IPCC WGI SR15 Second Order Draft Review Comments And Responses - Chapter 1

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5800					My feeling on reading the chapter summary was that it would greatly be aided by adding headers that may firstly aid the reader in following the intended narrative arc and secondly aid the authors to order that intended narrative. Presently it feels like the summary jumps across between subjects in a manner that does not aid the reader to distill a key narrative. [Peter Thorne, Ireland]	Accepted. Executive summary rewritten substantially and bullets re-ordered
5802					Upon reading the chapter I felt like the chosen ordering was working against rather than with the reader. Recognising that the order to put things is a subjective choice I would nevertheless suggest that it would make more sense from the reader's perspective to start rather than finish with Section 1.7. It felt like a lot of things clicked when I reached there and that this information would have helped were it the first piece of information rather than the very last. Next, I would put the sections 1.5 and 1.6 in either order, or maybe amalgamated that present effectively a narrative of how you are going to perform the assessment and introduce confidence / likelihood. Then, given the import, I think the 1.5 target, the observed basis etc. (current 1.2 but possibly beefed up per other comments and 1.3). Then, finally, some allusion to the broader context and concepts (current 1.1, 1.4) would make for a stronger more compelling text. Reordering in this manner would also potentially help reduce repetition. I think what this chapter is trying to say can be said more compellingly and in fewer words with some effort at reordering and would urge the chapter team to consider a range of alternatives that may help at a minimum sharpen their thinking on the matter. [Peter Thorne, Ireland]	Accepted: section 1.1 now contains a lot of material that was in later sections.
5804					I made this comment generically to the report as a whole but this is one of the two chapters which I read in depth so for competeness … I feel like the chapter is making the reader work far harder than necessary to trace back the Executive summary statements to the main text. It would greatly aid the reader were the executive summary statements to be made in (and lifted from) the main text in such a way that the main text preceding each lifted section directly supports the statement. This enables a reader to very simply and conveniently trace back the key finding but also the assessment basis that led the chapter team to come to that conclusion. This approach was used in at least a subset of AR5 WG1 chapters and my feeling was that it worked well from a reader perspective and as an author helped sharpen my thinking in performing the assessment. It would also ensure embedding of confidence / likelihood text in the text which is currently lacking compared to the ES. If the underlying text is shorn of confidence / likelihood but your ES contains it you are asking the reader to work very hard and risking unnecessary accusations of a lack of traceability of your findings [Peter Thorne, Ireland]	Accepted: traceability of statements in the ES has been improved in the revised version
7858					In general, Chapter 1 could be significantly shortened without loss of essential content. [Petr Zavialov, Russian Federation]	Accepted: chapter length has been substantially reduced
19104					There is a general lack of consideration of the effect of decreasing emissions of (cooling) aerosols in this chapter and in the report in general. A prime example is the statement made on page 5, lines 3-4. If aerosols are responsible for a large negative radiative forcing, then zero'ing their emissions could result in a large warming that would last a long while ! Another example is on page 59, lines 40-45. I would urge the author to qualify some of their statements. If the aerosol forcing is in the lower part of the IPCC range (ie -1.9 Wm-2), then strong mitigation will also be associated with a strong reduction in this negative forcing, causing a substantial warming that cannot be ignored or just mentioned in passing. [Olivier Boucher, France]	Accepted: this is addressed in more detail now in 1.2.4
19108					There is a false sense of consensus in the IAM literature as to where the Paris Agreement will take us in terms of emissions and commitment. See our study published in ERL (http://iopscience.iop.org/article/10.1088/1748-9326/aaa0b9) that shows the possibility of larger GHG emissions in 2030 as compared to today if (I)NDCs are interpreted literally. [Olivier Boucher, France]	Noted: the assessment of the NDCs is made in chapter 2
19126					I commend the authors for a significantly improved manuscript. Consistency across the chapters and with the SPM has increased but there remains a few areas of concern (eg the 0.17 vs 0.20 °C/decade rate of warming). [Olivier Boucher, France]	Accepted: statements about current rate of warming have been tidied up
38728					the concept "Anthropocene" is used throughout the chapter. I understand that this is a concept that is used in parts of the literature. But in my view, it does not function very well here in this chapter. I don't think it adds anything to the scene setting or understanding. [Jan Fuglestvedt, Norway]	Noted: as the reviewer observes, the Anthropocene is increasingly widely used in the literature framing the climate challenge, and as a framing chapter, we reflect that, although with less space devoted to it than previously.
44682					There remains quite a bit of repetition to be resolved between Chapter 1 and Chapter 5, in various sections. [Penny Urquhart, South Africa]	Noted: both chapters have been considerably shortened.
44684					The length of Chapter 1 has grown substantially since the FOD. It would be advisable to condense this down in the interests of readability. Several of the boxes could usefully be shortened. [Penny Urquhart, South Africa]	Accepted: chapter has been shortened
46478					Chapter length estimate is 25.5 IPCC pages (10.5 over the 15 page limit agreed by the IPCC panel). This estimate does not include figures, tables, references, FAQs, and cross-chapter boxes but does include chapter-boxes and main text and the executive summary. Please find areas of the chapter than can be edited down to reduce the length of the final chapter draft. [Sarah Connors, France]	Taken into account - Chapter length complies
46492					Technical Note Figure 1.1: Colourblind check failed for this figure. The greens and reds used are hard to distinguish between. [Sarah Connors, France]	Accepted: standard colour-blind tables used for all figures
46612					Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Taken into account.

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54138					There should be references to COP22 and COP23. As this Chapter stands, It gives an unfortunate strong feeling that nothing has moved, globally, since 2015 [Ayman Bel Hassan Cherkaoui, Morocco]	Noted: it is unclear what references are called for here, in an assessment of the state of knowledge that is explicitly not intended to be policy prescriptive.
63160					Are you defining "feasibility" as the collective ability to limit warming to 1.5degC, or are you refering the the feasibility of a specific apporach or technology to contribute to limiting global warming??E.g., It seems feasible to reduce emissions by instituting a global, weekly no beef consumption day (the beef lobby nonwithstanding), but it is hardly a feasible way to limit warming to 1.5degC with this method. So "feasibility" must refer to collective methods in a given, multi-element pathway? [Greg Rau, United States of America]	As noted in X-chapter Box 3, there are many dimensions to feasibility
86					Conducted only a very cursory review of this Chapter. Having said that, overall Chapter 1 appears to be much more refined (improved) than the FOD. Even just this opening chapter is almost overwhelming in content and clarity. I suggest that all global heads of state be strongly enticed to read the Executive Summary and that their scientific advisors should read the entire chapter in order to convince all countries to respond appropriately. A stand- alone paragraph at the beginning of the Excutive Summary might be the best way to get them interested in taking action. [Paul Doyle, Canada]	Noted, although we have to avoid being policy-prescriptive
7344					All along the Chapter a high number of acronyms are used. Very frequently the meaning of them are also included not only the first time they have been mentioned but in many other occassions. For the shake of an example "Sustainable Development Goals (SDGs)" has been written as this (acronym+meaning) in Page 6-Line 11, Page 10-Line 25, Page 11-Line 37, Page 24-Line 20, Page 49-Line 15, Page 50, Lines 15 and 19 and Page 51-Line 27. Otherwise, the single acronym "SDGs" has been written in Page 9-Line 23, Page 10-Lines 27, 31, 34, 39, 40 and 50, Page 12-Lines 25 and 28, Page 49-Lines 18, 38, 40, 42, 51 and 52, Page 50-Lines 4, 21, 23, 27 and 28 and Page 56-Line 32. I am not sure if you deliberately do this but it is very confusing for the readers due to the high number of acronyms that are in the text. I suggest writing the acronym+meaning only the first time they are used and when they appear in a section title and use the single acronym in the rest of the text but indicated in bold to remark their significance. [Pedro Salvador, Spain]	Taken into account. in line with the rest of the Report
8542					There is very limited use of the IPCC calibrated confidence and likelihood langauage in Chapter 1. I counted four confidence statements and only two italicised likelihood statements, although the word "likely" is used frequently, presumably not in the calibrated sense as it is not italicised. Perhaps this is in an attempt to improve readability for a less technical readership but it risks taking away from the scientific standing of the assessment. I suggest careful consideration of this point; if avoiding its use then why use it at all? If using, be careful to distinguish between the general use of "likely" and the calibrated "likely". This would also apply to other Chapters [Pauline Midgley, Germany]	Noted, and the use of calibrated language has been increased.
8572					this Chapter (and doubtless others) requires a really keen copy-edit as it is a total hodge podge of inconsistent and incorrect use of hyphens and dashes [Pauline Midgley, Germany]	Taken into account - TSU works on this
8576					several of the Figures (1.4, 1.5, 1.6) have their captions split over two pages. This should be avoided in the final layout in this and all other Chapters. Als otitle of X-Chapter box 1.3, Table 1 should not be split from the Table itself (pp. 48-49) [Pauline Midgley, Germany]	Taken into account - format to follow rest of the report
10468					The sub-heading format x.x.x needs to be checked for consistency. E.g., in 1.1.1, the first letter of all the words is in capital case. In 1.2.1, they are in lower case. This inconsistency also appears in other places in the chapter. [Hong Yang, Switzerland]	Taken into account. in line with the rest of the Report
10470					to capture the key massages. If there were the third order draft, would the key messages change substantially again? [Hong Yang, Switzerland]	Noted: these changes were primarily in response to requests to shorten and focus the ES.
17906					The chapter has "Framing" in the title, but I miss a clear framing. It provides a lot of useful definitions (that are partly inconsistent with chp 2), but I cannot see a storyline. There is also a lot of overlap with chp 4 and this doesn't seem to be consitent either. [Brigitte Knopf, Germany]	Noted: we have endeavoured to ensure consistency in the revision
17918					GENERAL COMMENTS TO CHAPTER 1: the chapter provides many definitions that are necessary for transparency and to avoid misleading interpretations. The emphasis on socio-economic consequences of climate chnage is very welcome, but presented too broadly - which gives to the reader an impression of well-known and too general/theoretical information. Some examples, extracted from the other chapters, could enrich the chapter and avoid this impression. [Andrea TILCHE, Belgium]	Noted: although adding more examples would not be consistent with the need to shorten the chapter.
31640					The Tol and Tol et al. references appear to be superfluous [Lorcan Lyons, France]	Taken into account.
31852					I found that the sections in this chapter that were in my area of expertise were both comprehensive and well-written, and I congratulate the Lead Author team for this [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted. with gratitude
38724					A useful chapter that introduces some key concepts and sets the scene for the report. I think it would strengthen the chapter if the authors could shorten and sharpen the later parts of the chapter. [Jan Fuglestvedt, Norway]	Accepted: chapter has been shortened
38928					Ch 1 is special since its main purpose is to set the scene and introduce key concepts, explain apporaches and perpectives. A challenge is therefore to find a good balance between assessing and preparing for assessment. Sometimes it contains too much desciptive materail that is quite general and may not always be needed here. [Jan Fuglestvedt, Norway]	Accepted

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17920					General Chapter comment • This chapter should be providing a background for the remaining chapters and therefore each section should ideally link to the succeeding chapters, referencing relevant sections and avoiding duplication. There are many sections, which do not clearly provide a link to the succeeding chapters. • The chapters is at many places written in a very technical way, which makes it difficult to understand. • The conclusions should be coming from the substantive chapters dealing with the questions and not in this chapter. • The chapters contains a number of boxes and these are sometimes too long and the chapter would shortening these to ideally less than a page or maximum two pages. • The chapter outline deviates from the approved outline, which may require some explaining. [Andrea TILCHE, Belgium]	Noted: links to subsequent chapters have been improved
43986					The scope of this chapter remains unclear and structural issues have not improved much from the FOD. Instead of focussing on its primary task, which is framing and introduction of key concepts. The chapter partly pre-empts analysis provided in the subsequent chapters leading to a chapter that in total is 4x longer (excluding references) than the indicative length given in the approved outline. Sections 1.3, 1.4, and 1.5 should be revisited and shortened substantially. Cross-chapter review would be in order to avoid duplication with subsequent chapters. [Carl-Friedrich Schleussner, Germany]	Accepted
53898					I really like the figures in this chapter, especially the animation - I hope you can keep it [Piers Forster, United Kingdom (of Great Britain and Northern Ireland)]	Accepted
55410					Most statements in the executive summary, and key conclusions in the body of the chapter, still miss confidence statements. This makes it extremely problematic to get them approved in the SPM, and risks forcing authors having to make judgements on the fly during approval. If the authors feel that statements don't need confidence qualifiers because they are self-evident then the authors should reflect whether the statements are actually worth making (and if they are worth making, they probably need uncertainty language to make them robust and clear). Please work hard to get a line-of-sight from the body of the text, including confidence statements in the text, to the executive summary, and from there into the SPM. It would strengthen the findings from this chapter a lot. [Andy Reisinger, New Zealand]	Accepted
55764					Several of the comments below refer to a publication currently "in press". I will be pleased to provide the manuscript if needed. [Maryse Labriet, Spain]	Noted
57112					sections 1.1.3 and 1.7 seem to partly duplicate. However, both can stay as from beginning to end of the chapter the reader might need the entire picture again [alessandra conversi, Italy]	Accepted - Section 1.1.3 was substantially revised
57118					Overall a very well written chapter, very clearly explained [alessandra conversi, Italy]	Noted with thanks
57148					Animation : the idea is very nice because it would help the IPCC getting a “communication tool” be reviewed and part of approved material. However, - I have the impression that it is difficult to figure out the changes between scenario features that are illustrated because it is shown in a movie at the same time that it is explained. I would suggest the following: o Keep the reference curve on screen (perhaps in shaded form) while showing the change that is explained (such as a delay in emissions) o Show some explanation text, without splitting sentences in successive images, before showing the change on the curve (like : we will now show the effect of a delay in emission cuts; it could capture attention like text in silent movies, showing the text then the action, so eyes do not need to constantly move from curves to text and vice versa) o The final presentation may facilitate going back and forth between topics (this is currently possible if you use your movie app well, but I think that it could be made clearer). The purpose would be to help the user have a more detailed look at the changes that are shown. This would be a first step towards limited interactivity, more could perhaps be thought of. - Impacts and time scales : it might be strange to illustrate impacts by referring only to sea level rise; SLR is an impact that could increase significantly in the longer term, while other impacts might be nearer term. Perhaps should a column for “post 2100” be added ? And information about other impacts pre-2010, perhaps in a risk-framework as in AR5 burning ember? [Philippe Marbaix, Belgium]	a static version.
57520					be consistent in the use of 5th vs fifth, 2nd vs second, etc [Hans Poertner, Germany]	Noted with thanks
57528					be consistent in the use of "carbon dioxide" versus "CO2" [Hans Poertner, Germany]	Taken into account.
57560					Acronyms should be defined at first mention; thereafter only acronym should be used (e.g. greenhouse gases/GHG); ensure consistent use [Hans Poertner, Germany]	Taken into account. in line with the rest of the report

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58512					With regard to framing the report around “ethics and equity”, in my view as a social scientist, the authors have done a good job. I never the less have some comments about this issue (both here in Chapter 1, and also in Chapter 5). A positive comment, is that I think the document does a good job of anchoring this material to UN documents and agreements. On the other hand, other ethical perspectives exist, and other conceptualizations of equity exist. My own ideological orientation is consistent with the position given in the document. I can imagine, however, other readers who might not accept at face value the framing in terms of ethics and equity. From a normative perspective, I am not sure I have a proposed solution to this issue. (There will be disagreements, so perhaps it is better to give a cohesive perspective than equivocate too much.) However, from an empirical perspective (as opposed to a normative perspective, I believe one can argue that if “justice issues” are not addressed in the context of policy solution, then some actors will be less likely to “buy-into” or embrace the policy solutions proposed. This is a pragmatic point that could be used to bolster this framing. On the other hand, some actors (such as some dominant actors in the US) will be somewhat resistant to the “ethics and equity” framing. [Tindall David, Canada]	Noted: the discussion of ethical and equity issues has been elevated to section 1.1
17184					The entire Chapter needs a careful round of copy editing for simple editorial correctness and consistency. For example, there are many instances where an em dash is is used instead of with a hyphen, hyphenation of compound modifiers is haphazard and inconsistent, words like "hotspot" are also written "hot spot" or "hot-spot", there are instances where spaces are missing between words, and the entire piece needs careful punctuation to avoid ambiguity. I will point out some of the grammatical issues, but will leave missing spaces, and proper punctuation to the CLAs and REs. [David Schoeman, Australia]	Noted. editorial correctness is the goal
24098					This Chaper on 'Frame work ' is expected to include questions to be answerd responding to scientific and policy related issues, such as what is the remarkable differences between 1.5 and 2.0 degree world, impact, sdaptation , difficulties in mitigation, sinargyand trade-with SDGs.off. Current version have no description on this mandate. [Shuzo Nishioka, Japan]	Noted: this is a framing chapter, and we have attempted to avoid pre-empting material in later chapters.
