustainable development. All pathways to limit warming involve synergies and trade-offs (high confidence) {Box 1.1, 1.4, 2.5, 4.4, Box 4.6, 5.5.3, Box 5.3}. [Japan]	
4956	21	11	22	1	Lots of these points in this extended section again feel a little repetitive and could probably be condensed down and made clearer for the non-expert reader. For example: D5.1 and D5.3 seem to overlap significantly and could be merged, and also sentence lengths for these points could be cut down significantly. [United Kingdom (of Great Britain and Northern Ireland)]	
5996	21	11	21	12	D5.1. This sentence could be read as indicating that the IPCC definitely says that 1.5°C is possible, due to the use of the words "can limit". By contrast, previous pages say that it depends on many factors. We are particularly concerned that this is reported with "high confidence". We would like to have a clearer wording. We suggest using part or all of statement D5.1 as a replacement for D5. A simpler alternative would be to add "help" so that the sentence reads "pathways can help limit" [Belgium]	
7284	21	11	21	3	" Section D5 should be removed completely. It provides a blanket sanction to the feasibility of the 1.5 deg. C target ignoring the complex and detailed considerations presented in earlier sections and Chapters. The section 2.5 cited in Para D5 actually states that “The assessment indicates unprecedented policy and geopolitical challenges” in the introduction to the entire discussion. This is in flat contradiction to the claims made in para D5. Similarly the first line of Section 2.5.2.2 states that “Literature on global climate-change mitigation investments is relatively sparse, with most detailed literature having focused on 2°C pathways (McCollum et al., 2013; Bowen et al., 2014; Gupta and Harnisch, 2014; Marangoni and Tavoni, 2014; OECD/IEA and IRENA, 2017).” The confidence levels presented in the section are in direct contradiction to this and to the literature cited in the Chapters." [India]	
8328	21	11	21	13	What the SPM seems to completely ignore are the consequences of 1.5°C warming after 2100, when sea level might be rising at rates of well above a meter per century that will be requiring extensive relocations of coastal cities. There really needs to be an indication given of this limited aspect of the analysis as a 1.5°C warmer world far into the future will have very serious implications for society. [United States of America]	
8330	21	11	21	13	The statement in D5 is unqualified and comes across as overly simplistic and optimistic. The statement seems to be saying that all we need to do to achieve 1.5°C (and the sustainable development goals too!) is to pursue climate-resilient development pathways. This doesn't seem to acknowledge the many challenges associated with 1.5°C and the various dimensions of feasibility. Are the "climate-resilient development pathways" meant to be compared to other approaches to achieving 1.5°C? A more appropriate top-line statement could be something along the lines of what is found in D5.1, "Pathways that are consistent with sustainable development are associated with reduced mitigation and adaptation challenges." [United States of America]	
8332	21	11	21	13	D5 states that "Pursuing climate-resilient development pathways can limit warming to 1.5°C." It's unclear if climate-resilient pathways refers to pathways in both the developed and the developing world. A common interpretation is that climate-resilient development pathways refers to the developing world, in which case the sentence implies actions to limit warming to 1.5°C lie with developing countries, which is not accurate. The text could be updated to something along the lines of "Pursuing climate-resilient development pathways can contribute to limiting warming to 1.5°C." Or "Pursuing climate-resilient development pathways, for all economies, can limit warming to 1.5°C." [United States of America]	
8824	21	11	21	11	After "pathways" add "principals and provisions of UNFCCC" [Iran]	
9562	21	11	21	13	Strategies pursued by Indigenous groups should be highlighted here. [Canada]	
9564	21	11	21	13	In the excutive summary of Chapter 5, there was an emphasis on "social justice and equity are core aspects of climate-resilient development pathways". This is an important dimension for Indigenous Peoples and would be important to include in either this paragraph, the one below, or a completely new one that references this conclusion. [Canada]	
5680	21	12		15	Include: Ürge-Vorsatz, D., Rosenzweig, C., Dawson, R. J., Rodriguez, R. S., Bai, X., Barau, A. S., ... & Dhakal, S. (2018). Locking in positive climate responses in cities. Nature Climate Change, 8(3), 174. [Mexico]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7274	21	13	21	17	Coal use phase out has been reflected by 2050 with annual reduction rate 4 to 5% or with CCS. Both the scenarios would be difficult for the developing countries to adopt. [India]	
302	21	15	21	19	Please check the chapters to which D5.1 refers. Neither 2.5.3 or 5.5.2 seem to contain texts that would allow to present these conclusions with hich confidence. Maybe a reference to another chapter is missing? [Finland]	
3874	21	15	21	16	"Sustainable development can enable societal and systems transformations" - this statement is vague and imprecise concerning the direction of causality. We suggest an alternative: "Sustainable development pathways including societal and systems transformations can help limit warming to 1.5°C". It would also be helpful to specify what is meant by "systems transformations" [Germany]	
4202	21	15	21	19	D5.1. This is a useful paragraph, but it is lacking a statement on how the act of limiting warming to 1.5 has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Saint Kitts and Nevis]	
5456	21	15	21	19	D5.1. This is a useful paragraph, but it is lacking a statement on how the act of limiting warming to 1.5 has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Saint Lucia]	
6300	21	15	21	19	This is a useful paragraph, but it is lacking a statement on how the action on limiting warming to 1.5°C has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Fiji]	
6806	21	15	21	19	D5.1. This is a useful paragraph, but it is lacking a statement on how the act of limiting warming to 1.5 has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Marshall Islands]	
9086	21	15	21	19	D5.1. This is a useful paragraph, but it is lacking a statement on how the act of limiting warming to 1.5 has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Solomon Islands]	
9214	21	15	21	19	D5.1. This is a useful paragraph, but it is lacking a statement on how the act of limiting warming to 1.5 has substantial benefits for sustainable development through reducing climate change impacts and adaptation needs. [Nauru]	
6578	21	16	21	19	A comparison between sustainable development pathways and pathways with high inequality and poverty does not make much sense: sustainable development is much more than reducing inequalities and poverty. [Netherlands]	
2570	21	21	21	25	Statement D5.2 is laregly repetition of D2, D3 and D4. Please re-phrase to identify what is distinctive about each of these statements. [European Union (EU)]	