30812					Many times in the chapter "local and regional scales" are mentioned, whereas the chapter descriptions remain global or rather aggregated. I am assuming that local and regional details of the issues discussed in this chapter will be properly presented in the following chapters, but this could be clearly stated. [Érika Mata, Sweden]	Noted. Regional detail is provided in Ch3
36392					It is unclear how the current content of the chapter relates to the proposed outline. The chapter does not focus on framing and contains analysis that should be provided in subsequent chapters. Sections 1.3-1.5 could be cut considerably. [Snaliah Mahal, Saint Lucia]	Accepted: chapter has been shortened

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33006					The emphasis on ethics, justice and human rights in this chapter is very welcome and critical in assessing 1.5 pathways. The chapter could refer to climate justice more explictly as there is a growing literature to support climate justice as a people-centred approach to climate action e.g. The Journal of Human Rights and the Environment (volume 8, issue 1; volume 7 issue 1; volume 5, issue 0 - special issue on climate justice); Nature Climate Change (e.g. Sovacool, B (2013) Nature Climate Chnage 3, 959–960 (2013); Mantyka-Pringle et al. (2015) Honouring indigenous treaty rights for climate justice. Nature climate change volume 5, September 2015; Nicholas, P. K. and Breakey, S. (2017), Climate Change, Climate Justice, and Environmental Health: Implications for the Nursing Profession. Journal of Nursing Scholarship, 49: 606–616; Health and Human Rights Journal, Volume 16, Issue 1, Climate Justice and the Right to Health – A Special Issue. There is also grey literature to draw on for example the publications of the Mary Robinson Foundation - Climate Justice - Rights for Action (https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-Rights-for-Action-edition-2.pdf) ; zero carbon zero poverty the climate justice way (https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf). See also Cameron, Shine and Bevins (2013) Climate justice: Equity and justice informing a new climate agreement. WRI working paper. See also the following books: Henry Shue, 'Climate Justice: Vulnerability and Protection' OUP 2014 Clare Heyward and Dominic Roser, 'Climate Justice in a non Ideal World' OUP 2016 Catriona McKinnon, 'Climate Change and Future Justice', Routledge 2011 Stephen Gardiner, 'A Perfect Moral Storm: The Ethical Tragedy of Climate Change', OUP 2011 Darrel Moellendorf, 'The Moral Challenge of Dangerous Climate Change: Values, Poverty and Policy' CUP 2014 Okereke, C. and Coventry, P. (2016) Climate justice and the international regime: before, during and after Paris. Wiley Interdisciplinary Reviews: Climate Change, 7 (6). pp. 834-851. Jeremy Moss (ed), 'Climate Change and Justice', CUP 2018 Dominic Roser and Christian Seidel, 'Climate Justice: An Introduction', Routledge 2016 International Environmental Agreements: Politics, Law and Economics. Volume 18, Issue 1, February 2018. Special Issue: Achieving 1.5 °C and Climate Justice Issue Editors: Kate Dooley, Joyeeta Gupta, Anand Patwardhan. https://link.springer.com/journal/10784/18/1/page/1 [Tara Shine, Ireland]	Noted: many of these papers are not specific to 1.5C, and some are now cited in 1.1
33008					The gender differentiated impacts of climate change and climate action are not dealt with sufficiently in this chapter. There is a considerable literature to draw on - e.g. Social dimensions of climate change: equity and vulnerability in a warming world. Mearns, R & Norton, A. (2010). World Bank (Chapter 5 on gender); The Full View: second edition (2016) Mary Robinson Foundation and UN Women. https://www.mrfcj.org/wp-content/uploads/2016/11/MRFCJ-Full-View-Second-Edition.pdf; Turning Promises into Action – Gender Equality in the 2030 Agenda for Sustainable Development. UNW / UNDP (SDG 13 on page 119) http://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2018/sdg-report-gender-equality-in-the-2030-agenda-for-sustainable-development-2018-en.pdf?la=en&vs=948; Routledge handbook of gender and environment. MacGregor, Sherilyn, 1969- editor. Book. English. Published Abingdon, Oxon; New York, NY: Routledge, 2017. https://capitadiscovery.co.uk/dcu/items/930587?query=gender+and+climate+change&resultsUri=items%3Fquery%3Dgender%2Band%2Bclimate%2Bchange Gender and climate change. Rebecca Pearse. Wires Climate Change. First published 28 December 2016 Gender and Climate Change in Latin America: An Analysis of Vulnerability, Adaptation and Resilience Based on Household Surveys. Authors Lykke E. Andersen, Dorte Verner, Manfred Wiebelt. First published: 17 October 2016. Journal of International Development Climate change vulnerability, impacts, and adaptation: Why does gender matter? Fatma Denton. Pages 10-20 | Published online: 01 Jul 2010 Journal – Gender and Development THE OUTBURST: Climate Change, Gender Relations, and Situational Analysis Nielsen, Jonas ØstergaardAuthor InformationView Profile. Social Analysis; Oxford Vol. 54, Iss. 3, (Winter 2010): 76-89 [Tara Shine, Ireland]	Rejected -This is a framing chapter where details on different groups are covered in subsequent chapters i.e. Chatter 4 and 5
46338					Migration is mentioned 5 times in the text (with "Forced" added twice) and "Displacement" 2 times it might be good to define both terms and to include them in the glossary. Nb. The SPM does not mention "Migration" but only "Displacement". [Etienne Piguet, Switzerland]	Noted
52722					There are several places when "interpretation" of the Paris Agreement is used. Suggest avoiding using this term and replacing it with formulations that refer to the "implantation" of the Paris Agreement [Iulain Florin VLADU, Germany]	Accepted: chapter no longer refers to interpretation of the PA
52724					In section 1.2.5 various metrics, including the GWP* are discussed and their impact on the definition of the "balance" and net zero emissions is discussed. However, it seems that these metrics are not used in Chapter 2, which seems based on GWP100. This inconsistency should be explained. [Iulain Florin VLADU, Germany]	Noted: there is new literature that the implications of different metrics need to be considered in computing aggregate emissions particularly under ambitious mitigation. Ch2 continues to use GWP for consistency with AR5, but the X-chapter box raises the issue.

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36394					This chapter should be sensitive to the scientific and political context of the Paris Agreement. Framing needs to fully acknowledge the elements of the Paris Agreement relevant in the report in the context of the science that was used at the time: IPCC AR5 and the Structured Expert Dialogue. Treatment of global mean temperature in the chapter is not following the definition provided by IPCC AR5. The introduction of a new GWP metric and a single re-interpretation of 'balance' conflicts with the Paris Agreement and is policy prescriptive. [Snaliah Mahal, Saint Lucia]	Noted: references to the SED have been removed because it is considered a political document. Treatment of GMST follows and refines the definitions provided in AR5. The revised GWP* metric has been introduced into the literature specifically for the purpose of understanding ambitious mitigation pathways, so is relevant to 1.5C, not policy prescriptive.
5552	1		77		no general comments [Kirsten Halsnaes, Denmark]	Appreciated
4074	1				In many places in this chapter (and perhaps others I have not read) the 1.5 deg C limit is discussed in comparison with a 2 deg C limit. Strictly, this is not consistent with the wording of the target of the Paris Agreement, which aims to hold the temperature increase to well below 2 deg C and pursue efforts to limit the increase to 1.5 deg C. As with other parts of the clause stating the aim, interpretation is needed as to what is meant by "well below", but the efforts and implications of aiming for 1.5 deg C strictly need to be assessed against a number such as 1.8 deg C that is what a reasonable person might regard as well below 2 deg C (but bigger than 1.5 deg C). A widespread change is not practical at this stage of the process of preparing this report, but consideration should be given to somewhere acknowledging that 2 deg C is not strictly the alternative aim to 1.5 deg C. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the ambiguity is acknowledged
24264	1	1	7	24	It is odd seeing that Chapter 1 pre-empts some of the assessments done by later chapters. These areas of overlap can be deleted in Chapter 1, as it is already beyond its page limit. [Joeri ROGELJ, Austria]	Accepted: chapter has been shortened
50640	1	1	78	33	A more critical view of SDGs (eg omission of fresh-water biodiversity and ecosystems under the Goal, Life under Water) as well absence of mechanisms to integrate or manage synergies or trade-offs between SDGs should be included [Jagdish KRISHNASWAMY, India]	Noted: the new box on SDGs is more balanced
9632	1	1	78	35	While this chapter does a great job of emphasizing the importance of equity, several passages seem to imply that equity and human rights are synonymous, which isn't quite right. In fact, history has many examples of nations that aimed for absolute equality at the expense of human rights. I suggest that you clearly and explicitly state that "Achieving equity, social and economic justice, and individual rights and freedoms, as outlined for example in the United Nations Universal Declaration of Human Rights (http://www.un.org/en/universal-declaration-human-rights/), are all key to successfully achieving long-term emissions reductions, and all efforts to promote emissions reductions must respect these goals and ideals." [Sean Fleming, United States of America]	Noted - text altered.
53390	1	1	54	4	weak on importance of natural forests, deforestation and forest degradation, and on ways to reduce deforestation and degradation. The discussion on how land use affects climate through non-greenhouse gas emissions pathways is limited,not well framed, silo-ed into small minor or less important sections, and not integrated into the general text, certainly in this summary. Finally, there are some scattered comments about Indigenous Peoples, their knowledge, land tenure in the context of climate mitigation, but again poorly framed and limited, and not drawing on the published literature on this aspect. [Elizabeth Penelope Davies, United States of America]	Rejected.
61708	1	1	61	1	the chapter. However, the chapter is significantly (10 pages, about 70%) too long compared to the initial target. My recommendation is to strongly shorten the following sections : Executive Summary (please aim for 2 word pages), the box on Anthropocene (not fully used in other chapters), the paragraphs in section 1.3.1 where there is potentially a repetition of chapter 3 (due to examples from the literature, without a full assessment), the length of section 1.4.1, the description of solar radiation management (thanks to box 4.2), section 1.5.4 (as detection and attribution are not strongly used in chapter 3), section 1.6.3. [Valérie Masson-Delmotte, France]	Accepted: chapter has been shortened

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63096	1	2	7	6	In chapter 1 and page no 6 (1-6), sentences 2-4 seek the trade-offs between mitigation, adaptation, and sustainable development" for limiting global warming to 1.5OC as, according to sentences 20-21, climate variability and climate change increase poverty in the vulnerable countries. To address this poverty, in page no 6, sentences no 29-38 emphasize on ethics and equity in distributing opportunities and sharing benefits and costs for present and future generations. This ethical point is closely connected with policy direction on mitigation and adaptation options that reshape (sentences no 37-39) socioecological and socioeconomic systems. When the adaptation policy emphasizes more on investment and economic growth in developing the socioecological system, it raises the ethical question, adaptation investment for whom? To respond this question, sentences 43-48 describes the importance of flexible governance for decoupling economic growth from greenhouse gas emissions. This governance approach seeks "to incorporate multiple stakeholder perspectives in the decision-making process to reach meaningful and equitable decisions; interaction across scales and coordination between the different levels of government, NGOs, Congressional Budget Offices, academia and the private sector." This governance approach should be appreciated if it can ensure the inclusion of the excluded who are, for example, traditional fishermen. Again, the same question remain dominant when it is visible the globalization of adaptation investment and governance. In 1-7, 1-5 describes major barriers as "finance, education and new innovative knowledge, information, technology, public attitudes, social values, and practices, and human resource constraints, plus institutional capacity to strategically deploy resources." Sentences 6-10 describe importance of decentralization in "facilitating partnerships among public, civic, private sectors and education." This decentralization reflects the development discourse of post-Fordism that is connected with sustainable development and develops more centralized control than the Fordist regime. [Mohammad Anwar Hossen, Bangladesh]	Noted - this text has been revised.
51544	1	4	1	4	Is the dominant cause still only 'extremely likely' can we not upgrade this to virtually certain yet? [Jason Donev, Canada]	Obsolete. Text was revised
51546	1	4	1	4	Should 'unequivocal' be in italics? This is a strong statement, and a good one, but it seems like it's trying to be making a statement about certainty, which by convention is in italics. [Jason Donev, Canada]	Obsolete. Text was revised
51548	1	4	1	1	This opening paragraph needs to state the overall conclusions about the important question: Is 1.5C possible or not? It can feel awkward to give away the point of the paper in the opening paragraph, but this report must be clear and concise about the results that it is reporting. See my previous comment. [Jason Donev, Canada]	Noted. Text edited to discuss this point without being policy prescriptive.
63098	1	4	78	6	In 1-8, sentences 50-53 describe the United Nations 2030 Agenda for Sustainable Development that intervenes the pace of current warming and mitigation pathways. In 1-10, 30-36 describes SDG13 specifically requires 'urgent action to address climate change and its impacts for the goals of ending poverty and hunger, reducing inequality, making cities resilient and sustainable, encouraging sustainable consumption and production, making energy affordable and clean, promoting 'decent work' and conserving biodiversity on land and sea. The document, SGDs, works for corporate elites and harmful for local communities; therefore, the SDGs-based adaptation policy raises the question of SOD effectiveness for the target groups of marginalized people who are major victims of climate change effects. [Mohammad Anwar Hossen, Bangladesh]	Noted: the new box on SDGs is more balanced
54110	1	6	1	7	The sentence doesn't flow well. "Expressed the ambition in the resulting Paris Agreement to … " is awkward. I propose "At COP21 in 2015, UNFCCC Parties expressed, in the Paris Agreement, the ambition to..." instead of "At COP21 in 2015, UNFCCC parties expressed the ambition in the resulting Paris 7 Agreement to" [Ayman Bel Hassan Cherkaoui, Morocco]	Noted. Sentence reworked in new version
53896	1	7			Generally but especially in ES, I missed a connection to AR5 [Piers Forster, United Kingdom (of Great Britain and Northern Ireland)]	Noted. As appropriate connections to AR5 occur, although in the txt.
51438	1	12	1	12	this is misleading. As stated in Chapter 2, page 4, line 13-14, limiting warming to 1.5°C would require deep reductions in non-CO2 drivers such as methane, and not require these emissions to be cut to (net) zero. [Astrid Schulz, Germany]	Obsolete. Bullet has been deleted.
7686	1	16			Fig 1 legend: for Berkley read Berkeley [Amory Lovins, United States of America]	Accepted
47740	1	17	1	17	Please use space between Pereira (Brazil/UK) and Pallav Purohit (India/Austria) [Sarah Connors, France]	Noted. The sentence is deleted.
39490	1	33	1	33	Replace "1.5° C" by "1.5°C" (without space) [Hernan Edgardo Sala, Argentina]	Noted
51550	2	2	2	26	The assertion in this paragraph that we can limit warming to 1.5C seems inconsistent with statements from the FOD. While this may be the current thinking based on reviewer feedback, it does seem striking. [Jason Donev, Canada]	Noted. Clarifying precisely what is meant by feasible is an important development.
51552	2	2	2	26	The conclusion made here is strong a strong assertion, but could be stronger. The weakness comes from more than one place. The first place is that the bullet point is focused on introducing the notion of pathways, an important concept, but it presents the idea that there *is* a path forward to limit warming to 1.5C. These two points must be presented separately. The conclusion that there is a solution needs to be the absolute first thing said in this report. It must also be stated with less equivocation. If this report is to provide either hope or guidance this point above all others must be clear. The pathway tool must be separated out from this statement that there exists paths. [Jason Donev, Canada]	Obsolete. The statement is deleted. Related statements are found in SPM and ES in Ch2. (If it is about the paragraph in p.5, L.20-26, not in p.2
51554	2	2	2	26	This assertion is inconsistent with Chapter 5's presentation on limiting our warming to 1.5C. [Jason Donev, Canada]	Obsolete. Bullet has been deleted.
54450	3	1	78	33	The pages when printed appear with an error - often alphabets and characters are replaced by a square box. There appears to be a formatting issue with the .pdf version of the document. [RABIZ FODA, Canada]	Taken into account.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40414	3	2	3	2	There is no reference to indigenous and local knowledge in the Executive Summary. I suggest including here the issues referred to in the chapter. [Pedro Alfredo Borges Landaez, Venezuela]	Accepted. Multiple forms of knowledge are now highlighted in the ES of the FGD.
48212	3	12	3	12	Would limited the title of the section to "Transformation pathways and transition" be more appropriate? Not clear from the section 1.4 what is the difference between transformation and transformation pathways? [Sarah Connors, France]	Noted. Title modified as text reduced in this section
2380	4		78		Repetition of what is already covered in the various chapters - is this necessary?. [Debra Roberts, South Africa]	Accepted. We have worked with other chapters to reduce repetition in the FGD
17922	4		6		Conclusions in this section cover the scope of other chapters of the report. The links between such messages, the underlying chapter (Ch1), the other chapters and the SPM should be reviewed to ensure coherence and avoid duplication. [Andrea TILCHE, Belgium]	Noted: efforts have been made to harmonize chapters
57496	4		7		please use consistent format when listing more than one reference section in the executive summary (currently there is a mixture of "&", "/" and ";") [Hans Poertner, Germany]	Accepted.
322	4	1	7	21	please give the definition of 1.5?,such as global meaning, temperature, 1.5?,warming meaning [Zong-Ci Zhao, China]	Noted: the definition is now provided in terms of "warming"
12992	4	1	4	16	Several assessments carried out by climate experts have shown that there is a great link between the stabilization of global mean temperature and need to limit the total amount of emitted carbondioxide. Current climate mitigation efforts aim to stabilize levels of green house gases in the atmosphere. It has been proven scientifically that a single pulse of carbondioxide released into the atmosphere increases globally averaged surface temperature by an amount that remains approximately constant for several centuries, even without the additon og other emissions in the atmosphere. [Denise Okpala, Nigeria]	Noted
57658	4	1	7	24	Executive summary needs to be balanced with the other chapters in that it should provide the conceptual framing more than reporting results which will be elaborated on later on. [Hans Poertner, Germany]	Noted. The executive summary is completely rewritten.
61712	4	1	7	53	Please check carefully which key items in the executive summary are supported by the content of the chapter, and their consistency with the other chapters (e.g. "many impacts of transient warming passing through 1.5°C versus if climate stabilised at 1.5°C" could better fit in chapter 3 with traceability to the underlying assessment of the available literature). Some statements are particularly long, pleae consider if this level of detail is needed for the ES and the TS of the report. [Valérie Masson-Delmotte, France]	We have carefully checked, and statements have been shortened and made more succinct
62900	4	1	7	21	The Executive Summary sounds relatively pessimistic with respect to the prospects of mitigation. Mitigation is mostly mentioned in terms of barriers, governance challenges, tradeoffs with adaptation and other SDGs. Still, the report comes up with an assessment of many promising mitigation options as well. [Sabine FUSS, Germany]	Noted. The executive summary is completely rewritten.
30726	4	2	7	21	It is unclear why some paragraphs are labelled e.g. High Confidence, whereas the confidence level is not stated in other paragraphs. [Érika Mata, Sweden]	Accepted, this has bee addressed
45456	4	2	4	2	This executive, well enough written, sounds like the ES for the whole report. Focus on CH 1 framing issues? [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Focus (esp. in ES) better in the FGD.
2484	4	4	4	6	century. At COP21 in 2015, UNFCCC parties expressed in the resulting Paris Agreement the ambition to limit the increase in global average temperature above pre-industrial levels to “well [Christophe Deissenberg, Luxembourg]	Noted. Sentence reworked in new version
4714	4	4	4	1	Neither this paragraph nor the entire Executive Summary provide any analysis of the meaning and implications for the planet and society of choosing 1.5 C. This was a politically based choice, not a scientific one. The IPCC is a scientific/expert body and it seems to me very important that it lay out what the implications are of this choice that has been made, both as a potential value for the ceiling of the temperature increase and as the long-term sustained value. The Paris Accord was the first attempt of the negotiators to quantify what was meant in the statement of the objective of the UNFCCC, and it seems to me this report should be presenting expert opinion on what the implications ar of this choice--that simply has to be laid out, and that is not done here at the start nor, it turns out, anywhere in this Executive Summary. I think that omission is an abrogation of scientific responsibility and that simply has to be done, providing an indication of the implications of choosing 1.5 C versus other long-term stabilization levels compared to preindustrial, down to 0 and perhaps even below given that ice sheet melting is so well begun. [Michael MacCracken, United States of America]	Rejected. This chapter provides the background to the IPCC and UN call for this report, but analysing why 1.5 was chosen is more of a political science question and not part of the approved outline.
8546	4	4	4	4	need to explain the italicisation of calibrated uncertainty language even if only as a footnote referring to later section 1.6 [Pauline Midgley, Germany]	Obsolete. Sentence has been deleted
31702	4	4	7	21	A novice reader will have a hard time determining the importance of 1.5C. The effects of 1.5C are skirted and not fully explained. Maybe the potential effects of 1.5C should be explained in the first paragraph. Otherwise one would have to go to FAQ to get that importantr bit of information. [Michael SUTHERLAND, Trinidad and Tobago]	There is no scope to explain this in detail in the opening paragraph of the Executive summary
31798	4	4	4	6	Is this "just" a restatement of the IPCC AR5 WG1 conclusion? I think it is, but this should be stated clearly [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Sentence has been deleted.
40890	4	4	4	5	Consider changing 'were' to 'are' or 'have been' - …greenhouse gas emissions are/have been the dominant cause… [Neelam Singh, United States of America]	Obsolete. Sentence has been deleted.
43988	4	4	5	54	Mixing the long term warming goal with regional warming information is quite confusing for the lay person and could lead to dangerous misinterpretations like '1.5 is already reached for my region'. or 'This is how 1.5°C would look like for us'. Both of which are wrong. [Carl-Friedrich Schleussner, Germany]	Agreed. Text changed so this comment is resolved.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
53890	4	4	3	42	I like this paragraph a lot but maybe change the bold text to make it more paletable to policy makers? [Piers Forster, United Kingdom (of Great Britain and Northern Ireland)]	Noted: Unclear what this refers to, but Box 1.2 has been renamed and heavily shortened
57102	4	4	4	4	near "it is extremely likely" please add a reference to a box/paragraph where "extremely likely" is defined (i.e., Section 1.6.2). I looked in the glossary, and after some searching I found under the term "Likelihood" where to find this definition (i.e., Section 1.6.2). But this is exceedingly elaborate and cumbersome. Insert the link near this mention. [alessandra conversi, Italy]	Obsolete. Sentence has been deleted
62940	4	4		6	Participation has been emphasied in a paper on adaptation of urban areas which can be cited as: Mycoo, M. A. (2014). Autonomous household responses and urban governance capacity building for climate change adaptation: Georgetown, Guyana. Urban climate 9, 134-154 [Michelle Mycoo, Trinidad and Tobago]	Noted: reference was reviewed
2498	4	5	4	6	At COP21 in 2015, the UNFCCC parties expressed in the resulting Paris Agreement the ambition to limit the increase in global average temperature above pre-industrial levels to [Christophe Deissenberg, Luxembourg]	Noted. Sentence reworked in new version
45552	4	5	4	5	Change 'were' by 'are' [Adela M Sánchez-Moreiras, Spain]	Noted. Sentence reworked in new version
5686	4	6	4	1	Reminding you that this summary is going to be widely used (and abused) by non-scientist policy makers and journalists who may be for or against climate action. Why 1.5 degree? Why not 2 or 2.5? For example, extreme events, damages beyond repair, etc. should be mentioned to justify the number. Something like (Page 5 lines 41-42) should be used in the opening paragraph of the executive summary to explain why we are aiming for below 1.5 degree. [Nima Ehsani, United States of America]	Rejected. This chapter provides the background to the IPCC and UN call for this report, but analysing why 1.5 was chosen is more of a political science question and not part of the approved outline.
13388	4	8	4	8	below 20C. Two extra " after C. [Sergio Aquino, Canada]	Accepted.
48632	4	8	4	8	suggest including the year/time frame by which limiting warming to 1.5C should be considered [Yamina Saheb, France]	Specific Paris agreement text is included in the front matter , which includes the approved text.
13390	4	1	4	1	introduces important. Omit 'the' important. [Sergio Aquino, Canada]	Noted. The text is substantially changed, and these lines removed.
61710	4	11	4	13	Please use subscript for CO2. [Valérie Masson-Delmotte, France]	Obsolete. Text revised
1268	4	12	4	15	The current version of this paragraph suggests erroneously that only anthropogenic climate factors matter. However, natural climate drivers such as ocean cycles (PDO, AMO…) have been identified as major contributors to natural climate variability. These need to be mentioned here, otherwise the set of key climate factors is not balanced. Furthermore, longterm fluctuating temperature trends occurred in pre-industrial times on centennial timescales, processes which are likely to have not abruptly ceased in the the past 150 years. [Sebastian Luening, Portugal]	Noted, although under the definition of "warming" used, variability on timescales <30 years is excluded
2486	4	12	4	14	Ceteris paribus, the global temperatures will remain constant if and only if the total amount of greenhouse gases in the atmosphere, expressed in CO2 equivalent, remains constant. Thus, stabilizing the global temperatures requires that the total net emissions of greenhouse gases must be reduced to zero. Since CO2 emissions accumulate in the climate system, warming will continue [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
5496	4	12	4	16	It is not clear what is meant by equivalent reductions means in this context; I would think that the reader would infer this was GWP-100 equivalence which is not I think what the authors mean. For example, when CO2 emissions reach net zero, this does not mean that non-CO2 emissions (e.g. sulfur) would need to reach zero or even decrease. Suggest making this statement more transparent (would this mean it is nescessary to discuss appropriate equivalence metric to make this statement true?) or deleting. [Haroon KHESHGI, United States of America]	Accepted: sentence has been deleted.
5684	4	12	4	16	Reminding you that this summary is going to be widely used (and abused) by non-scientist policy makers and journalists who may be for or against climate action, I believe it is important to emphasize that net zero CO2 does not mean no CO2 emission. Carbon sequestration technologies may be used as a sink to balance anthropogenic emissions. [Nima Ehsani, United States of America]	Accepted: sentence has been deleted.
13392	4	12	4	14	For stabilisation of global temperatures at any level, total net global greenhouse gas emissions must be reduced to zero. [Sergio Aquino, Canada]	Noted, although the meaning of "total net" is unclear. Hence the need for X-chapter box 2
34404	4	12		13	This is confusingly written, and most readers won't know what 'if expressed in terms that give all climate drivers a similar global temperature impact to CO2' mean. Short-lived GHG emissions don't have to be reduced to zero to stabilise climate, but I suppose the phrase above is supposed to account for this. I think it would be simpler and correct, to say that total net long-lived GHG emissions must be reduced to zero to stabilise temperature. [Nathan Gillett, Canada]	Accepted: statement deleted.
36938	4	12	4	15	Change to "(…) reduced to nearly net zero." and to "(…) reach nearly net zero". [Keigo Akimoto, Japan]	Accepted: sentence has been deleted.
38422	4	12	4	12	Should be "total net global anthropogenic greenhouse gas emissions" NOT "total net global greenhouse gas emissions". See 1.2.5. [Volodymyr Demkine, Kenya]	Obsolete. Text revised
40892	4	12	4	14	Delete 'if' in ….if expressed in terms that give all climate drivers…? [Neelam Singh, United States of America]	Accepted: sentence has been deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
49362	4	12	4	16	If net greenhouse gas (GHG) emissions fall zero, I would expect the temperature to be decreased rather than stabilized (i.e. held at the same level). To achieve net zero GHG emissions, CO2 emissions need to be negative to compensate for residual non-CO2 GHG emissions since there are known limits for non-CO2 GHG abatement potentials (e.g. CH4 abatement roughly up to 80% and N2O mitigation up to 60% from the baseline (see AR5 scenario database)). Thus, I think that net zero GHG emissions is a requirement that is generally more than necessary for temperature stabilization. However, it is widely believed that the 1.5°C target won't be achieved without temporal overshoot. If we follow pathways temporarily exceeding 1.5°C (Fig. 1.5e), the temperature needs to be decreased after peaking, requiring negative CO2 emissions, which may be large enough to imply net zero (or negative) GHG emissions. On the other hand, if we follow pathways remaining below 1.5°C (Fig. 1.5b), we need net zero CO2 emissions, but not necessarily net zero GHG emissions. What I intend to raise here is that this statement is contingent on underlying pathways. For further clarifications, see Tanaka and O'Neill (2018). Tanaka K, O'Neill BC (2018) Paris Agreement zero emissions goal is not always consistent with 2°C and 1.5°C temperature targets. Nature Climate Change (in press). [Katsumasa Tanaka, Japan]	Accepted: sentence has been deleted.
53700	4	12	4	14	Convoluted sentence. Suggestion: For stabilisation of global temperatures at any level, total net global greenhouse gas emissions must be reduced to zero. [Patrik Winiger, Netherlands]	Accepted. revised
55262	4	12	4	15	Very dense and long sentence, difficult to follow. [ELISA BERDALET, Spain]	Accepted - revised
56822	4	12	4	16	The context in this paragraph is confusing (and may well be the case throughout the report). It reads "For stabilisation of global temperatures at any level, total net global greenhouse gas emissions, if EXPRESSED IN TERMS (empahsis placed) that give all climate drivers a similar temperature impact as CO2…" But it went on to focus only on "CO2 emissions". Article 2 of the Paris Agreement (Objective) states "[t]his Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change...". The ultimate objective of the Convention (Article 2) is..."stabilization of greenhouse gas concentrations in the atmopshere at a level that would prevent dangerous interference with the climate system..." Thus the Paris Agreement requires to focus on all GHG emissions (CO2 equivalent), not just "CO2 emissions". [Penehuro Fatu Lefale, New Zealand]	Accepted: sentence has been deleted.
56964	4	12	4	14	needs caveat: "...global temperatures at any level, given a constant albedo, total net greenhouse…" [Oliver Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: sentence has been deleted.
57226	4	12	4	16	This is not easy for non-specialists to read: 'expressed in terms that give all climate drivers a similar global temperature impact as CO2' what does this mean?? Stabilisation of global temperatures at any level – is this really any level or the policy relevant levels? [Hans Poertner, Germany]	Accepted: sentence has been deleted.
62896	4	12	4	16	It would be good to make this statement 1.5°C-specific,e.g. by stating already here the carbon budget and/or time until when net zero emissions would need to be reached to attain the 1.5°C target. [Sabine FUSS, Germany]	Noted, but this assessment belongs in Ch2
7064	4	13			CO2 --> CO2 [Dmitry L. Musolin, Russian Federation]	Obsolete. text revised
7836	4	13			I find this sentence difficult to perceive. What exactly does "gas emissions expressed in terms that give all climate drivers a similar global temperature impact" mean? The terms should be defined upfront before making this important statement. [Petr Zavialov, Russian Federation]	Accepted: statement deleted.
31800	4	13	4	13	This is a very cryptic statement - after reading the chapter I think I understand what is meant [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: sentence has been deleted.
36350	4	13			Please, write CO2, instead of CO2. [Emilio Cerdá, Spain]	Obsolete. Text revised
38720	4	13	4	13	expressed may be changed to "aggregated". [Jan Fuglestvedt, Norway]	Accepted: sentence has been deleted.
39492	4	13	4	13	Use "2" as superscript in "CO2" in order to keep consistency along the chapter. [Hernan Edgardo Sala, Argentina]	Noted
51384	4	13			CO2 in place of CO2 [PRIYANKA LAHA, India]	Obsolete. Text revised
40894	4	14	4	15	CO2 emissions or GHG emissions? (GHG emissions accumulate in the climate system….until anthropogenic GHG emissions reach net zero.) [Neelam Singh, United States of America]	Accepted: sentence has been deleted.