5164	21	21	21	21	D5.2. The integration between climate policies (adaptation, mitigation) and all other aspects of sustainable development requires .. ((explanation: policies and measures to cope with climate change are integral part of those aiming to achieve sustainable development and in particular the SDGs)) [Hungary]	
8334	21	21	21	21	"requires" is policy prescriptive, consider rewording [United States of America]	
8336	21	21	21	21	"systemic" or "systematic"? [United States of America]	
8338	21	21	21	25	D5.2 should acknowledge the importance of landscape-level planning to maximize mitigation and adaptation benefits while ensuring ecosystem and development sustainability. [United States of America]	
304	21	27	21	3	Really cryptic/difficult to understand [Finland]	
996	21	27	21	27	"joint" between whom? Could it be more precise ? [France]	
1758	21	27	21	3	This statement is just saying that 1.5 °C-consistent development pathways that satsify sustainable development features are sustainable, which amounts to a tatology. How useful is such a statement to policy makers in order for it to find its way into the SPM? [Saudi Arabia]	
2572	21	27	21	3	Sentence looks generic with the use of terms that sound quite abstract in the context and structure of the sentence. It is not clear what is the added value to policy makers. We reccomend to either delete or re-phrase by focusing on more tangible information/messages. [European Union (EU)]	
4958	21	27	21	3	It's unclear what this paragraph is saying. Could you please reword to use less jargon. [United Kingdom (of Great Britain and Northern Ireland)]	
7290	21	27	21	3	The draft report talks about the consistent development pathways that encompass joint, iterative planning and 28 transformative visions power asymmetry and unequal opportunities. In this regard it is to be noted that the asymmetry of distribution in terms of opportunities and resources are primarily skewed against the developing countries. This distortion of availability of resources are supposed to be addressed through the multilateral regime on climate change. [India]	
8340	21	27	21	3	D5.3 contains incredibly obtuse and difficult-to-understand language. Suggest deleting. [United States of America]	
9366	21	27	21	3	The wording of this paragraph is to academic, too technocratic and difficult to understand. [Switzerland]	
420	21	32	22	1	D6.2) Add "particularly LDCs" after "developing countries" [Chad]	
998	21	32	21	35	Sentence unclear - Rewrite - how can civil society, cities and the private sector strengthen institutional capacity? [France]	
4204	21	32	21	35	D6: Again, this statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5 is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5dC world compared to a 2dC world (high confidence bold) (4-5)) [Saint Kitts and Nevis]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5166	21	32	21	35	Chapter 2 contains important messages about the enabling condition for succesful realisiation of 1.5 °C strategies, namely keeping population growth at lower levels, reducing inequalities and promoting international cooperation. The last issue is covered in this headline statement, but the other two are missing. So the following changes are needed: 1) replace "implies" by "requires"; 2) insert "managing population growth, limiting inequalities," before "international cooperation" in line 33. [Hungary]	
5322	21	32	22	1	The chapter 4 executive summary provides an important statement on the fact that adaptation finance is not adequate and will have to be scaled up: "While adaptation finance has increased quantitatively, significant further expansion would be needed to adapt to 1.5°C" (Chapter 4, page 4-5). This should be incorporated into the SPM, perhaps under D6, [Zambia]	
5324	21	32	22	1	This paragraph from chapter 4 executive summary (4-9) should be incorporated into the SPM: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems....This implies the mobilisation of institutional investors and mainstreaming of climate finance within financial and banking system regulation. Access by developing countries to low-risk and low-interest finance through multilateral and national development banks would have to be facilitated (medium evidence, high agreement).New forms of public-private partnerships may be needed with multilateral, sovereign and sub-sovereign guarantees to de-risk climate-friendly investments, support new business models for small-scale enterprises and help households with limited access to capital. Ultimately, the aim is to promote a portfolio shift towards long-term low-emission assets, that would help redirect capital away from potential stranded assets (medium evidence, medium agreement)." [Zambia]	
5458	21	32	21	35	D6: Again, this statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5 is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5dC world compared to a 2dC world (high confidence bold) (4-5)) [Saint Lucia]	
6302	21	32	21	35	This statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5°C is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5°C world compared to a 2°C world (high confidence bold) (4-5)). [Fiji]	
6580	21	32	22	1	All points in section D6 seem true for 2 degrees as well. Completely unclear to what extent it is different from a 2 degrees world. And not only here but also in other instances throughout report - with notable exeptions where the difference is made explicit. [Netherlands]	
6582	21	32	21	35	Chapter 2 contains important messages about the enabling condition for succesful realisiation of 1.5C strategies, namely keeping population growth at lower levels, reducing inequalities and promoting international cooperation. The last issue is covered in this headline statement, but the other two are missing. So the following changes are needed: 1) replace "implies" by "requires"; 2) insert "managing population growth, limiting inequalities," before "international cooperation" in line 33. [Netherlands]	
6658	21	32	22	1	The chapter 4 executive summary provides an important statement on the fact that adaptation finance is not adequate and will have to be scaled up: "While adaptation finance has increased quantitatively, significant further expansion would be needed to adapt to 1.5°C" (Chapter 4, page 4-5). This should be incorporated into the SPM, perhaps under D6, [Sudan]	
6660	21	32	22	1	This paragraph from chapter 4 executive summary (4-9) should be incorporated into the SPM: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems....This implies the mobilisation of institutional investors and mainstreaming of climate finance within financial and banking system regulation. Access by developing countries to low-risk and low-interest finance through multilateral and national development banks would have to be facilitated (medium evidence, high agreement).New forms of public-private partnerships may be needed with multilateral, sovereign and sub-sovereign guarantees to de-risk climate-friendly investments, support new business models for small-scale enterprises and help households with limited access to capital. Ultimately, the aim is to promote a portfolio shift towards long-term low-emission assets, that would help redirect capital away from potential stranded assets (medium evidence, medium agreement)." [Sudan]	