47054	4	14	4	14	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Noted
48634	4	14	4	14	similarly the year by which emissions must be reduced to zero would make it clear how urgent it is to take action [Yamina Saheb, France]	Noted, but this assessment belongs in Ch2
55412	4	14	4	15	shouldn't this say " will continue AT LEAST until CO2 emissions reach zero, given committed warming? Or disentangle this statement if you imply CO2-forcing-equivalent behaviour (with slowly falling concentrations when emissions reach zero). [Andy Reisinger, New Zealand]	Accepted: sentence has been deleted.
40624	4	16	4	16	The numbers in curly brackets ({}) should be explained. Do they relate to the relevant section of the chapter? This is not clear. [Jonny Williams, New Zealand]	Noted -clear in final version
13394	4	18	4	22	omit 'of the current level'. Omit 'not in themselvs'. Omit 'stable'. [Sergio Aquino, Canada]	Obsolete. Bullet has been deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
24262	4	18	4	23	The assessment of NDCs is provided in a Box in Chapter 4, as well as Chapter 2. This should at least be cross-referenced, but even better this overlap should be avoided, and the summary should be given in the chapters where the assessment was made. [Joeri ROGELJ, Austria]	Accepted. Bullet has been deleted.
37434	4	18	4	23	This statement is silent on two more important facts about the NDCs: the mitigation contributions expressed in current NDCs are estimated to collectively achieve a small share of the reductions that cost-efficient pathways to 2°C anticipate in 2030 (Rogelj et al., 2016) and that furthermore the NDCs do not represent policy instruments (which are required to achieve any mitigation) Michaelowa et al., 2018). References: Rogelj, J., Den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., ... & Meinshausen, M. (2016). Paris Agreement climate proposals need a boost to keep warming well below 2 C. Nature, 534(7609), 631. Michaelowa, A., Allen, M., & Sha, F. (2018). Policy instruments for limiting global temperature rise to 1.5 C–can humanity rise to the challenge?. Climate Policy, 18(3), 275-286. [Matthias Honegger, Germany]	Obsolete. Bullet has been deleted.
39336	4	18	4	23	We think that the following sentence that we can read in this chapter from page 9 line 29 to page 10 line 1, should be included in this paragraph: “The current NDCs are not ambitious enough to secure the 1.5°C warmer world and are instead tracking toward a warming of 3–4°C above preindustrial temperatures by 2100, with the potential for further warming thereafter (Rogelj et al., 2016; UNFCCC, 2016).” [Olga Alcaraz, Spain]	Obsolete. Bullet has been deleted.
53592	4	18	4	19	It is not clear which country will implement by 2025 and which country will implement by 2030. [AKM SAIFUL ISLAM, Bangladesh]	Obsolete. Bullet has been deleted.
55264	4	18	4	2	Should the acronyms be spelled completely in the Executive summary? E.g. NDC is spelled, but GHG are not [ELISA BERDALET, Spain]	Taken into account. Greenhouse gases is now spelled out in the Executive Summary.
55414	4	18	4	2	This statement strikes me as rather weak - no action whatsoever by 2030 will in itself be sufficient to limit warming to any level. [Andy Reisinger, New Zealand]	Obsolete. Bullet has been deleted.
56824	4	18	4	2	The text should be strengthened to take into account recent assessment of climate engineering technologies, especially RMM. Suggest the following additional text after the bolded text: "The only way to keep warming under 1.5oC would be RMM" [Penehuro Fatu Lefale, New Zealand]	Obsolete. Bullet has been deleted.
2488	4	19	4	23	under the Paris Agreement by 2025 or 2030 will not in themselves suffice to limit warming to 1.5 °C. Currently-specified NDCs imply the stabilisation of global GHG emissions near their current level by 2030 and do not specify the total cumulative emissions of long-lived greenhouse gases such as CO2 that will occur before these are reduced to net zero. Continued stable CO2 emissions after 2030 would result in ever increasing warming. {1.2} [Christophe Deissenberg, Luxembourg]	Obsolete. Bullet has been deleted.
8518	4	2	4	2	I suggest spelling out "greenhouse gas" here because the acronym GHG only occurs once in the ES and is then defined on its first occurrence in the body of the text on page 8 [Pauline Midgley, Germany]	Taken into account. Greenhouse gases is now spelled out in the Executive Summary.
9546	4	2	7	26	While this paragraph and point are outlining the unequal impact of warming on marginalized populations, it would be appropriate here to directly discuss the issue of climate justice (explicitly using this term) in a sentence or two so that it is noted in this report that those who are experiencing and suffering from the greatest impacts of warming are not those who are responsible for this warming. [Joanna Petrasek MacDonald, Canada]	Rejected - term 'climate justice' attracted little support.
39494	4	2	4	21	Line 20 has the abbreviation "GHG", but it has not been previously defined in this chapter. I suggest to replace it by its full wording "greenhouse gases (GHG)", and then use "GHG" in line 21. [Hernan Edgardo Sala, Argentina]	Taken into account. Greenhouse gases is now spelled out in the Executive Summary.
40896	4	2	4	23	Add that current NDCs translate to a warming of 3-4C above pre-industrial temperatures by 2100 - as noted on p9, line 30-31 [Neelam Singh, United States of America]	Obsolete. Bullet has been deleted.
48636	4	2	4	2	similarly the year for limiting warming to 1.C would make it clear how urgent it is to take action [Yamina Saheb, France]	Obsolete. Bullet has been deleted.
4706	4	22	4	23	This sentence ought to be presented in CAPITAL LETTERS. It really needs to be featured. Should not this point be the key message in this paragraph and be in bold, etc.? [Michael MacCracken, United States of America]	Obsolete. Bullet has been deleted.
46432	4	22	4	23	The sentence "Continued stable CO2 emissions…" should perhaps be changed to "Continued stable CO2 emissions at the same level…" or something similar. [Göran Finnveden, Sweden]	Obsolete. Bullet has been deleted.
2490	4	25	4	29	The current patterns of development and of resource consumption, particularly of fossil fuels, creates structural impediments to achieving ambitious temperature stabilisation goals. Existing multi-level inequalities between regions, among others in technology, finance, human capital and governance, constrain approaches to address the challenge of limiting global warming to 1.5°C.{1.1; 1.4.1} [Christophe Deissenberg, Luxembourg]	Obsolete. Paragraph reworded
13014	4	25	4	25	Delete the text ", particularly of fossil fuels,". [Eleni Kaditi, Austria]	Accepted: sentence has been deleted.
44686	4	25	4	28	Very important statement that is not stated as clearly or directly in the SPM - one is left wondering why not? Suggest that the wording of 3.6 in the SPM is strengthened to more accurately reflect the Chapter 1 wording. [Penny Urquhart, South Africa]	Noted: sentence has been deleted (see previous comments)
49712	4	25	4	28	The description of this paragraph is too gerenal, in line 26 '…structural impediments…' could be specified, waht kinds of the impediments they are? And it is needed more explain on what are the 'approaches' in line 28, and how the approaches are constrained with the factors of 'multi-level inequalities'. [Yinlong XU, China]	Accepted: sentence has been deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
53378	4	25	4	25	In particular fossil fuels. Unbalanced.Weak with respect to deforestation and natural forests. See peer-reviewed refs summarised in Rosa C. Goodman and Martin Herold. 2014. "Why Maintaining Tropical Forests Is Essential and Urgent for a Stable Climate." CGD Working Paper 385. Washington, DC: Center for Global Development. http://www.cgdev.org/publication/why-maintaining-tropical-forests-essential-and-urgent- stable-climate-working-paper-385 Also cited by Seymour and Busch 2017.".Why Forests Why Now." If all deforestation were stopped tomorrow, damaged forests were allowed to grow back, and mature forests left un disturbed, tropical forests would absorb 27-37% of current annual GHG emissions, or 30-40% of the remaining GHG emissions from all other sources. [Elizabeth Penelope Davies, United States of America]	Accepted: sentence has been deleted.
13396	4	26	4	28	Omit 'existing multilevel'. Omit 'in' before technology. Insert comma: human capital, and governance. [Sergio Aquino, Canada]	Accepted: sentence has been deleted.
37128	4	26	4	27	Existing multilevel inequalities between regions..' This is unnecessarily wordy. 'Differences between regions…' [John Sweeney, Ireland]	Noted. Wording has been revised.
37436	4	26	4	26	Add at the end of the headline sentence: ...overcoming such structural impediments requires implementation of policies, sometimes against the will of significant interest groups. [Matthias Honegger, Germany]	Accepted: sentence has been deleted.
54452	4	27	4	27	Insert "…….political environment….." [RABIZ FODA, Canada]	Accepted: sentence has been deleted.
56826	4	27	4	27	The word "regions" is misleading. Inequality is a 'value' judgement so we should not compare 'regions' in this context. There are inequalities within 'regions' (Small Island States in the Asia Pacific region cannot be lumped with Japan, Indonesia, etc). The word "States" addresses this issue more accurately. [Penehuro Fatu Lefale, New Zealand]	Accepted: sentence has been deleted.
5688	4	3	4	42	Clarity and transparency is (should not be are instead of is?) important for the interpretation of the Paris Agreement. I cannot say how the rest of this paragraph is related to the title. I cannot see the purpose of the information provided here which includes too many numbers and is confusing. [Nima Ehsani, United States of America]	Noted. Headline statement and text have been rewritten.
5690	4	3	4	3	Clarity and transparency is (should not be are instead of is?) important for …. [Nima Ehsani, United States of America]	Noted. Headline statement has been rewritten.
13016	4	3	4	3	Replace "interpretation" with "implementation". [Eleni Kaditi, Austria]	Obsolete. Sentence has been deleted.
13398	4	3	4	3	replace highlighted text with: The interpretation of the Paris Agreement must be transparent and objective. [Sergio Aquino, Canada]	Noted. Headline statement has been rewritten.
12994	4	3	4	42	It has been observed over the early years of implementing the Paris Agreement that several developing nations are finding it difficult to quantify outcomes. This is a major challenge faced by economic asssessment. For example, referring to improvements such as energy intensity relative to an unspecified business as usual baseline. (The outcomes of developed nations, by contrast, can be quantified because their NDCs were required to specify improvements to economy-wide emissions.) Moreover, many NDCs specify a target only for the final year—a level in 2025 or peaking emissions by 2030, rather than a trajectory over time—again making it difficult to assess whether projected or, later, observed trends are on track. When the agreement was established, developing nations sought information on financial aid and other assistance. Many made pledges they could undertake on their own, and conditional pledges depending on aid. However, developed nations insisted that NDCs should focus on climate change mitigation, and most developed-country NDCs provide no indication of aid they will provide to others. Also, It takes time to prepare and approve official national reports and inventories for a given year. Publication typically falls 16 to 18 months after the reported year, and international reviews take additional time. So, in 2018 nations will have available results through 2016—at best. Also, since initial NDCs cover a period through 2025 or 2030, review of actual outcomes will not be available until 2027 or 2032. Interim reviews must be based on progress and trends. Available data will not be well-matched to the timing for near-term decisions to establish the transparency and other frameworks, or to the five-year cycles to review and renew NDCs. [Denise Okpala, Nigeria]	Noted. Bullet on NDCs has been removed.
31804	4	3	4	42	After reading the chapter I understood this a little better, but as written here there is a disconnect between the statement that a 30-year period centred on a given time is the working definition, and yet the 2006-2015 temperature is presented, which implies some knowledge of temperatures to 2030. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted. We have clarified that "For periods shorter than 30 years, 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."
40088	4	3			Suggest replacing this sentence with one that better represents the info in the the rest of this paragraph. Something like: "Clear definitions of temperature rise and reference time frames are important for the interpretation of the Paris Agreement and discussion presented in this report." [Ko Barrett, United States of America]	Agreed. Headline statement has been rewritten.
40370	4	3			It is interpreted in the text that the Paris Agreement is sufficient, but many researchers say that it will not be enough. [Jonathan Gómez Cantero, Spain]	Noted. Statement has been rewritten.
40898	4	3	4	42	Current bold text doesn't convey what follows. Suggest changing the bold text to instead give the working definition of global average temperature followed by the discussion as it is. [Neelam Singh, United States of America]	Agreed. Headline statement has been rewritten.
52726	4	3	4	3	It seems to me that the content of the para is not about "interpretation" of the Paris Agreement but rather on the understanding of what the temperature goal of the agreement means. Perhaps this is also the place where not only 1.5 degree is unpacked/explained but also "well below 2 degree". Suggest replacing "interpretation" with "implantation" [Iulain Florin VLADU, Germany]	Noted. Statement has been deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
54466	4	3	4	42	The heading of 'transparency' does communicate what is in the paragraph which is a summary of the calculation of average global temperature. More appropriate heading--e.g. 'Calculating and Tracking Global Average Temperature' --is needed [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Headline statement has been rewritten.
56828	4	3	4	42	The current text only addresses working definitions of 'global average temperatures' and 'pre industrial levels" (1.2.2). It needs text from Section 1.2.4 (Definitions of 1.5oC consistent Pathways and associated emissions and impacts. [Penehuro Fatu Lefale, New Zealand]	Rejected. Goal of this bullet is on defining global average temperature and pre-industrial reference period.
321	4	32	4	32	adding "annual" [Zong-Ci Zhao, China]	Obsolete. Sentence has been deleted
2492	4	33	4	33	period used to define “pre-industrial”. This report utilizes, as working definition of global average [Christophe Deissenberg, Luxembourg]	Obsolete. Sentence has been rewritten.
31802	4	34	4	34	area-weighted average [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Sentence has been rewritten.
53702	4	34	4	34	Suggestion: ...land surface (air) and sea surface (water) temperatures over a … [Patrik Winiger, Netherlands]	Noted. Wording has been revised.
32806	4	35	4	35	The word 'corrected' doesn't seem appropriate to me here. It suggests there's something wrong with temperatures when there is natural forcing that needs to be fixed. I'd favor something like 'adjusted to account' or 'adjusted to remove' (then delete 'for' as well) instead. [Drew SHINDELL, United States of America]	Accepted. "Corrected" has been replaced with "accounting for"
37130	4	35	4	36	Correction for volcanic activity is a new departure and introduces sources of uncertainty in pre industrial times when volcanic activity may not have been accurately known or accurately reconstructed. It also introduces a risk that the IPCC will be accused of adjusting raw temperature data and it would in my opinion be better not to introduce such adjustment methodology. [John Sweeney, Ireland]	The correction is made when referring to warming over a period shorter than 30 years. When considering a 51-year reference period, as simple average can be used.
50532	4	35	4	36	This seems a strangely imprecise definition. What defines "short-term" and what other aspects are considered in addition to volcanoes? It's also not clear why the 30-year average includes this correction but the ten year average doesn't (`at lines 37-38) [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Noted: there are a number of methods in the literature for separating the long-term trend in GMST from short-term natural fluctuations. We do not endorse a specific method, but all give similar results.
55416	4	36	4	39	Chapter 2 gives a different warming between 2006-2015 and 1851-1900 of 0.95 degrees (if I understood chapter 2 correctly; and if I haven't, I suspect others may misunderstand, too). Please ensure the two chapters are consistent or make crystal clear that it makes sense that they give different numbers. See chapter 2, page 17, lines 12-25. [Andy Reisinger, New Zealand]	Agreed. We have tried to ensure consistency between chapters.
4076	4	37	4	37	Delete "consistent with AR5". The WGI glossary of AR5 defines the pre-industrial period as the period before 1750. This definition is used in many places in AR5. Various other definitions are used in other places for expediency, including one that is consistent with the choice made in this Special Report. The SOD advances arguments for choosing 1850-1900 as a reference period, and given all the other uncertainties, it may be expedient so to do. But this reference period is not consistent with the definition given in the WGI contribution to AR5, so it would be better not to claim consistency with AR5. And this reference period should not be called "pre-industrial" as it patently is not pre-industrial. Industrialization began one hundred or more years before the start of the period 1850-1900. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted. We have replaced "consistent with AR5" with "used as an approximation of pre-industrial temperatures in AR5". In section 1.2.1.2 we include a reference to Box TS.5, Figure 1 of Field et al., 2014a.
8544	4	37	4	37	I suggest defining AR5 here because it occurs so many times in the Executive Summary or alternatively "The IPCC Fifth Assessment Report" should be spelled out throughout the ES [Pauline Midgley, Germany]	Accepted. AR5 has been defined in the opening paragraph of the Executive Summary.