6808	21	32	21	35	D6: Again, this statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5 is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5dC world compared to a 2dC world (high confidence bold) (4-5)) [Marshall Islands]	
6942	21	32	22	1	The chapter 4 executive summary provides an important statement on the fact that adaptation finance is not adequate and will have to be scaled up: "While adaptation finance has increased quantitatively, significant further expansion would be needed to adapt to 1.5°C" (Chapter 4, page 4-5). This should be incorporated into the SPM, perhaps under D6, [Gambia]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6944	21	32	22	1	This paragraph from chapter 4 executive summary (4-9) should be incorporated into the SPM: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems....This implies the mobilisation of institutional investors and mainstreaming of climate finance within financial and banking system regulation. Access by developing countries to low-risk and low-interest finance through multilateral and national development banks would have to be facilitated (medium evidence, high agreement).New forms of public-private partnerships may be needed with multilateral, sovereign and sub-sovereign guarantees to de-risk climate-friendly investments, support new business models for small-scale enterprises and help households with limited access to capital. Ultimately, the aim is to promote a portfolio shift towards long-term low-emission assets, that would help redirect capital away from potential stranded assets (medium evidence, medium agreement)." [Gambia]	
7278	21	32	21	35	Refer underlying report - Chapter 2 (7,30,7,32), (48,35,48,37), (61,Table 2.9, 61); Chapter 4 (11,1,11,2), (11, Table 4.1), (35,11,35,12), (121,1,121,3) - At several places in the report, phasing out of fossil fuel/ coal is considered to be essential for climate secure future. However, coal being a mature technology, continues to be attractive in many countries. It needs to be highlighted that the potential for fossil fuel phase-out pathway varies amongst countries and for several developing countries in particular, coal/ fossil fuel would continue to be the mainstay, atleast in the foreseeable future. It also needs to be highlighted that for developing countries, the transition to non-fossil fuel based energy sources is dependent upon provision of technical, financial and capacity building support from developed countries. Without such support, phasing out fossil fuels globally may compromise the developmental interests of the developing countries, and particularly the most vulnerable ones, by exacerbating poverty. [India]	
7282	21	32	21	5	The draft report talks little about international collaboration and co-operation in terms of technology and resource sharing for convergence of SDGs and 1.5 degree C consistent pathways. Chapter 4.4.2.1 only mentions internationally, the Paris Agreement process has aimed at enhancing the capacity of decision-making Institutions in developing countries to support effective implementation with no road map for achieving the goal. 4.4.4.4 section also mentions about Technology Transfer in the Paris Agreement but is silent about mechanism of technology transfer from developed country to developing countries. [India]	
7294	21	32	22	1	The feasibility of meeting the 1.5 deg. C target is strongly dependent on the discussion in Chapter 2 and 3 of the report. Policy implementation and other such considerations are relevant only if the considerations of Chapters 2 and 3 can be reflected in practice. D6 may be restructured to reflect that. [India]	
8342	21	32	21	32	Suggest changing "policy implemention" to "action" given that there are many non-state actors involved (e.g., private sector, cities, indigenous people) that could take action more generally to limit warming to 1.5°C that may not necessarily be policy-related. [United States of America]	
8344	21	32	22		Many of these statements are policy prescriptive and do not adequately acknowledge the scarcity of relevant literature. [United States of America]	
8346	21	32	21	46	This language about policy changes that are "implied" is policy prescriptive. Change to "may be supported by" [United States of America]	
8348	21	32	22	1	The discussion under D6 is not specific to 1.5°C of global warming. Any of these findings can be said (and has been said) about a higher targets. Where there are substantive findings on the need for support and policy implementation approaches that are specific to 1.5°C, they should be highlighted; otherwise, they should be removed. A better discussion is needed here on the enabling environments that are needed to create the incentives for pursuing the more stringent and rapid actions implied by limited warming to 1.5°C. It isn't enough to simply say there needs to be more international support and wealth transfer. [United States of America]	
8350	21	32	22	3	The sole focus of this section on international sources of finance misses the importance of domestic resources to support the changes necessary to limit warming to 1.5°C. These edits to points D6.2 and D6.3 could fix this omission: [D6.2] Implementing 1.5°C-consistent climate responses in developing countries and for poor and vulnerable people requires [DELETE: international resources supporting] access to finance, technology and capacity building (high confidence). [ADD:, which may be enhanced through international cooperation.] Financial, institutional and innovation capabilities currently fall short of implementing far-reaching measures at scale in all countries (high confidence). Enhanced capacities of local public and private sectors support the deployment of context responses and hence support systems transitions to limiting warming to 1.5°C. [D6.3] [DELETE: International] [ADD: Capacity building efforts, including those that stimulate investment funding and technology innovation transfer], can support fast and profound local transformation when they consider the context-specific needs of recipients (high confidence). Strengthened global -to local structures enable inclusive access to finance and technology and ensure participation, transparency, capacity building, and learning among different players. (high confidence) [United States of America]	
8446	21	32	22	1	The chapter 4 executive summary provides an important statement on the fact that adaptation finance is not adequate and will have to be scaled up: "While adaptation finance has increased quantitatively, significant further expansion would be needed to adapt to 1.5°C" (Chapter 4, page 4-5). This should be incorporated into the SPM, perhaps under D6, [Nepal]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8448	21	32	22	1	This paragraph from chapter 4 executive summary (4-9) should be incorporated into the SPM: "Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, climate-resilient infrastructure and services requires an evolution of global and national financial systems....This implies the mobilisation of institutional investors and mainstreaming of climate finance within financial and banking system regulation. Access by developing countries to low-risk and low-interest finance through multilateral and national development banks would have to be facilitated (medium evidence, high agreement).New forms of public-private partnerships may be needed with multilateral, sovereign and sub-sovereign guarantees to de-risk climate-friendly investments, support new business models for small-scale enterprises and help households with limited access to capital. Ultimately, the aim is to promote a portfolio shift towards long-term low-emission assets, that would help redirect capital away from potential stranded assets (medium evidence, medium agreement)." [Nepal]	
9088	21	32	21	35	D6: Again, this statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5 is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5dC world compared to a 2dC world (high confidence bold) (4-5)) [Solomon Islands]	
9216	21	32	21	35	D6: Again, this statement ignores the fundamental difference regarding action needed for mitigation and adaptation. Policy implementation to successfully adapt to 1.5 is much easier than having to adapt to higher levels (add this clear statement from ES chapter 4: "adaptation needs will be lower in a 1.5dC world compared to a 2dC world (high confidence bold) (4-5)) [Nauru]	
9566	21	32	22	1	D6 refers to strengthening the institutional capacity of, inter alia, Indigenous peoples, but does not expand on this concept in subsequent sub-paragraphs. Consider expanding on what this would mean for Indigenous peoples, including possible reference to the value of "recognition of Indigenous rights, governance systems and laws," as noted in chapter 4 (4.3.5.5). [Canada]	
9568	21	32	21	35	Referring to the institutional capacity of Indigenous peoples is uncomfortable wording. The word 'institutional' could be disassociated from Indigenous peoples in this sentence, or another sentence referring to the general capacity of Indigneous peoples could be added. This also not reflective of the wording in Chapter 4 Executive Summary, which says "enhanced institutional capability in all countries, including building the capability to utilise Indigenous Knowledge and local knowledge". We suggest that this wording is reflected in the sentence. [Canada]	
3876	21	33	21	34	Relevant national and subnational authorities are not (only) constituted "from" civil society, the private sector, cities, local communities and Indigenous peoples. Probably it is meant that national and subnational authorities should strengthen cooperation with these actors or that the capacity of all these actors should be strengthened (add "including" to the original sentence). Please specify. [Germany]	
8768	21	33	21	33	to add term "regardless of political relations" after term "….implies international cooperation" [Iran]	
8826	21	33	21	33	After "international cooperation" add " in full implementation of UNFCCC" [Iran]	
1000	21	34	21	35	The agreed terminology should be used ("indigenous people and local communities", not the contrary). [France]	
4634	21	34	21	35	“National and sub-national authorities from civil society, ...”is hard to understand. The word “from” is too open. Changing “from” to more rigid word, (e.g. consisted of) is suggested. [Japan]	
8352	21	34	21	34	"authorities" is not an apt descriptor when referring to different groups such as civil society, private sector, etc. Suggest replacing with "actors" or something more general than "authorities" which implies governmental authority. [United States of America]	
9570	21	35	21	35	Please capitalize 'peoples'. [Canada]	
306	21	36	21	36	typo: ipoverty [Finland]	
2574	21	37	21	42	Please add after "These changes" : "some of which are already underway". Note that poverty reduction is an SDG. [European Union (EU)]	
3878	21	37	21	42	D6.1 introduces "transformational adaptation" but the expression is already used in D3.1. In addition, D6.1 does not refer to the kind of adaptation which is indicated by this term, but only to the sustainable development aspects. In the current version, the statement seems to focus on poor people(s) and countries. Is "transformational adaptation" not required in all countries and systems? Please revise this paragraph. [Germany]	
4408	21	37	21	37	ipoverty ? poverty [Republic of Korea]	
4434	21	37			There should be "poverty" instead of "ipoverty" [Czech Republic]	
4636	21	37	21	37	Replace “ipoverty” with “poverty” [Japan]	
4638	21	37	21	38	We seek clarification of "ipoverty reduction and promoting equity with benefits for sustainable development goals" given that the 2030 Agenda (A/RES/70/1) does not mention "equity" while eradicating poverty is indeed one of its goals. The term "transformational adaptation" is mainly explained in the section 4.2.2.2 and 4.5.3.1, but there is no clear mentioning to "equity" and "sustainable development" except for the transformational adaptation "in urban settings" (4.5.3.1) which is too narrow to be referred in the general sentence in SPM D6.1. We suggest to delete the sentence "linked to ipoverty reduction and promoting equity with benefits for sustainable development goals" if there is no appropriate reference section. [Japan]	

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4960	21	37	21	37	"ipoverty" should read "poverty" [United Kingdom (of Great Britain and Northern Ireland)]	
5168	21	37	21	37	ipoverty [Hungary]	
5246	21	37	21	37	should be poverty, not ipoverty [Spain]	
5812	21	37	21	37	"Transitional adaptation" is not clear - what is meant? [Sweden]	
5998	21	37	21	37	typo: ipoverty => poverty [Belgium]	
6584	21	37	21	37	Typo: 'ipoverty' [Netherlands]	
8354	21	37	21	37	Typo: "ipoverty" should be "poverty" [United States of America]	
8356	21	37	21	37	Revise to read: "Transformational adaptation entails deep and long-term societal changes. These may be linked to poverty reduction and promoting equity with benefits for sustainable development goals." [United States of America]	
8358	21	37	21	37	The concept of "transformational adaptation" is not likely to be meaningful to many readers. (This also appears early in the Chapter 4 Executive Summary, apparently as a term of art, without explanation. The term is first defined, in passing, in Section 4.2.2.2.) [United States of America]	
8504	21	37	21	37	POVERTY [Zimbabwe]	
8708	21	37	21	37	"ipoverty" to "poverty" [New Zealand]	
8756	21	37	21	37	Last bit of the line says "linked to ipoverty", it should be "linked to poverty" [Maldives]	
9368	21	37	21	37	"ipoverty" ? [Switzerland]	
9572	21	37	21	38	In the interest of concensus and clarity, recommend removing the text "implies deep and long-term societal changes….development goals. These changes", so that the sentence reads: "Transformational adaptation can be enabled by multi-level…". [Canada]	
9584	21	37	21	37	SPM: (1) Mistype: "ipoverty" cahnge to "poverty", Chapter 3: (2) make a stronger contrast in figures 3.1, 3.5, 3.9, 3.11 and 3.13, (3) Put a definition of abreviation of GMST in Figure 3.3 as was done in Figure 3.4, (4) In Figure 3.13 instaed "Managng" put "Managing", (5) In Box 3.3 instead "about10 -5 kyr" put "about 10 -5 kyr", (6) In Figure 3.17 put the same font in the part "1.5 o and 2.0 oC relative to 0.87 oC", (7) In Box 3.4 instead "(0.87 oC;Chapter 1)" put "(0.87 oC; Chapter 1)", (8) In Box 3.5 (last paragraph) instead "1.5C" put "1.5oC", (9) In Box 3.6 I propose intead "trillion" to be 10^12 or 10^18 depending no language (http://www.enciklopedija.hr/natuknica.aspx?id=70238)ž , (10) In Cross- Box 3.7 two times appears "for example by postulating that increases in agricultural efficiency and changes in diet can enable land use". [Croatia]	