8632	4	37	4	41	Please consider using the period 1981 - 2010 (instead of 2006 - 2015) for the modern reference. If changeing the period is not any more possible, please state the IPCC/AR5 values for the period 1981 - 2010 in addition to the period 2006 - 2015. Reason: The period 1981 - 2010 is is the period that the WMO is using and I see benefits from having identical periods for the modern reference. From WMO Press Release 18-01-2018: "The globally averaged temperature in 2017 was about 0.46°C above the 1981-2010 long-term average (14.3°C). This 30-year baseline is used by national meteorological and hydrological services ..." (Link: https://public.wmo.int/en/media/press-release/wmo-confirms-2017-among-three-warmest-years-record) [Urs Ruth, Germany]	Noted. In Table 1.1 we have include the increase in global average surface temperature in 1981-2010 relative to 1850-1900.
48338	4	37	4	41	Revision: Using the five most widely cited datasets available back to the 19th century, the decade 2006-2015 is estimated to have been 0.90°C (±0.1°C) warmer than 1850-1900 … Hence a warming of 1.5°C relative to pre-industrial conditions corresponds to a warming of 0.60°C (±0.1°C) ... [David Clarke, Canada]	Noted. In response to reviewer comments we have decided to compute the average over the four published datasets (the three used in AR5 and Cowtan and Way (2014)).
2494	4	39	4	42	1900, and the best estimate is that the totality of this warming was human-induced. Hence, a warming of 1.5°C relative to pre-industrial conditions means a warming of 0.63°C (±0.1°C) relative to the observed temperatures for the decade 2006-2015. Expressing future changes relative to this more recent decade reduces the sensitivity of the results to earlier periods. {1.2.2} [Christophe Deissenberg, Luxembourg]	Obsolete. Text removed
40090	4	39			Reference is wrong and It is misleading to say ALL of this warming is human induced. Reference should be 1.2.1.3. Also, this statement is too definitive. The underlying section of the report provides inaccurate information on volcanoes - large volcanoes have erupted recently - and should at least consider long term climate occilations in its consideration (PDO, ENSO, AO, etc.) [Ko Barrett, United States of America]	Noted: in fact, the statement is conservative. Most studies find that best-estimate anthropogenic warming exceeds total observed warming, consistent with the figures given in AR5
49410	4	39	4	39	Consider to replace ‘all of’ with ‘most of’ since it is still debatable topic. [Alexander Chernokulsky, Russian Federation]	Obsolete. Paragraph reworded
56160	4	39	4	39	All is too definitive, better to say "the vast majority", or similar. [Annika Herbert, Australia]	Obsolete. Paragraph reworded
62898	4	39	4	39	Does "best estimate" mean that there is robust evidence/high agreement in the literature? [Sabine FUSS, Germany]	Obsolete. Text removed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4078	4	4	4	4	Delete "observed". The temperatures referred to are global averages that are estimated from analyses of many local observations. They are not directly observed. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: "observed GMST" is a standard phrase (pedantically, all "observed" quantities are inferred from observations)
53712	4	4	4	4	Insert the word "future" to make it clearer that this is the temperature amount that can still be increased (relative to 2006-2015) to reach 1.5 °C: ...corresponds to a future warming of 0.63°C… [Patrik Winiger, Netherlands]	Obsolete. Text removed
4080	4	41	4	41	A decade is rather a short period to choose as a reference relative to which future change could be stated. Climatological practice as developed by WMO Member States is to use 30-year averages, starting on a specific year within each decade. Thus the latest climatological reference period is 1981-2010, and the next will be 1991-2020. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: definition of warming is now clarified to refer to 30-year average
48340	4	41	4	41	Addition (to be inserted): Using three datasets with more complete coverage, the decade 2016-2015 is estimated to have been 0.93°C (±0.1°C) warmer than 1850-1900 (unadjusted) or 1.00°C (±0.1°C) when adjusted to account for differences between sea surface and air temperature. In these two cases, warming of 1.5°C relative to pre-industrial conditions corresponds to warming of 0.57°C (±0.1°C and 0.50°C (±0.1°C) respectively, relative to 2006-2015. [David Clarke, Canada]	Noted: all 4 published global land/sea datasets are now used.
13400	4	44	4	44	rearrange: In 2017, human-induced warming ….above pre-industrial levels. [Sergio Aquino, Canada]	Obsolete. Text removed
12996	4	44	4	53	It is very likely that 2017 will be one of the three hottest years on record, with many high-impact events including catastrophic hurricanes and floods, debilitating heatwaves and drought. Long-term indicators of climate change such as increasing carbon dioxide concentrations, sea level rise and ocean acidification continue unabated. Arctic sea ice coverage remains below average and previously stable Antarctic sea ice extent was at or near a record low. According to the World Meteorological Organization's statement on the current situation of climate change, the average global temperature from January to September 2017 was approximately 1.1°C above the pre-industrial era. As a result of a powerful El Niño, 2016 is likely to remain the warmest year on record, with 2017 and 2015 being second and/or third. 2013-2017 is set to be the warmest five-year period on record. [Denise Okpala, Nigeria]	Noted.
24266	4	44	4	46	It is confusing that the term warming seems to be used both for global temperature targets and local changes. I suggest using "warming" for the global mean temperature levels only, and using "temperature increase" in other instances. This would mainly be a convention to limit confusion. [Joeri ROGELJ, Austria]	Noted: we have tried to limit the possibility of confusion here.
8548	4	45	4	45	need to explain the italicisation of calibrated confidence language even if only as a footnote referring to later section 1.6 [Pauline Midgley, Germany]	Obsolete. Text removed
2496	4	46	4	53	In AR 5, temperatures were assessed to rise along an anthropogenic warming trend at 0.17°C (±0.07°C) per decade, and hence to reach 1°C above pre-industrial, i.e. 0.13°C above 2006-2015, around 2017/18. The actual temperatures fluctuates naturally about this trend. A large volcanic eruption could cause a temporary cooling of the observed global temperatures without affecting the underlying warming as defined in this report. Most land regions are experiencing greater warming than the global average, with annual average warming already exceeding 1.5°C in many regions. Over one quarter of the global population lives in regions that have already experienced more than 1.5°C of warming in at least one season. {1.2.2 & 1.2.3} [Christophe Deissenberg, Luxembourg]	Obsolete. Text removed
4082	4	46	4	47	This sentence as it stands is not necessarily correct, as the 2017/2018 temperatures include effects of natural variability as well as climate change. The sentence needs a qualifier at the end, such as "once effects of natural decadal and sub-decadal variability are filtered out". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: definition of warming is clarified.
32808	4	46	4	47	The logic here reads strangely to me. Temperatures were assessed to be increasing in AR5, and therefore several years they did something. Seems like you're either getting at how if one extrapolates beyond AR5 using their assessed warming rate you'd have reached 1C when observations did as well. Maybe just changed 'and hence reached' to 'and hence were expected to reach'. [Drew SHINDELL, United States of America]	Obsolete. Text removed
34406	4	46			Give the period over which this trend was calculated. [Nathan Gillett, Canada]	Accepted
40790	4	46	4	47	The indicated rise of 0.13oC is not constant with the estimated increase in temperature per decade as mentioned in the same sentence of change over 2006-2015 period…this needs refinement to 0.904oC.with are rate of 0.017oC per year [NARESH KUMAR SOORA, India]	Noted: rise is consistent with current estimated rate of warming
48342	4	46	4	47	Revision: Temperatures in five assessed datasets are rising at 0.18°C (±0.07°C) per decade, and hence reached 1°C above pre-industrial (0.10°C above 2006-2015) around 2015/16. [David Clarke, Canada]	Noted: revised chapter uses average of all 4 published global datasets
8634	4	47	4	48	Say: "Temperatures continue to fluctuate naturally on either side of this anthropogenically (not: "externally") driven warming trend." Reason: "externally driven" could be confused by some readers with external forcings such as volcanoes, solar etc. [Urs Ruth, Germany]	Obsolete. Text removed
13402	4	48	4	48	Omit: naturally. [Sergio Aquino, Canada]	Obsolete. Text removed
40092	4	48			Externally driven warming trend is a term that doesn't mean much to the average reader. Could we simplify and say "temperature estimate"? If not, clarify external to what. [Ko Barrett, United States of America]	Accepted. "Externally driven warming trend" is no longer used in the Executive Summary.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
53704	4	48	4	5	The mentioning of a volcanic eruption appears to be coming almost out of nowhere. Altough the previous sentence mentions natural fluctuation, there is no substantial connection to the rest of the paragraph and it is unclear why specifically volcanic eruption has been choosen as example for such a temperature fluctuation. I suggest to briefly explain the mentioning of vulcanoes or to remove the entire sentence. [Patrik Winiger, Netherlands]	Accepted. Statement has been deleted.
4084	4	5	4	53	The 1.5 deg C target of the Paris Agreement is a target for the global average temperature. It was chosen in the knowledge that some regions will have warmed by well over 1.5 deg C by the time the global limit is reached. The impacts of change in one region may be felt remotely, in particular through sea-level rise. A 1.5 deg C warming may be dangerously high in one region but not so in another. In the light of this, it is not easy to see the relevance for this Special Report of the (nevertheless interesting) fact that more than a quarter of the global population live in regions that have already experienced more than 1.5 deg C warming. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the reviewer notes this is an interesting fact, that places the global warming goal in context
9544	4	5		53	This sentence makes a very important point (i.e. certain populations and regions already experiencing more than 1.5 warming). The Arctic is one such region where warming of 1.5 or greater has created a cascade of rapid and significant impacts that have (and continue to) challenge the people in this region, particularly Inuit who have lived off the land for millenia. As such, this point should not come at the end of this paragraph but rather should be pulled out to stand on its own (as another key point in bold under the Executive Summary) with further elaboration to emphasize which regions are already experiencing impacts of 1.5 and what this means for certain populations (such as Inuit, islanders, agrarians, fishers) who face massive challenges from the implications of this warming. The Arctic should be explicitly highlighted, along with other regions facing disproportionate warming. Another sentence is also needed to recognize that 1.5 for the world is an average and will still mean detrimental and irreversible impacts for certain regions/populations that will live with warming above 1.5. [Joanna Petrasek MacDonald, Canada]	Accepted, although regional detail is provided in Ch3
56830	4	5	4	5	The phrase "Most land regions" is misleading. We know those in higher latitude regions are experiencing greater warming than those located in lower lattitude regions. Suggest the following text "Higher lattitude regions.." [Penehuro Fatu Lefale, New Zealand]	Accepted. Statement has been deleted.
57228	4	5	4	53	These last two sentances should be a stand alone bullet point. That some regions have experienced greater warming is repeated in bullets below [Hans Poertner, Germany]	Accepted.
13404	4	51	4	51	Omit: in many regions. [Sergio Aquino, Canada]	Obsolete. Text removed
40094	4	51	4	52	Could we add a sentence indicating which regions are warming less than the global average (i.e. oceans) to provide readers with the complete picture? [Ko Barrett, United States of America]	Accepted.
50614	4	51	4	53	A quantitative statement on area of biodiversity hotspots, ecosystem or biomes that already under 1.5 degree warming in atleast one season is recommended. [Jagdish KRISHNASWAMY, India]	Noted but not clear, we have not yet reached 1.5 degree average global warming
2500	5	1	5	19	LINES 1-19 USE TOO MUCH JARGON IN A TOO IMPRECISE WAY AND DO NOT ALWAYS MAKE A STRAIGHTFORWARD DISTINCTION BETWEEN WARMING LEVELS, SPEEDS OF CHANGE, AND ACCELERATION. LIKEWISE, EMISSIONS APPEARS TO BE THE INDEPENDENT VARIABLE AT SOME PLACES, AND WARMING AT OTHERS. HERE AN ATTEMPT AT REFORMULATION, USING EMISSIONS AS THE INDEPENDENT VARIABLE. [Christophe Deissenberg, Luxembourg]	Noted. Paragraph has been rewritten.
2502	5	1	5	19	The surface temperature is almost instantaneously, and linearly, correlated with the total amount of greenhouse gases in the atmosphere: If all anthropogenic emissions were reduced to zero immediately, any further emissions-induced temperature increase would occur within at most one decade and would be small enough to be indistinguishable from the natural variability during that time. That is, the future warming depends on the future emissions and, thus, it is ceteris paribus geophysically possible to avoid substantial warming beyond its current level by drastically reducing the future emissions. [High confidence]. However, many effects of a given level of warming exhibit a significant inertia. Thus, e.g., the sea level will continue to rise even after global emissions are reduced to zero, i.e., after the surface temperature is stabilized. {1.2.6} //NEW PARAGRAPH// Since the warming depends upon the cumulated past CO2 emissions, feeble emission reductions in early periods need to be compensated by increased subsequent reductions to meet a given temperature goal. In the case where the cumulated emissions become so large that the temperature overshoots this goal, it becomes necessary to use active net CO2 removal after the overshot to bring the cumulated emissions and therefore the temperature back to the desired value. [At the present rate of human-induced emissions, the global temperatures will reach 1.5°C in the 2040s, or earlier if the emissions continue to rise and the warming continues to accelerate. [High confidence] To avoid temperatures exceeding 1.5°C, the emissions rate would need to be reduced, starting immediately, by 50% before the 2040s, and to zero within a similar times interval thereafter.{1.2.6}] DO THE SENTENCES I PUT BETWEEN SQUARE BRACKET REALLY BELONG HERE? THEY ARE MORE DISTURBING THAN ENLIGHTENING. SUGGESTION: DELETE! INCIDENTALLY, ALMOST THE SAME THINK IS STATED A COUPLE OF SENTENCES BELOW. [Christophe Deissenberg, Luxembourg]	Noted. Paragraph has been rewritten.
5692	5	1	5	2	Use a different word instead o “commit.” Cause, affect, etc. [Nima Ehsani, United States of America]	Noted. Headline statement has been rewritten

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7136	5	2	5	7	I feel that these lines are confusing with respect to previous IPCC reports (see for example Figure 5.2 of the TAR Syr report which mentions temperature stabilization of a few centuries) and in AR4 the term of committed is largely used. I understand that the assumptions are different but I don't see the interest to focus in the executive summary on an hypothetcal scenario (zero emission). It would be useful at least to confirm that iin the case of stabilization (somewhat zero net emission) there is a commited warming. [Jean Jouzel, France]	Noted. The goal of this bullet is to clarify that past emissions alone do not take us past 1.5°C (addressing a common misconception). The paragraph has been rewritten to clarify this..
4716	5	2	5	9	This paragraph provides another opportunity for explaining the situation that we are in, namely that if all emissions were to instanteously go to zero, what the consequences would be of a 1 C global warming to both climate change impacts and to sea level rise (which will not be stabilized--a point noted, but the implications of which not mentioned). It seems to me essential here to give a brief description here of the consequences of 1 C peak and even stabilization. If paleoclimatic sea level sensitivity applies, then a 1 C warming would eventually mean a sea level rise of 15-20 meters or so--very disruptive, and pretty clearly why we do not want a stabilization level above no more than 0.5 C or less. It just seems to me that in conveying scientific understanding for decision makers, the scientific community has to be very clear and frank about the situation--not succeeding in doing this in the past is what has gotten the world into this predicament. [Michael MacCracken, United States of America]	Rejected. Assessing the impacts of a 1 C global warming is beyond the scope of this chapter.
14158	5	2	5	9	It seems there are only two studies, i.e., the evidence is too weak to support this conclusion (Line 2-5). Hence, it shows the confidence in this regard is very low and will be arguing. Furthermore, this conclusion seems quite different from the AR5. [Rongshuo Cai, China]	Noted. The paragraph has been rewritten with reference to 1.5C, such that higher confidence can be assigned to its statements. Also, the conclusion is based not only on modelling studies but also on evidence regarding climate sensitivity and radiative forcing and their respective uncertainties.
16628	5	2	5	9	The statement 'Past emissions do not commit to substantial future surface warming, but do commit to future..' should be worded better as it could be interpreted as emissions have not led to global warming. 3 sea level rise. [Janet Stanley, Australia]	Noted. Statement has been rewritten.
40096	5	2			Commit what? Commit the Earth? [Ko Barrett, United States of America]	Obsolete. Heading revised
40900	5	2	5	9	It is almost misleading and confusing to read the bold text. The discussion below explains it but without that explanation - IF emissions were reduced to zero immediately, future warming would last a decade - it's confusing to read that past emissions do not commit to substantial surface warming and only future sea level rise. Suggest expressing this full idea in the bold text. [Neelam Singh, United States of America]	Noted. Bold statement has been rewritten.