1002	21	38	21	41	Add strenghtening capacities of women, considering these messages of the chapters : 4.4.1.1: The importance of community participation is emphasised in literature, and in particular the need to take into account equity and gender considerations 4.4.3.1.1: Adaptive capacity further depends on gender roles, technical capacities and knowledge. We suggest to add : "These changes are enabled by multi-level governance, coordinated sectoral and cross-sectoral policies, gender responsive policies, collaborative stakeholder partnerships…" [France]	
1004	21	38	21	41	Add "long-term planning" to this list [France]	
3880	21	4	21	4	"greater" - greater than what? Please review this adjective, as it is not clear where the augmentation comes from. [Germany]	
4410	21	4	21	4	financing ? finance [Republic of Korea]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4412	21	4	21	41	What provides greater access to financing and technology can be not only innovative financing mechanisms but also innovative technology mechanism. Therefore, it is better to revise 'innovative financing mechanisms' to 'innovative financing and technology mechanisms'. [Republic of Korea]	
2580	21	43	22	3	Statements related to finance, technology transfer and investment should be treated in a more integrated manner since the report finds that sustainable paths to 1.5°C must direct finance both towards the right populations (all countries but especially the vulnerable, least developed countries) AND towards the right types of expenditure (energy efficiency, low carbon energy, health, education etc). Combine the messages from D6.2, D6.3, B6.2, B6.4, D2.3, D3.2 & D4.4. [European Union (EU)]	
416	21	44	21	46	D4 seems to be better phrased than the corresponding statement in the Exec Summ of Chap. 2, p. 2-7. However, it still provides equal emphasis to the negative and positive effects of following at 1.5°C pathway, even though the figure SPM-4 shows that the positives outweigh the negatives. [Chad]	
1760	21	44	22	3	There seems to be a large degree of overlapping between statements D6.2 and D6.3. Perhaps better to combine them together. [Saudi Arabia]	
2576	21	44	21	5	Please add after … capacity building 'and investment in ecosystem-based approaches providing multiple benefits. Several overarching adaptation options that are closely linked to sustainable development can be implemented across rural landscapes. {4.3.6, 4.5.3} [European Union (EU)]	
2578	21	44	22	3	Statements related to finance, technology transfer and investment should be treated in a more integrated manner since the report finds that sustainable paths to 1.5°C must direct finance both towards the right populations (all countries but especially the vulnerable, least developed countries) AND towards the right types of expenditure (energy efficiency, low carbon energy, health, education etc). Combine the messages from D6.2, D6.3, B6.2, B6.4, D2.3, D3.2 & D4.4. [European Union (EU)]	
3882	21	44	21	46	D6.2 and D6.3 both address international support including access to finance and technology. Please shorten and join the two paragraphs. Please see also our comment on tracing back the content of D6.2 to the underlying report. [Germany]	
3884	21	44	21	46	The expression "in developing countries and for poor and vulnerable people" should be modified to " for poor and vulnerable people in developing countries". This would clarify that this paragraph is specifically addressing the situation in developing countries. We also suggest switching the first two sentences of D6.2, i.e. starting with the current situation in the first sentence of D6.2 followed by a more balanced statement on the situation for 1.5C. Please add also information concerning 2C. Please see also our comment on tracing back the content of D6.2 to the underlying report. [Germany]	
3886	21	44	21	5	The content of paragraph D6.2 is very hard to trace back to the underlying report. The sections quoted here for reference do not relate specifically to support for vulnerable populations or developing countries, the sections of chapter 4 mostly discuss changes in the financial systems and governance issues related to investment, there is no statement in the ES of either Chapter 2 or 4 even remotely similar to the wording of the paragraph here. While we do not disagree with the content, it is important for the integrity of the report that a clear line of sight is being provided in support of statements and confidence assessments. Please make sure that the wording highlighted here can actually be found in the underlying report, if possible in the Executive Summaries of Chapters that are meant to summarize the key findings. With a view to content, we'd also encourage to rephrase the line "resources supporting access" (p21 ln 45) to "by cooperation, including through market mechanisms, that harnesses" in order to clarify that cooperation and related mechanisms are a necessary condition for resource flow. [Germany]	
4096	21	44	21	45	D6.2: I suggest that it should read "vulnerable countries and people" not only "vulnerable people" [Saint Kitts and Nevis]	
4640	21	44	21	46	Implementing 1.5?C -consistent climate responses in developing countries and for poor and vulnerable people requires international resources supporting access to finance, technology and capacity building (high confidence)" is a quote from the second paragraph of Chapter 4 Executive Summary (page 5). This part, however, is not boldface in the paragraph, suggesting less importance than other parts. Limiting warming to 1.5?C would require efforts in all countries, not only in specific countries, so it would be appropriate to quote bold type key message of the paragraph; "To strengthen the global response, almost all countries would need to significantly raise their level of ambition. Implementation of this raised ambition would require enhanced institutional capabilities in all countries, including building the capability to utilize Indigenous and local knowledge. [Japan]	
5318	21	44	21	46	D6.2) Add "particularly LDCs" after "developing countries" [Zambia]	
5460	21	44	21	45	D6.2: Should this not read "vulnerable countries and people" not only "vulnerable people"? [Saint Lucia]	
6196	21	44	21	46	We suggest additions of "particularly LDCs" after "developing countries" in D6.2 [United Republic of Tanzania]	
6654	21	44	21	46	D6.2) Add "particularly LDCs" after "developing countries" [Sudan]	
6810	21	44	21	45	D6.2: Should this not read "vulnerable countries and people" not only "vulnerable people"? [Marshall Islands]	
6938	21	44	21	46	D6.2) Add "particularly LDCs" after "developing countries" [Gambia]	
7280	21	44	21	47	Refer to the underlying report chapter 4 page 26 line 15-20: Capacity building of communities in inventorying and assessment of carbon stocks/biodiversity should be highlighted. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8442	21	44	21	46	D6.2) Add "particularly LDCs" after "developing countries" [Nepal]	
8684	21	44	21	45	D6.2: Should this not read "vulnerable countries and people" not only "vulnerable people"? [Grenada]	
8706	21	44	21	44	Add "many" to make "many developing countries". Within the UNFCCC context, not all Parties which define themselves as developing countries require international resources to support their access to finance, technology, etc. [New Zealand]	
9090	21	44	21	45	D6.2: Should this not read "vulnerable countries and people" not only "vulnerable people"? [Solomon Islands]	
9218	21	44	21	45	D6.2: Should this not read "vulnerable countries and people" not only "vulnerable people"? [Nauru]	
9574	21	44	21	45	This statement is too prescriptive. Delete "requires" and replace with "can be enabled by". Delete "international" in "international resources". Unless there is specific evidence that resources should be limited to 'international', then all types of resources should support developing countries access finance, technology and capacity building. [Canada]	
8360	21	45	21	45	"requires" is policy prescriptive, consider rewording [United States of America]	
8362	21	45	21	46	Needs to be balanced by emphasizing importance of enabling environments, building domestic institutions, spurring innovation, etc., as discussed in 2.5.1, 2.5.2, 4.4.4.1, 4.4.4.2 and 4.4.4.3. [United States of America]	
8828	21	45	21	45	After "people requires" add "depoliticizes efforts lead emissions reduction and support from developed countries to developing countries…" [Iran]	
8364	21	46	21	46	It is not clear what "innovation capabilities" means. [United States of America]	
9576	21	46	22	47	Recommend replacing "all countries" with "many countries". The statement "Financial, institutional….currently fall short of implementing far-reaching measures at scale in all countries" sounds very definitive and it is uclear how this could be supported by evidence. [Canada]	
418	21	47	21	49	D4.3) This statement gives a very negative view of the impact of mitigation on development, but there are many positive impacts of mitigation on development, e.g. those countries that are heavily dependent on fossil fuel imports can reduce their import dependence through domestic renewable energy generation and avoid the creation stranded assets from lock-in to fossil fuel infrastructure. [Chad]	
4072	21	47	21	49	Please consider to rephrase this sentence for simplicity. For example,if appropriate, removing the terms "context-specific" and "systems' , would greatly simplify the message [Norway]	
5320	21	47	21	49	D6.2) Add "particularly in developing countries" after "public and private sectors" [Zambia]	
6198	21	47	21	49	We suggest additions of "particularly in developing countries" after "public and private sectors" in D6.2 [United Republic of Tanzania]	
6656	21	47	21	49	D6.2) Add "particularly in developing countries" after "public and private sectors" [Sudan]	
6940	21	47	21	49	D6.2) Add "particularly in developing countries" after "public and private sectors" [Gambia]	
8444	21	47	21	49	D6.2) Add "particularly in developing countries" after "public and private sectors" [Nepal]	
1006	21	49	21	49	Add : "support the necessary systems' transitions..." in order to strengthen the message. [France]	
4642	21	52	22	3	The second sentence can be implied by the first sentence, therefore, instead of (or in addition to) the second sentence, the following two major challenges about climate finance would be mentioned. Firstly, as innovative mobilization of both public and private finance is important, the sentence such as "Unlocking new forms of public, private, and public-private financing is essential to support environmental sustainability of the economic system" which is written in Section 5.6.1 should be inserted. Secondly, as the effective allocation of the limited climate finance is also important, the sentence such as "Knowledge gaps persist with respect to the instruments to match finance to its most effective use in mitigation and adaptation" which is written in Table 4.13, should be added. Similar points are also mentioned in Executive Summary of Chapter4 (page4-9 para1). [Japan]	
6186	21	52	21	53	In line 52, add "Particularly to Least Developing Countries (LDC)" after Technology Transfer [United Republic of Tanzania]	
8366	21	52	21	52	The technology transfer reference is problematic unless it is specified as voluntary and on mutually agreed terms, thereby protecting IP rights. [United States of America]	
8368	21	52	21	52	D6.3 does not make sense. International funding and technology transfer will support fast and profound transformations in many places WHETHER OR NOT they consider 'context-specific' things. Elaborate on the qualifier as applied to a 1.5°C pathway. [United States of America]	
8830	21	52	21	52	Delete: International [Iran]	
9370	21	52	21	52	Write: "International investment, stronger institutions (including good governance and inclusive markets) and technology transfer can support …" [Switzerland]	
7288	21	53	21	53	Page 21, Line 53 talks of “context-specific” needs of recipients. It should only be “needs” of developing countries. There is no concept of donors and recipients here. The IPCC Report has to recognize the financial mechanism of the Convention and its role in addressing climate change actions. Rather, it recognizes explicitly ODA, MDBs and also highlights the national and subnational budgets. Such explicit recognition is lacking when it comes to the multilateral climate finance under the Convention. [India]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8370	22	1	22	1	As with p.21/line 46, access to technology and finance is problematic. This paragraph is even more one-sided, as it doesn't mention capacity building, TA, and improved enabling environments or institutions as discussed in 2.5.1, 2.5.2, 4.4.4.1, 4.4.4.2 and 4.4.4.3. [United States of America]	
8372	22	1	22	1	Delete "inclusive". [United States of America]	
5818	22	2	22	2	Suggest replacing ”players” with ”actors”. [Sweden]	
1008	22	5	22	6	This sentence is very vague: please detail a bit. We suggest to formulate it as follow : "Taking into account equity and SDGs in International Agreements favour transformation consistent with a 1.5°C warmer world." [France]	
3888	22	5	22	6	Reconsider the formulation of the logic of the argument or message with respect to the role of equity and sustainable development. Are these "enablers" or rather "preconditions" to achieve 1.5°C? The messaging of the SPM is not clear in this respect, and seems to be swaying between the two, see also our comment on p6 ln 1 [Germany]	