46434	5	2	5	9	Somewhere in this paragraph it should be perhaps be made clear that "warming" means "increased temperature". [Göran Finnveden, Sweden]	Noted. Warming is defined in the first bullet of the Executive Summary.
54184	5	2	5	9	In my opinion, the summary of the section 1.2.6. is not clear. I would propose to change the headline to: " Past emissions do not commit to substantial future surface warming, but do commit to impacts that depend on cumulative warming such as future sea level rise" as well as a slight simplification of the rest of the paragrah to "In a hypothetical scenario where all anthropogenic emissions were reduced to zero immediately, any further warming beyond that already experienced would last at most one decade and be indistinguishable from natural variability over that time. This indicates that future warming depends on future emissions but any substantial additional warming is not geophysically unavoidable. [High confidence] Whether or not this occurs depends on future rates of emission reductions. In contrast, impacts that depend on cumulative warming, such as sea level rise, will continue to intensify even after global emissions are reduced to zero.{1.2.6} " [Jordi Salat, Spain]	Noted. Headline statement and text have been rewritten.
45754	5	3	5	5	Does this statement include the possibility of feedbacks continuing to contribute to warming under that scenario ? Perhaps distinguish between direct and indirect effects. [Mark Howden, Australia]	Noted. Sentence has been rewritten.
55418	5	3	5	5	This statement needs a bit more unpacking for lay readers, whether the issue here is committed warming or removal of cooling aerosols or cessation of short-lived forcers (well it's all of those of course, but I think this should be spelled out). [Andy Reisinger, New Zealand]	Noted. Sentence has been rewritten.
40792	5	4	5	4	would last at most a decade ….needs reviesion keeping in view of the half life time of the GHGs which have more than one decade as their half lifetime…therefore warming will continue for longer time. [NARESH KUMAR SOORA, India]	Noted. Sentence has been rewritten. Decadal warming is caused by the removal of aerosol radiative forcing, as explained in section 1.2.4
50616	5	6	5	7	Do not use double negative wherever feasible: not" geophysically "unavoidable"" [Jagdish KRISHNASWAMY, India]	Rejected. Double negative is used to counter common misconception that 1.5 is "geophysically unavoidable".
7838	5	7	5	9	This does not sound right, or al least requires substantiation. If warming of water and melting of land ice stop, why would sea level rise continue and even "itensify"? [Petr Zavialov, Russian Federation]	Rejected. Surface warming stops, but not warming of the deep ocean and melting of ice-sheet, which take century to millennia to respond.
39074	5	7	5	8	Please drop the confusing double negative. Replace with 'is geophysically avoidable'. Many people reading are not native English speakers and could misunderstand. [Lindsey Cook, Germany]	Rejected. Double negative is used to counter common misconception that 1.5 is "geophysically unavoidable".
40626	5	7	7	7	I think it would be helpful to replace 'is not geophysically unavoidable' with 'is geophysically avoidable'. [Jonny Williams, New Zealand]	Noted
50438	5	7	5	9	The role of the ocean for climate ineratia is not at all mentioned; why is only sea level rise ementioned? [Karina VON SCHUCKMANN, France]	Noted. Ocean thermal inertia is mentioned in the chapter text. The headline statement has been modified to include other impacts.
56832	5	7	5	9	Unclear. The phrase 'experienced is not geo-physically unavoidable'???? Need a better formulation. [Penehuro Fatu Lefale, New Zealand]	Noted. Sentence has been reworded.
49412	5	8	5	9	How long will they continue to intensify? [Alexander Chernokulsky, Russian Federation]	Obsolete. Sentence has been deleted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51440	5	8	5	8	please explain the term "cumulative warming" [Astrid Schulz, Germany]	Noted. The term "cumulative warming" is no longer used. We refer to "time-integrated impacts" instead.
57230	5	8	5	8	Cumulative warming will need to be explained here [Hans Poertner, Germany]	Noted. The term "cumulative warming" is no longer used. We refer to "time-integrated impacts" instead.
55926	5	9	5	9	add, "and may be substantial especially with triggering of irreversible processes such as polar ice sheet collapse." [Pamela Pearson, United States of America]	Rejected. An assessment of cryospheric changes in response to past emissions is beyond the scope of this chapter.
323	5	11	5	18	please also present the CMIP5 RCPs results [Zong-Ci Zhao, China]	Rejected. As this is a framing chapter, the statement is deleted. The description of CMIP5 is found in Ch2.
324	5	11	5	18	It should present the periods of global waming of 1.5?. Is it th first time to reach 1.5?? [Zong-Ci Zhao, China]	Obsolete. This statement is deleted. “The definition of 1.5C-consistent emissions pathways” is in another statement in the revised document.
7066	5	11	5	13	CO2 --> CO2 [Dmitry L. Musolin, Russian Federation]	Editorial. Subscript is used for “2” of CO2.
29282	5	11	5	13	CO2 [Yuanyuan Huang, France]	Editorial. Subscript is used for “2” of CO2.
36352	5	11			Please, write CO2, instead of CO2. [Emilio Cerdá, Spain]	Editorial. Subscript is used for “2” of CO2.
39338	5	11	5	18	In our view, and according to our comment nº1, the sentence: “At the present rate of human-induced warming, global temperatures would reach 1.5°C in the 2040s, or earlier if emissions continue to rise and warming continues to accelerate. [High confidence]” should be rewritten. We suggest the following text: “At the present rate of human-induced warming, global temperatures would reach 1.5°C in the coming years if emissions continue to rise and warming continues to accelerate. [High confidence]” [Olga Alcaraz, Spain]	Noted. The statement is deleted. The sentence “It will take 13–32 years (one-standard-error range) to reach 1.5°C if the current warming rate continues” is written in Chapter 1.2.4 of the final GD, but not in the Executive Summary. Related statements are found in SPM and ES in Ch2.
40098	5	11			Delete "initial". [Ko Barrett, United States of America]	Obsolete. The sentence is deleted.
44798	5	11	5	13	CO2-->CO2 [Hiroaki Kondo, Japan]	Editorial. Subscript is used for “2” of CO2.
48638	5	11	5	11	any initial delay is bit confusing. I suggest rephrasing by something like "any delay in teh current period" [Yamina Saheb, France]	Obsolete. The sentence is deleted.
51386	5	11	5	13	CO2 in place of CO2 [PRIYANKA LAHA, India]	Editorial. Subscript is used for “2” of CO2.
52728	5	11	5	13	Not clear what "initial delay in emission reduction" means. You refer in the last senstence in the same para that the human-induced warming needs to be reduced starting immediately, but not clear how this relates to the emission reductions referred to in the first sentence. Such clarification is essential as an input to the debate on NDCs. [Iulain Florin VLADU, Germany]	Obsolete. The statement means if the emission reduction delays, faster subsequent reduction is required to meet the same temperature goal. As the Ch1 is a framing chapter, this statement is deleted. Chapter 2 states about “The chances of limiting warming to 1.5°C and the requirements for urgent action” which includes NDCs.
56834	5	11	5	18	CO2 equivalent or CO2 emissions? Needs clarification (see comment above). [Penehuro Fatu Lefale, New Zealand]	Accepted. We clarified the use of “emissions”.
57232	5	11	5	11	Please be clear, what is cumulative impact? [Hans Poertner, Germany]	Noted. The paragraph is deleted. The cumulative impact of CO2 emissions means the impacts caused by cumulative anthropogenic CO2 emissions (see Sec 1.2.1).
37446	5	12	5	12	Replace: or with and; reaching 1.5°C as of now seems to require both "accelerating GHG emissions cuts AND using negative emissions technologies as illustrated by the fact that no scenarios in peer-reviewed publications can do without both. This is a politically accepted scientific insight also reported by the 2017 UNEP emissions gap report. [Matthias Honegger, Germany]	Noted. The paragraph is deleted. The statements about “Limiting warming to 1.5C implies reaching net zero CO2 emission globally around 2050…” and “All analysed 1.5C-consistent pathways use CDR…” are written in Chapter 2.
14160	5	13	5	15	At the present rate of human induced warming? What rate of warming? It shows a little obscure. Actually, the global waming rate is nonlinear. The estimate results of "global temperatures would reach 1.50°C in the 2040s....." are from the figure 1.6. Perhaps, it would be better to say " at the present GHG emission……" [Rongshuo Cai, China]	Obsolete. It is clarified in the FGD to refer to the rate of temperature increase that is attributable to human influence.
36354	5	13			Please, write CO2, instead of CO2. [Emilio Cerdá, Spain]	Editorial. Subscript is used for “2” of CO2.
40100	5	13	5	15	The sentence refers to the present role of human-induced warming, so it should end after "in the 2040s.[High Confidence] The qualifiers that follow should be split inot a second sentence if included. [Ko Barrett, United States of America]	Obsolete. The sentence is deleted.
42726	5	13	5	18	Rate of warming is less dependent on the cumulative emissions of CO2 and is instead influenced by short-lived climate forcers, which can have an immediate effect on the rate of warming if their emissions are reduced. UNEP (2017) The emissions gap report, xv (“The report also covers an assessment of the potential contribution from reductions in short-lived climate pollutants (SLCPs), although they are not directly comparable with reductions in long-lived greenhouse gases. Reductions of SLCPs limit the rate of short-term warming, and when sustained and combined with CO2 reductions, these reductions also help to limit long-term warming, which is the ultimate aim of closing the emissions gap.”); Xu et al 2013 (“This estimate is consistent with RX10, which would also yield 0.5 C avoided warming if only CH4, O3, and BC were mit- igated. All three studies calculated that full implementation of mitigation measures for these three SLCPs can reduce the rate of global warming during the next several decades by nearly 50%. Furthermore, Arctic warming can be reduced by two-thirds over the next 30 yr compared to business as usual (BAU) scenarios (UNEP and WMO, 2011).”). [Kristin Campbell, United States of America]	Noted. The paragraph is deleted. Please refer to Chapter 2.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
42940	5	13	5	18	Rate of warming is less dependent on the cumulative emissions of CO2 and is instead strongly influenced by short-lived climate forcers, which can have a nearly immediate effect on the rate of warming if their emissions are reduced. See UNEP (2017) The emissions gap report, xv ("The report also covers an assessment of the potential contribution from reductions in short-lived climate pollutants (SLCPs), although they are not directly comparable with reductions in long-lived greenhouse gases. Reductions of SLCPs limit the rate of short-term warming, and when sustained and combined with CO2 reductions, these reductions also help to limit long-term warming, which is the ultimate aim of closing the emissions gap."); and Xu et al 2013 ("This estimate is consistent with RX10, which would also yield 0.5 C avoided warming if only CH4, O3, and BC were mit- igated. All three studies calculated that full implementation of mitigation measures for these three SLCPs can reduce the rate of global warming during the next several decades by nearly 50%. Furthermore, Arctic warming can be reduced by two-thirds over the next 30 yr compared to business as usual (BAU) scenarios (UNEP and WMO, 2011)."). [Durwood Zaelke, United States of America]	Noted. The paragraph is deleted. Please refer to Chapter 2.
4086	5	14	5	14	Insert "the rise in" before "global temperatures". Otherwise the sentence is plainly wrong, since global temperatures are already between 14 deg C and 15 deg C. Similarly, change "temperatures" to "temperature rises" in line 16. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. The sentence is deleted.
34408	5	14			Insert 'above pre-industrial levels' after '1.5 C'. As written the statement refers to the absolute global mean temperature, which is much warmer than 1.5C. [Nathan Gillett, Canada]	Noted: the definition of "warming" is now provided in the SPM
38424	5	14	5	16	Should be "of human-induced warming, global temperature increase would reach 1.5°C in the 2040s, or earlier if emissions continue to rise and warming continues to accelerate. [High confidence] To avoid temperature increase exceeding 1.5°C" [Volodymyr Demkine, Kenya]	Obsolete. The sentence is deleted.
51388	5	14			rise in global temperature in place of "global temperatures" [PRIYANKA LAHA, India]	Accepted
38722	5	15	5	18	Could make it more clear by adding the word "emissions" [Jan Fuglestvedt, Norway]	Obsolete. The statement is deleted in ES of Ch1. Related statements are in ES of Ch 2 and SPM.
46436	5	15	5	17	The sentence "To avoid temperatures…." is based on section 1.2.6, but it is not so clearly described there. So perhaps this sentence need a bit more of an explanation (or more text is added to section 1.2.6 so that the numbers presented here are also explicitly presented there). [Göran Finnveden, Sweden]	Obsolete. The paragraph is deleted.
13406	5	16	5	17	Suggestion: target should be 2040 instead of a whole decade. [Sergio Aquino, Canada]	Rejected. It has uncertainties. The statement is deleted in Ch1. Related statements are in ES of Ch 2 and SPM. Please also refer to the sentences in the revised Ch1: "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."
51390	5	16			When it is written " To avoid temperature exceeding 1.5oC", it may mean as if the absolute tempertaure is 1.5oC. [PRIYANKA LAHA, India]	Noted: the definition is now provided in terms of "warming"
40794	5	17	5	17	similar timescale ….not clear…make it explicit [NARESH KUMAR SOORA, India]	Obsolete. The statement is deleted in Ch1. Related statements are in ES of Ch 2 and SPM. Please also refer to the sentences in the revised Ch1: "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."
37448	5	18	5	18	overshoot and return of CO2 concentrations physically requires global emissions to be below zero. This is such a central piece to understanding global carbon budgets, that leaving this out here would be severly misleading. Please therefore add at the end of the sentence: ...and eventually to below zero before the end of the century. [Matthias Honegger, Germany]	Obsolete. The statement is deleted in Ch1. Related statements are in ES of Ch 2 and SPM.
2504	5	2	5	4	HERE ALSO I ATTEMPTED A REFORMULATION. THE ORIGINAL TEXT WAS RATHER CONFUSED AND AT PLACES ALMOST IMPOSSIBLE TO UNDERSTAND [Christophe Deissenberg, Luxembourg]	Obsolete. The sentence is deleted.
5554	5	2	5	26	It is not convincing with these formulations that the pathway concept is very important to highlight here [Kirsten Halsnaes, Denmark]	Noted. This statement is deleted, as Ch1 is a framing chapter. However, the definition of 1.5-consistent pathways is written in another statement. And about emission pathways consistent with 1.5C global warming is written in the main texts in Ch 1, SPM and other chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2506	5	2	5	4	The notion of a pathway provides a valuable conceptual narrative and an operational framing for understanding the requirements necessary to limit the warming to 1.5°C. Multiple potential pathways towards limiting warming to 1.5°C do exist, with different implications for mitigation and impacts. But all require rapid and deep reductions in greenhouse gas emissions. [A 50% reduction in the rate of human-induced warming requires halving the annual global emission rate of cumulative greenhouse gases such as CO2, with corresponding reductions in other climate drivers. DOES THE SENTENCE BETWEEN SQUARE BRACKETS BELONG HERE, IS IT NEEDED AT ALL? {1.3/1.2} //NEW PARAGRAPH// In this report, “impacts at 1.5°C” refer to the projected impacts when the global mean temperature is 1.5°C above pre-industrial levels. [Several regions already experience higher levels of warming and associated impacts. ALREADY SAID, UNNECESSARY HERE. DELETE?] For many regions, an increase in global mean temperature of 1.5°C or 2°C implies substantial increases in the occurrence and/or intensity of some extreme events. The impacts are not all driven by warming. Some are related directly to the greenhouse gas concentrations and some may result from the very efforts made to limit the warming, such as the use of land for Bioenergy with Carbon Capture and Storage (BECCS). Many impacts will be very different if the warming approaches 1.5°C from below or if it returns to 1.5°C after a temporary overshoot. For example, some ecosystems may not recover after a temperature overshoot. Hence, the impacts at 1.5°C depend on how 1.5°C has been achieved. Their severity rest not only on the hazards (changes in climate averages and extremes e.g.) but also on the vulnerabilities of the different communities affected and their individual exposure to climate threats. That is, the adaptive capacity to a 1.5°C warmer world will vary markedly for individual sectors and across sectors. Some, such as water supply, public health, infrastructure, ecosystems and food supply, are of particular concern.{1.3} [Christophe Deissenberg, Luxembourg]	Obsolete. The statement starting with “The concept of pathways provides…” is deleted. The statement starting with “Impacts at 1.5C in this report …” is revised. The statement in ES in Ch1 explains what kind of impact is assessed in this report.