3890	22	5	22	1	The content of paragraph D6.4 is very hard to trace back to the underlying report. The referenced sections of chapter 5 do not provide content on "international agreements" or "global partnerships" (these expressions cannot be found in chapter 5). Chapter 1.4 addresses the global response, but does not provide findings supporting the statements in D6.4., e.g. page 1-31 mentions equity as an important issues for vulnerability reduction, but does not support the general statement of in the SPM. It seems as if D6.4 is an unbalanced version of the assessment of the governance issues provided on page 4-8, which mentions global partnerships as one option: "For 1.5°C-consistent actions, an effective governance framework would include: accountable multi-level governance that includes non-state actors such as industry, civil society and scientific institutions; coordinated sectoral and cross-sectoral policies that enable collaborative multi-stakeholder partnerships; strengthened global-to-local financial architecture that enables greater access to finance and technology; and addresses climate-related trade barriers; improved climate education and greater public awareness; arrangements to enable accelerated behaviour change; strengthened climate monitoring and evaluation systems; and reciprocal international agreements that are sensitive to equity and the Sustainable Development Goals (SDGs)." Please revise paragraph D6.4 to reflect the findings of the underlying report related to governance issues including international agreements and global partnerships. [Germany]	
4644	22	5	22	6	We share the view that SDGs are critical agenda and have linkages with climate change challenges. At the same time, we seek clarification on the term "international agreements that are sensitive to equity". International agreements are mentioned in the section "4.4.1.2 International Governance", but there is no clear mentioning to "equity" there. [Japan]	
4646	22	5	22	6	Request to provide more explanations of "transformation consistent with a 1.5°C warmer world" in this context with concrete examples. [Japan]	
4648	22	5	22	1	As for the first sentence, "International agreements that are sensitive to equity and the SDGs" is just one of the effective governance frameworks for 1.5°C-consistent actions which are written in Chapter 4 (in page 4-8). (The first sentence can give a misleading impression that if international agreements which take more into account equity and SDGs are agreed, a 1.5°C warmer world can be realized.) Similarly, "multi-level governance" which is written in the second sentence is also just one of the effective governance frameworks mentioned in Chapter 4. Therefore, it would be appropriate to quote the key message "Governance consistent with limiting warming to 1.5°C and the political economy of adaptation and mitigation can enable and accelerate systems transitions, behavioral change, innovation and technology deployment "which is written in boldface type in page 4-8 of Chapter 4. As this key sentence is more comprehensive and mentions both adaptation and mitigation, it is appropriate to be inserted in the SPM. [Japan]	
6000	22	5	22	1	We suggest to modify the first sentence of D6.4 as follows : "International cooperation is key for mitigation and adaptation to a 1.5°C warmer world, in particular international agreements that are sensitive to …" [Belgium]	
7298	22	5	22	1	There seems to be a lot of emphasis on non-state and private actors. It is useful to highlight governments', especially developed country governments' role in reducing emissions. [India]	
8374	22	5	22	1	The first line about international agreements consistent with a 1.5°C warmer world being sensitive to equity and SDG is not a scientific statement; it is a statement about societal policy options and relationship with societal goals. It may be true, but this is a statement for a policymaking body to make -- not the IPCC. [United States of America]	
8376	22	5	22	6	This seems like a rather sweeping statement about international agreements and a 1.5°C warmer world. While it may be beneficial for international agreements relating to climate change to be sensitive to equity and the SDGs, it is likely not the case that any international agreement that is sensitive to equity and the SDGs would enable transformation consistent with a 1.5°C pathway. This statement should be narrowed and reframed so that it is clearly accurate. [United States of America]	
8378	22	5	22	1	The reference to "governance of global partnerships" in D6.4 is unclear and should be revised or deleted. [United States of America]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8380	22	5	22	1	Delete the first two sentences. On the first sentence, it is totally unclear what "international agreements... sensitive to equity and the SDGs" refers to. There is no objective standard under which you could say that X or Y agreement is sensitive to equity/SDGs. Furthermore, this statement can be interpreted as policy-prescriptive and should not be included in an IPCC report. On the second sentence, "governance of global partnerships" is unclear. What does that mean? And the rest of the sentence is nonsensical as well. Certainly this statement is incorrect/misleading if focuses only on international "agreements" and omits reference to the suite of domestic policies/measures that also relate to equity within countries. [United States of America]	
8832	22	5	22	5	Add to start of D6.4 "The UNFCCC and similar …" [Iran]	
9578	22	5	22	6	Delete: "International agreements that are sensitive to equity and the SDGs enable transformation consistent with a 1.5C warmer world." This sentence is very broad, and has no substantive backing nor confidence qualifier. [Canada]	
1010	22	6	22	6	"Governance" is too vague - add "robust" [France]	
3892	22	6	22	9	The current second sentence of D6.4 is very convoluted and does not covey a clear message. Consider to replace "The governance … to 1.5°C" by "International governance - mobilizing public and private sector action through effective policy instruments and harnessing non-state actor engagement - improves the chances of constraining global warming to 1.5°C" [Germany]	
8710	22	6	22	6	For greater clarity, delete "The governance of". Sentence would start with "Global partnerships involving non-state actors, including…." [New Zealand]	
9580	22	8	22	8	Delete "would facilitate" and replace with "could facilitate". This sentence is very broad and there is no way to know definitively that these actions would be effective. [Canada]	
7300	22	11	22	11	An important table from Chapter 4, Table 4.13 identifies the knowledge gaps and uncertainties in mitigation and adaptation action required for 1.5 deg. C- consistent model pathways. This table should be included at the end of the SPM. [India]	
5536	23		23		The reference where these indices are defined should be included, since they are those proposed by the ETCCDI. [Mexico]	
5538	26		26		The name should have capital letters in each word for better identification in the acronym: Half a degree additonial warminh, prognosis and projected impacts (HAPPI). [Mexico]	
5540	27		27		It would be convenient to include the reference for the indices. [Mexico]	
5542	29		29		Change subscript in CO2 [Mexico]	
5544	29		32		In table S6 include the units of SST [Mexico]	
5546	3		32		In table S6 indicate the meaning of NA and homogenize N/A and NA [Mexico]	
5496	31		31		The document addresses options for implementation that respond to adaptation and mitigation in the context of the SDGs and the Sendai Framework for Disaster Risk Reduction, however this latest international agreement is not mentioned again in all the section. We suggest adding in what options are linked to that framework. [Mexico]	
5498	31		31		We suggest to remove sentences in the paragraph 1.4 because the information is repeated in others paragraphs. [Mexico]	