2508	5	2	5	4	In this report, “impacts at 1.5°C” refer to the projected impacts when the global mean temperature is 1.5°C above pre-industrial levels. A 1.5°C warmer world will exacerbate global risks such as the degradation of ecosystems, an increase in the frequency of extreme events such as heat waves, reduced food security, greater sanitary hazards, and reduced access to fresh water. The probability of extreme weather and climate events and of irreversible changes will increase rapidly at higher warming levels. Extreme weather and climate events that result in resource depletion, conflict and forced migration will impact the economic development worldwide and warming of 1.5°C or beyond will present increased challenges to addressing the Sendai Framework for Disaster Risk Reduction 2015-2030. The human consequences will greatly vary depending on the vulnerabilities of the different communities affected and on their individual exposure to climate threats, with the poorest being the most vulnerable. Thus, severe inequity in resource distribution, chronic poverty and marginality in many regions of the world will amplify their vulnerability to climate change, and the capacity to adapt to a 1.5°C warmer world will vary markedly for individual sectors and across sectors. Some sectors, such as water supply, public health, infrastructure, ecosystems and food supply, are of great concern. Many existing risks specific to rural areas and to medium to large size urban areas and cities will be magnified. {1.3} //NEW PARAGRAPH// The impacts will not all driven by warming. Some will be directly related to the greenhouse gas concentrations and some may result from the very efforts made to limit the warming, such as the use of land for Bioenergy with Carbon Capture and Storage (BECCS). Many impacts will be very different if the warming approaches 1.5°C from below or if it returns to 1.5°C after a temporary overshoot. For example, some ecosystems may not recover after a temperature overshoot. Hence, the impacts at 1.5°C depend on how 1.5°C has been achieved. [Christophe Deissenberg, Luxembourg]	Obsolete. The statement starting with “Impacts at 1.5C in this report …” is revised. The statement in ES in Ch1 explains what kind of impact is assessed in this report.
16630	5	2	5	26	The sentence starting 'but avoiding…' to 'drivers' should be the highlighted point in this para. [Janet Stanley, Australia]	Obsolete. This statement is deleted, as Ch1 is a framing chapter. However, the definition of 1.5-consistent pathways is written in another statement. And about emission pathways consistent with 1.5C global warming is written in the main texts in Ch 1, SPM and other chapters
40102	5	2			Insert a "pathway" [Ko Barrett, United States of America]	Obsolete. The sentence is deleted.
40628	5	2	5	2	pathway' should be replaced by 'pathways'. [Jonny Williams, New Zealand]	Obsolete. The sentence is deleted.
54468	5	2	5	26	The concept of a 'pathway' is not defined clearly enough here, nor is the rationale for linking it to narrative. Perhaps foreshadow the discussion later (p. 23) regarding how pathways are contingent series of actions towards a goal or result. Froma a narrative standpoint, scenario carries more resonance as a term. Climate-reslient-pathways as an IPCC objective might also be productively introduced here. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. This statement is deleted. The definition of 1.5C-consistent pathways is in the revised ES. Also climate-resilient development pathways is mentioned in ES.
56836	5	2	5	26	Missing from this text is the potential role of CDM and RMM in limiting warming to 1.5oC. Suggest the following text "Multiple potential pathways…But avoiding exceedance of 1.5oC requires "first and foremost" rapid and deep reductions in greenhouse gas emissions "combined with deployment and use of CDM and RMM technologies". [Penehuro Fatu Lefale, New Zealand]	Obsolete. This statement is deleted. Potential role of CDM is assessed in Ch2.
57234	5	2	5	23	These two sentences are the wrong way around, the second sentence should be the first ie the bold statement. [Hans Poertner, Germany]	Obsolete. This statement is deleted. However, the definition of 1.5-consistent pathways is written in another statement. And about emission pathways consistent with 1.5C global warming is written in the main texts in Ch 1, SPM and other chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4088	5	21	5	21	Rewrite this line: "to enable limit warming to a 1.5 deg C" has to be corrected. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. “enable” is not necessary. The sentence is deleted.
8930	5	21	5	21	to enable limit warming to a 1.5°C -> I'm no native speaker, but this formulation seems uncorrect to me. [Heike Huebener, Germany]	Obsolete. “enable” is not necessary. The sentence is deleted.
29280	5	21	5	21	delete "enable" [Yuanyuan Huang, France]	Obsolete. “enable” is not necessary. The sentence is deleted.
40902	5	21	5	21	…the conditions required to enable limiting warming to 1.5C…(typos - change to 'limiting' and delete 'a' as shown here) [Neelam Singh, United States of America]	Obsolete. “enable” is not necessary. The sentence is deleted.
56162	5	21	5	21	Change to "….enable limiting warming to…" [Annika Herbert, Australia]	Obsolete. “enable” is not necessary. The sentence is deleted.
57924	5	21	5	21	The article "a" may be deleted in the phrase "limit warming to a 1.5°C." [Siir KILKIS, Turkey]	Obsolete. “enable” is not necessary. The sentence is deleted.
7156	5	23	5	23	this should read "mitigation, adaptation, impacts, and sustainable development". [Petra Tschakert, Australia]	Noted. This statement is deleted. Instead a statement on ambitious mitigation actions refers to sustainable development, including climate adaptation and mitigation, poverty eradication and reducing inequalities.
40104	5	23			Delete"But". Insert "In all cases," [Ko Barrett, United States of America]	Obsolete. The sentence is deleted.
48640	5	23	5	23	I think the word adaptation is misssing in "mitigation and impacts" [Yamina Saheb, France]	Noted. This statement is deleted. Instead a statement on ambitious mitigation actions refers to sustainable development, including climate adaptation and mitigation, poverty eradication and reducing inequalities.
51006	5	23	5	24	Add "near-term" in this sentence. Rapid and deep near-term reductions. [Doreen Stabinsky, United States of America]	Obsolete. The sentence is deleted.
56966	5	23	5	26	needs caveat. "In the absence of large scale albedo modification, avoiding exceedance of 1.5…" [Oliver Morton, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. The paragraph is deleted.
40106	5	24			Delete sentence beginning with "A 50% reduction…" It is superfluous information that does not support the topic sentence of the paragraph. [Ko Barrett, United States of America]	Noted. The sentence is deleted.
42728	5	24	5	26	Specify the other drivers, especially SLCPs because of the immediate effect they can have on reducing the rate of warming. UNEP (2017) The emissions gap report, xv (“The report also covers an assessment of the potential contribution from reductions in short-lived climate pollutants (SLCPs), although they are not directly comparable with reductions in long-lived greenhouse gases. Reductions of SLCPs limit the rate of short-term warming, and when sustained and combined with CO2 reductions, these reductions also help to limit long-term warming, which is the ultimate aim of closing the emissions gap.”). Xu et al 2013 (“This estimate is consistent with RX10, which would also yield 0.5 C avoided warming if only CH4, O3, and BC were mit- igated. All three studies calculated that full implementation of mitigation measures for these three SLCPs can reduce the rate of global warming during the next several decades by nearly 50%. Furthermore, Arctic warming can be reduced by two-thirds over the next 30 yr compared to business as usual (BAU) scenarios (UNEP and WMO, 2011).”). [Kristin Campbell, United States of America]	Obsolete. The statement is deleted. See Cross-Chapter Box 2.
42942	5	24	5	26	Specify the other drivers, especially SLCPs because of the immediate effect they can have on reducing the rate of warming. See UNEP (2017) The emissions gap report, xv (“The report also covers an assessment of the potential contribution from reductions in short-lived climate pollutants (SLCPs), although they are not directly comparable with reductions in long-lived greenhouse gases. Reductions of SLCPs limit the rate of short-term warming, and when sustained and combined with CO2 reductions, these reductions also help to limit long-term warming, which is the ultimate aim of closing the emissions gap.”); and Xu et al 2013 (“This estimate is consistent with RX10, which would also yield 0.5 C avoided warming if only CH4, O3, and BC were mitigated. All three studies calculated that full implementation of mitigation measures for these three SLCPs can reduce the rate of global warming during the next several decades by nearly 50%. Furthermore, Arctic warming can be reduced by two-thirds over the next 30 yr compared to business as usual (BAU) scenarios (UNEP and WMO, 2011).”). [Durwood Zaelke, United States of America]	Obsolete. The statement is deleted. See Cross-Chapter Box 2.
24268	5	25	5	26	Chapter 1 does not assess what "corresponding reductions in other climate drivers" are, which makes this statement confusing, as it referes to something the chapter does not provide. [Joeri ROGELJ, Austria]	Accepted. The statement is deleted.
31806	5	25	5	26	reductions is strictly only correct for drivers that result in a positive forcing [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. The statement is deleted.
9654	5	28	5	29	Comparing 1.5c in relation to pre-industrial is not usefull referencing for informing 1.5c in the context of Paris Agreement, which is considering 1.5c in the context of well below 2c [Mustafa BABIKER, Sudan]	Rejected - The definition of 1.5 is based on pre-industrial
40110	5	28	5	39	There is so much crammed into this paragraph, much of it not connected to the key finding in bold. Perhaps the bold statement should read something like,"Impacts at 1.5C in this report are not only caused by warming." Then you could delete the second sentence and the rest of the paragraph makes sense. [Ko Barrett, United States of America]	Section has been shortened
40904	5	28	5	29	In some instances the bold text refers to an assessment based on current knowledge, in other places, it is just describing or clarifying how a particular term has been used or what it means (like in these lines). Would be nice to have consistency where bold text represents an assessment. [Neelam Singh, United States of America]	Noted. We are now more consistent

Comment No	From Page	From Line	To Page	To Line	Comment	Response
43990	5	28	5	39	I do not understand the motivation of this paragraph. From the chapeau in bold, I would expect a discussion on how it can be determined "when the global mean temperature is 1.5°C above pre-industrial levels", the scientific caveats and challenges with it. Plus questions of time scales, 'stabilisation' vs transient, etc. This is an important topic that is not sufficiently covered in the ES. Plus selecting only mitigation related land use change as an example (editorial comment: Can land be 'displaced'?) and not other drivers of LU or, probably even more important, aerosols is insufficient. Plus then stating en passant that impacts depend ond exposure and vulnerability (without going into detail about different future trajectories) is not adequate. In short, there are too many thoughts in this paragraph leading to none of them being adequatly represented. [Carl-Friedrich Schleussner, Germany]	Rejected. The specific details requested by the reviewer are provided in Ch1, and we cannot elaborate in detail in the ES due to strict word limits.
51392	5	28			Impacts of 1.5oC in place of Impacts at [PRIYANKA LAHA, India]	Implemented
40108	5	29			This sentence is duplicative of information on P4 lines 50-51. Please address duplication and consider placing these discussion points closer to each other in the Executive Summary [Ko Barrett, United States of America]	Duplication removed
57236	5	29	5	32	Repetition of the bullet point starting on page 4 line 44 [Hans Poertner, Germany]	Noted
51394	5	31			Intensification in place of "intensify" [PRIYANKA LAHA, India]	Phrase deleted
53706	5	31	5	31	Remove "or 2°C" [Patrik Winiger, Netherlands]	Implemented
45756	5	32	5	35	What about climate variables other than warming ? [Mark Howden, Australia]	Text deleted
57238	5	32	5	33	Provide an example for impacts directly related [Hans Poertner, Germany]	Text deleted
40906	5	33	5	34	BECCS is a very specific example for negative emissions and it's odd to see it highlighted here. You could argue that any kind of transformational change is an ambitious undertaking with large scale impacts which are not always positive in terms of heavily reducing or completely eliminating emissions but can also be negative such as dampening or wiping out regional economy if the scale of change is indeed ambitious. Or similar impacts on ecosystem as BECCS - e.g., dramatic increase in use of biofuels. [Neelam Singh, United States of America]	Text deleted
51008	5	33	5	35	This is a very important point. It should remain in the executive summary of this chapter and should be emphasized in the SPM. [Doreen Stabinsky, United States of America]	Noted
4708	5	34	5	34	I don't understand how land can be displaced. Don't you mean changes in land cover and land use? If, needs to be said as I don't think "displacement" will be generally understood. [Michael MacCracken, United States of America]	Obsolete. The sentence is deleted.
7434	5	34	5	34	Replace "displacement of land" by "displacement of food production" [Axel Michaelowa, Switzerland]	Obsolete. The sentence is deleted.
17924	5	34	5	35	The reference to BECCS as an "ambitious effort" assumes that BECCS could in fact constrain GHG concentrations. That is far from certain at this point in time, and should be substantiated before it is assumed as a given. [Andrea TILCHE, Belgium]	Text deleted
17926	5	34	5	35	displacement of land is an odd/unclear expression. The physical displacement of land (such as seizmic activity) is dangerous and relevant, but presumably the text refers to the displacement of land use (incl. food production). [Andrea TILCHE, Belgium]	Obsolete. The sentence is deleted.
39076	5	34	5	34	The example given (BECCS) is influences readers inappropriately toward a still undeveloped (CCS) technique, when more effective and proven mitigation approaches in natural climate solutions and behaviour change exist now. Why is BECCS pushed prematurely before other options are sufficiently pursued? [Lindsey Cook, Germany]	Text deleted
50442	5	34	5	35	Reconsider formulation; BECCS would not displace land, but rather reallocate the use of land and displace people or agriculture from that land [Ina Möller, Sweden]	Obsolete. The sentence is deleted.