5500	32		32		Section 1.4.1 Classifying Response Options is very interesting when it addresses the differences between the incremental adaptation and the transformational, however we suggest that the types of adaptations that may exist, be made more explicit in terms of which are related to strengthening human and institutional capacities and which promote changes in socio-environmental systems through specific actions through projects. [Mexico]	
5502	33		33		The framework of feasibility for adaptation and mitigation options allow to expand the overview of the factors that should be considered in the design and implementation. It is suggested that the evaluation of the feasibility can resume as fundamental elements establish M & E methodologies [Mexico]	
5548	35		35		In the text of figure change Rx1d to Rx1day [Mexico]	
5550	36		36		Change RCP2.6 and 4.5 to RCP2.6 and RCP4.5 [Mexico]	
5504	38		38		Add more resolution to the figures [Mexico]	
5552	38		38		Include a line spacing [Mexico]	
5506	42		42		Add more resolution to the figures [Mexico]	
5554	43		43		Mitigation should be replaced by "decrease" or some other concept, because it can be confused with the term of mitigation when it refers to the reduction of greenhouse gases. [Mexico]	
5556	43		43		Change runof to runoff [Mexico]	
5558	49		5		Some representative figure of changes in the ice sea could be included, because it would help to enrich the information included in this section. [Mexico]	
5560	51		53		Some representative figure of changes in the sea level could be included, because it would help to enrich the information included in this section. [Mexico]	
5562	53		53		Change Rasmussen et al. (2018)(2018) to Rasmussen et al. (2018) [Mexico]	
5564	56		56		Change 65 Ma to 65 million years and 300 Ma to 300 million years [Mexico]	
5566	56		56		Change Al to Aluminum [Mexico]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5568	57		62		In the Table 3.2 approve the format of this description as in the case of "Tropical and extra-tropical cyclones", so in all cases it shows similar information. [Mexico]	
5570	59		59		It is suggested to include some data of increase or decrease for the projections of 1.5° C and 2.0° C, as in temperature events. In this case, the information provided has no contribution. [Mexico]	
5572	6		6		Indicate some representative quantitative data of each of the "runoff and river flooding" projections. In the fourth column indicate which is the difference between 1.5°C and 2.0° C? [Mexico]	
5574	62		62		In Ocean chemistry include some impacts that will be more pronounced with a warming of 2 ° C than with 1.5 ° C. [Mexico]	
5576	64		64		Include the meaning of dT in table S6 [Mexico]	
5578	64		64		Adjust the height of the fourth row [Mexico]	
5580	65		65		Delete the citations of Hanasaki et al. (2013) posterirores to the first appointment of the same. [Mexico]	
5582	65		65		Delete Representative Concentration Pathway [Mexico]	
5584	65		65		Delete (Tobin et al., 2018) in: "1.5°C (Tobin et al., 2018)", and "countries (Tobin et al., 2018)" [Mexico]	
5586	66		66		Change Alfiere et al (2017) to They report [Mexico]	
5588	67		67		"(Sun et al., 2017)" must be at the beginning of the author's contribution, otherwise it is confused with the previous author's contribution. [Mexico]	
5590	69		69		Include the meaning of LPJmL [Mexico]	
5592	69		69		In the text check the number of figures 3.15a and 3.15b [Mexico]	
5594	74		74		In the text check the number of figure 3.16, because the figure does not correspond to what is mentioned in the text. [Mexico]	
5596	76		76		Review "Aalto et al., (2017) predict a 72% reduction", the term is not correct, it refers to projections [Mexico]	
5598	79		79		Homogenenize the run-off or runoff script [Mexico]	
5600	81		81		Change "evidence) Organisms" to "evidence).Organisms" [Mexico]	
5602	9		9		Delete (see Figure 3.17) in the text of Figure 3.17 [Mexico]	
5604	92		92		Change (0.87°C;Charpter 1) to (0.87°C; Charpter 1) [Mexico]	
5606	92		92		Change Fang et al., 2013, 2014, Reyes-Nivia et al., 2013, 2014 to Fang et al., 2013, 2014; Reyes-Nivia et al., 2013, 2014 [Mexico]	
5608	96		96		Change livlihoods to livelihoods [Mexico]	
5610	96		96		Change "but is also dependent on other extreme weather events, such as temperature" to "but it even depends on other extreme events such as those related to temperature" [Mexico]	
5612	96		96		Change slowe to Slower [Mexico]	
5614	97		97		Change 2018) The to 2018). The [Mexico]	
5616	97		97		Change 2oC to 1.5oC to 2°C to 1.5°C [Mexico]	
5618	11		11		Change 1.5C to 1.5°C [Mexico]	
5620	12		12		It is suggested to include the meaning of C3 [Mexico]	
5622	13		13		It is suggested to include the range of uncertainty of 3.1% as the previous values. [Mexico]	
5624	17		17		If Mekong refers to the Mekong River Commission (MRC), indicate it, as it is mentioned here first, or indicate what it refers to. [Mexico]	
5626	114		114		Homogenenize the acronyms U.S. or USA [Mexico]	
5628	119		119		Include the meaning of H, M, L and include in the spaces without data "Not available", N / A or "-----" [Mexico]	
5630	121		129		Center the texts of the table 3.5 [Mexico]	
5632	126		126		Change km?2 to superscript [Mexico]	
5634	126		126		Change 1.5degC to 1.5°C, 2.0degC to 2.0°C [Mexico]	
5636	131		131		Change the font size (Brown et al., 2018a) [Mexico]	
5638	134		134		Change AR% to AR5 [Mexico]	
5640	139		139		Change 2018b)but to 2018b) but [Mexico]	
5642	14		14		Change AMOC). to AMOC) [Mexico]	
5644	145		145		Change numer to number [Mexico]	
5646	145		145		Change "Worldwide, the largest increases in the number of hot days are projected to occur in the tropics (Figure 3.7). Moreover, the largest differences in the number of hot days for 1.5°C of global warming versus 2°C of global warming are found in the tropics (Mahlstein et al., 2011)." to "Worldwide, the largest increases in the number of hot days are projected to ocurr in the tropics (Figure 3.7), where exist the largest differences in the number of hot days for 1.5°C of global warming versus 2°C (Mahlstein et al., 2011)." [Mexico]	
5648	146		146		Change the font size of SIDS to adapt (Benjamin and Thomas, 2016) [Mexico]	
5650	146		146		In all cases, what could be the benefit for fishing in the Arctic? [Mexico]	
5652	146		146		Change 1.5ºC to 1.5°C [Mexico]	

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5654	149		149		In the "Tropics" in the part of warming of 2°C -3°C, It is suggested to include some data that quantifies the reduction, as in the other cases. [Mexico]	
5656	152		154		Change in the table 3,7 1.5ºC to 1.5°C [Mexico]	
5658	156		156		Change les to less [Mexico]	
5660	162		162		Delete this text, it is repeated: for example by postulating that increases in agricultural efficiency and changes in the diet can enable land use, [Mexico]	
5662	174		174		It is suggested to include the meaning of superindices a to i [Mexico]	
5664	174		178		This information is known to be contained in the document, when the chapter and section is indicated, the continuity of the reading is lost. It is suggested to include only those references of the most relevant information. [Mexico]	
5666	179		179		It is important to include the global warming data; because about 1 ° C is not half of 1.5 ° C [Mexico]	