50618	5	34	5	35	Apart from BECCs could also mention the impact of small and medium hydro-power on aquatic ecosystems and ecosystem services [Jagdish KRISHNASWAMY, India]	Text deleted
33014	5	35	5	39	character and severity of impacts depends on vulnerabilities (e.g. gender equality, enjoymnet of human rights) [Tara Shine, Ireland]	This is now discussed in later bullets
44688	5	35	5	35	Hence impacts at 1.5°C depend on how 1.5°C has been achieved is a very clear and pithy statement that could usefully be employed in the relevant place in the SPM. [Penny Urquhart, South Africa]	Noted
57240	5	35	5	35	impacts at 1.5°C depend on how 1.5°C has been achieved' - this should be the bold statement for this bullet [Hans Poertner, Germany]	Noted
48642	5	37	5	37	I guess you are referring to current vulnerabilities and not the up coming ones due to CC impacts. [Yamina Saheb, France]	This is now discussed in later bullets
57242	5	37	5	37	Human communities and ecosystems - please be clear [Hans Poertner, Germany]	Text deleted
13408	5	38	5	38	will vary markedly for individual 'regions (instead of sectors). [Sergio Aquino, Canada]	Text deleted
57244	5	38	5	38	Threats or hazards? [Hans Poertner, Germany]	Text deleted
57246	5	38	5	39	Adaptive capactiy should be a bullet point on its own [Hans Poertner, Germany]	Text deleted, this is indeed now discussed in later bullets
5694	5	41	5	42	Something like this should be used in the opening paragraph of the executive summary to explain why we are aiming for below 1.5 degree. [Nima Ehsani, United States of America]	Noted
5696	5	41	5	53	I think this paragraph should be moved to the beginning of the executive summary. [Nima Ehsani, United States of America]	Rejected - we do not think this would be appropriate
13410	5	41	5	52	what constitutes a temperature overshoot? [Sergio Aquino, Canada]	This is now better explained

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39078	5	41	5	53	Human suffering may be hard to quantify, but please try to help highlight the consequence of what insufficient action would entail - deaths, disease, due to the consequences listed in these sentences. [Lindsey Cook, Germany]	Noted
40112	5	41	5	52	This topic sentence - and the entire parapgraph - is not understandable. Supporting sentences are not clear. Please reconsider what is the main point and include only those points that support it. [Ko Barrett, United States of America]	This entire paragraph has been substantially revised
43992	5	41	5	53	As above. There is a lot to say about different 1.5°C worlds. But then it goes on in a tour de force through climate risks with most statements not at all linked to the overshoot question. I don't understand how Sendai comes in here. And would argue that the statement that 'extreme weather and climate risks \emph{result} in conflict and forced migration' is not sufficiently backed by scientific evidence. [Carl-Friedrich Schleussner, Germany]	Reference to Sendai framework has been removed from the ES
42730	5	41	5	47	This is especially true for self-reinforcing feedbacks, like thawing permafrost releasing carbon dioxide and methane into the atmosphere, or irreversible tipping points like melting of the Greenland and Antarctic ice sheets. Lenton T. M. (2012) Arctic Climate Tipping Points, AMBIO, 41:10–22, 10 (“The Arctic sea-ice, GIS, Atlantic thermohaline circulation (THC), and boreal forest have previously been identified as potential ‘tipping elements’ in the Earth system— climate subsystems that could exhibit a ‘tipping point’ where a small change in forcing (in particular, global temperature change) causes a qualitative change in their future state (Lenton et al. 2008). The resulting transition may be either abrupt or irreversible or, in the worst cases, both.”); Drijfhout S., et al. (2015) Catalogue of abrupt shifts in Intergovernmental Panel on Climate Change climate models, PROC. NAT’L. ACAD. SCI. 112(43):E5777–E5786, E5777 (“Abrupt transitions of regional climate in response to the gradual rise in atmospheric greenhouse gas concentrations are notoriously difficult to foresee. However, such events could be particularly challenging in view of the capacity required for society and ecosystems to adapt to them. We present, to our knowledge, the first systematic screening of the massive climate model ensemble informing the recent Intergovernmental Panel on Climate Change report, and reveal evidence of 37 forced regional abrupt changes in the ocean, sea ice, snow cover, permafrost, and terrestrial biosphere that arise after a certain global temperature increase. Eighteen out of 37 events occur for global warming levels of less than 2°, a threshold sometimes presented as a safe limit.”); Lenton T. M., et al. (2008) Tipping elements in the Earth’s climate system, PROC. NAT’L. ACAD. SCI. 105(6):1786–1793, 1786 (“In discussions of global change, the term tipping point has been used to describe a variety of phenomena, including the appearance of a positive feedback, reversible phase transitions, phase transitions with hysteresis effects, and bifurcations where the transition is smooth but the future path of the system depends on the noise at a critical point. We offer a formal definition, introducing the term ‘‘tipping element’’ to describe subsystems of the Earth system that are at least subcontinental in scale and can be switched—under certain circumstances— into a qualitatively different state by small perturbations. The tipping point is the corresponding critical point—in forcing and a feature of the system—at which the future state of the system is qualitatively altered.”); see also Duarte C. M., et al. (2012) Abrupt climate change in the Arctic, NATURE CLIMATE CHANGE 2:60–62, 60 (“Perhaps the most dangerous aspect of?Arctic climate change is the risk of passing tipping points. Tipping points?have been defined as critical points, in forcing or some feature of a system, at?which a small perturbation can qualitatively alter its future state. Tipping elements are those large-scale components of the Earth system that can exhibit a tipping point.?The Arctic region arguably has the greatest concentration of potential tipping elements in the Earth system, including Arctic sea?ice, the Greenland ice sheet, North Atlantic deep-water formation regions, boreal forests, permafrost and marine methane hydrates. Recent analyses have added several more candidates.”). [Kristin Campbell, United States of America]	The suggested literature has been noted, and added to the chapter text where relevant

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42944	5	41	5	47	The most significant impact from overshoot is the acceleration of self-reinforcing feedbacks. Any forcing beyond 1.5 contributes to impacts that will not be reduced for decades to centuries, including added SLR and warming of oceans. This includes self-reinforcing feedbacks like thawing permafrost releasing carbon dioxide and methane into the atmosphere, and irreversible tipping points like melting of the Greenland and Antarctic ice sheets. A cluster of tipping points exist between 1.5 and 2C, so overshooting the 1.5C temperature goal risks offsetting these feedbacks that will compromise the ability to keep warming well below 2C. See Lenton T. M. (2012) Arctic Climate Tipping Points, AMBIO, 41:10–22, 10 ("The Arctic sea-ice, GIS, Atlantic thermohaline circulation (THC), and boreal forest have previously been identified as potential 'tipping elements' in the Earth system— climate subsystems that could exhibit a 'tipping point' where a small change in forcing (in particular, global temperature change) causes a qualitative change in their future state (Lenton et al. 2008). The resulting transition may be either abrupt or irreversible or, in the worst cases, both."); and Drijfhout S., et al. (2015) Catalogue of abrupt shifts in Intergovernmental Panel on Climate Change climate models, PROC. NAT'L. ACAD. SCI. 112(43):E5777–E5786, E5777 ("Abrupt transitions of regional climate in response to the gradual rise in atmospheric greenhouse gas concentrations are notoriously difficult to foresee. However, such events could be particularly challenging in view of the capacity required for society and ecosystems to adapt to them. We present, to our knowledge, the first systematic screening of the massive climate model ensemble informing the recent Intergovernmental Panel on Climate Change report, and reveal evidence of 37 forced regional abrupt changes in the ocean, sea ice, snow cover, permafrost, and terrestrial biosphere that arise after a certain global temperature increase. Eighteen out of 37 events occur for global warming levels of less than 2°, a threshold sometimes presented as a safe limit."); and Lenton T. M., et al. (2008) Tipping elements in the Earth's climate system, PROC. NAT'L. ACAD. SCI. 105(6):1786–1793, 1786 ("In discussions of global change, the term tipping point has been used to describe a variety of phenomena, including the appearance of a positive feedback, reversible phase transitions, phase transitions with hysteresis effects, and bifurcations where the transition is smooth but the future path of the system depends on the noise at a critical point. We offer a formal definition, introducing the term "tipping element" to describe subsystems of the Earth system that are at least subcontinental in scale and can be switched—under certain circumstances— into a qualitatively different state by small perturbations. The tipping point is the corresponding critical point—in forcing and a feature of the system—at which the future state of the system is qualitatively altered."); see also Duarte C. M., et al. (2012) Abrupt climate change in the Arctic, NATURE CLIMATE CHANGE 2:60–62, 60 ("Perhaps the most dangerous aspect of?Arctic climate change is the risk of passing tipping points. Tipping points?have been defined as critical points, in forcing or some feature of a system, at?which a small perturbation can qualitatively alter its future state. Tipping elements are those large-scale components of the Earth system that can exhibit a tipping point.?The Arctic region arguably has the greatest concentration of potential tipping elements in the Earth system, including Arctic sea?ice, the Greenland ice sheet, North Atlantic deep-water formation regions, boreal forests, permafrost and marine methane hydrates. Recent analyses have added several more candidates."). [Durwood Zaelke, United States of America]	The suggested literature has been noted, and added to the chapter text where relevant
55930	5	41	5	53	Per the above comment, next point then begins with the bolded language: "Some ecosystems and species may not recover after an overshoot." and continue with existing language. [Pamela Pearson, United States of America]	Noted
55928	5	41	5	53	Another key aspect of overshoot involves irreversible process, which is different from failure to recover by individual ecosystems or species and of more global impact. Suggest splitting this therefore into two points, beginning at line 42 after "overshoot.": "Some processes, such as carbon release from permafrost thaw or additional ocean acidification associated with higher atmospheric CO2 levels at overshoot temperatures, are essentially irreversible on human scales even after a return to 1.5 degrees. Other risks, more strongly associated with higher temperatures as outlined in Chapter 3 such as collapse of the West Antarctic Ice Sheet and associated multi-meter SLR, have potential to continue for many centuries once triggered, especially with longer periods of overshoot." [Pamela Pearson, United States of America]	Noted
51396	5	42			climate is stabilised in place of " climate stabilised" [PRIYANKA LAHA, India]	Phrase deleted
37132	5	45	5	46	Flooding should also be included here [John Sweeney, Ireland]	Obsolete. The sentence is deleted.
53708	5	47	5	5	Rewrite: Extreme weather and climate risks that result in resource depletion, conflict and forced migration are impacting economic development worldwide. Warming of 1.5°C or beyond presents increased challenges to addressing the Sendai Framework for Disaster Risk Reduction 2015-2030. [Patrik Winiger, Netherlands]	Obsolete. The sentence is deleted.
46454	5	48	5	5	it seems weird that the Sendai Framework is mentioned here but not the 2030 Agenda which also faces increased challenges from warming beyond 1.5C [Sven Harmeling, Germany]	Reference to Sendai framework has been removed from the ES
51398	5	49			to address or to be addressed in place of "addressing" [PRIYANKA LAHA, India]	Phrase deleted
7158	5	51	5	51	It should read "marginalization", not "marginality". It is about the processes that marginalize people, not some kind of intrinsic status for which they themselves are responsible. [Petra Tschakert, Australia]	Text deleted
7840	5	51			Poverty is something quantifiable, but what is meant by "marginality"? I suggest replacing or deleting this word. [Petr Zavialov, Russian Federation]	Obsolete. The sentence is deleted.
51400	5	51			amplify in place of ampifies [PRIYANKA LAHA, India]	Phrase deleted

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54112	5	51	5	51	in many global regions does not address inequities across global regions. [Ayman Bel Hassan Cherkaoui, Morocco]	Obsolete. The sentence is deleted.
50444	5	52	5	52	Double space between 'size' and 'urban' [Ina Möller, Sweden]	Obsolete. The sentence is deleted.
53594	5	52	5	52	Not only rural areas and medium to large urban areas, per-urban areas are also under existing risks [AKM SAIFUL ISLAM, Bangladesh]	Text deleted
7436	6	1	6	1	Insert sentence "Increasing the stringency of mitigation policy instruments to make them compatible with an 1.5°C emissions path is very challenging due to multiple barriers (1.4.6)." [Axel Michaelowa, Switzerland]	Noted. The executive summary is completely rewritten.
2510	6	2	6	18	Links, synergies and trade-offs between mitigation, adaptation and sustainable development, as well as the different dimensions of feasibility, are critical to understanding climate resilient development pathways for limiting global warming to 1.5°C. The connections between limiting global warming to 1.5°C and sustainable development are societally and spatially complex and multifaceted. Such connections can be synergistic or involve trade-offs, and are best understood holistically, recognising how in the Anthropocene all aspects of life on Earth are impacted by human decisions. AR5 noted that climate change constitutes a moderate threat to current and a severe threat to future sustainable development. It also concluded that ill-designed responses could offset already achieved gains. Fortunately, important synergies exist between achieving the UN Sustainable Development Goals (SDGs) and climate responses. Positive synergies between mitigation, adaptation and sustainable development exist within the narrative of climate resilient development pathways of both rural areas and cities. Achieving feasibility, that is, the systems-level capacity to achieve a goal or target, requires in the present case the integration of natural system considerations into human system scenarios, the placement of technical transformations into their political, social, and institutional context, and an understanding of the dynamics across spatial, social and temporal scales.{1.4.5; 1.4.6; 1.4.7} [Christophe Deissenberg, Luxembourg]	This bullet has been revised. The comment is not very clear
17928	6	2	6	4	Also diraster risk reduction could be included here. [Andrea TILCHE, Belgium]	Noted. The Executive summary needs to be short, but important issues addressed. It is rewritten following comments, and this comment is included.
24270	6	2	6	18	Reads largely as a repetition of AR5. Any repetition of AR5 can be deleted from the ES and the underlying chapter. [Joeri ROGELJ, Austria]	Noted. This is a framing chapter, and therefore any information from AR5 that is required for framing should be included.
40114	6	2	6	4	This is an overly complicated sentence. Change to: "Understanding the synergies and trade-offs between mitigation, adaptation and sustainable development is critical to understanding climate resilient…." [Ko Barrett, United States of America]	Obsolete. Heading revised
50620	6	2	6	17	The absence of a specfic goal to conserve fresh-water ecosystems under SDGs makes these ecosystems particularly vulnerable to commitments made under Paris. [Jagdish KRISHNASWAMY, India]	No response required.
40378	6	4	6	8	It would be advisable that the conceptual reference on the Anthropocene –and how all aspects of life on Earth are impacted by human decisions– be complemented by a reference to how «civilizing collapses» occur (Cfr. Tainter, Joseph. The Collapse of Complex Societies. Cambridge: Cambridge University Press, 1988). [Erick Pajares, Peru]	Noted - this was not feasible to implement here but could be picked up under AR6
54390	6	5	6	5	add "adaptation feasibility and options" before "… ambitions of sustainable development" ? [Reinhard Mechler, Austria]	Noted and revised
5556	6	6	6	8	too general conclusions about holistic etc are not very informative [Kirsten Halsnaes, Denmark]	Noted. The executive summary is completely rewritten.
7160	6	6	6	8	The concept of the Anthropocene is randomly dropped in here. This sentence is an empty filler, doesn't add anything. If the concept of the A is so important, why is it not more present in the ES (and in the other 4 chapter of the SR). Remove. [Petra Tschakert, Australia]	Noted. Paragraph has been re-written. Relevance to Chapters 4 and 5 demonstrated in Box 1.1.
51402	6	6			complex as well as multifaceted in place of "complex and multifaceted" [PRIYANKA LAHA, India]	Noted
53596	6	6	6	6	These connections are "Complex and multi-faced" as well as "Dynamic" [AKM SAIFUL ISLAM, Bangladesh]	Noted and revised
604	6	8	6	8	Use of the “anthropocene” is fairly contentious and may be leaving a wide open goal for critics until it is FORMALLY recognised by the appropriate body? This is a fundamental oversight! [Timothy Barker, United Kingdom (of Great Britain and Northern Ireland)]	Rejected, the lack of formal recognition by Geologists has not stopped other disciplines from the Anthropocene paradigm with respect to climate change and other human drive global environmental change. In addition a strong majority (34 out of 35) members of the Anthropocene Working Group - the body formed to consider the formalization of the Anthropocene, have recommended that the Anthropocene be formally added to the Geological Time Scale. This is an exceptionally strong consensus.
38730	6	8	6	8	in the Anthropocene is not needed here, in my view. It may create confusion since many readers do not know what this concept contain. [Jan Fuglestvedt, Norway]	Rejected, there will be no point if IPCC reports are limited only to what is already known. To strengthen the global response to anthropogenic warming IPCC needs to review all relevant literature including new novel approaches such a the Anthropocene lens
56164	6	8	6	8	As the Anthropocene is not yet a recognised era with no defined starting point, it is not advisable to use it so matter-of-factly in a report like this. Better to say "in a man-made world", or "since the mid-20th century". [Annika Herbert, Australia]	Rejected, There are other disciplines that have advanced the concept to cover relevance to climate change

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63138	6	1	6	18	While "positive synergies between mitigation, adaptation and sustainable development can be presented" and..."feasible", the more important question is what is the capacity and sufficiency of the preceding to address climate change. If we insist on solving both sustainable development and climate change at the same time we run the risk of solving neither. Given that maintaining climate within critical limits is a prerequite for sustainable developement (pg 39, line 42-44), it would seem the most important goal is to solve the climate problem first in a way that at least does not impede the attainment of SDGs. Thus climate mitigation and adaptation by definition help achieve SDGs, but insisting that climate and sustainable development goals be achieved together is an unrealistic and potentially disasterous strategy. [Greg Rau, United States of America]	Noted. The Executive summary needs to be short, but important issues addressed. It is rewritten following comments, and this comment is included.
52730	6	11	6	13	The reference here is only to positive synergies between mitigation, adaptation and sustainable development. But the report in later chapters also refers to trade-offs in several SDGs. Need to be more precises here to avoid misperception of only positive synergies [Iulain Florin VLADU, Germany]	Accepted.
51010	6	13	5	17	This definition of feasibility should be used consistently throughout the report. There are astronomical numbers for possible CO2 sequestration that emerge from IAMs, described in subsequent chapters. These cannot be considered feasible according to this definition. [Doreen Stabinsky, United States of America]	Noted. We are now more consistent
53598	6	13	6	13	It should be "rural areas, peri-urban and urban areas" instead of "rural areas and cities" [AKM SAIFUL ISLAM, Bangladesh]	Noted. The Executive summary needs to be short, but important issues addressed. It is rewritten following comments, and this comment is included.
7414	6	14	6	17	According to a more pertinent framework of this context we consider that social is inherent indeed political and institutional dimension, so is an epistemologic problem to propose a division where the social aspect is considered aside from the other two. So, our proposition considering all of them as social aspects will be, political, cultural ans institutional dimension (for a deep regard in that framework see Urban sustainability in theory and practice by James, Paul, 2015) [Manuel MORALES, France]	Noted.
2512	6	2	6	26	Climatic variability and climate change may exacerbate poverty, particularly in countries and regions where poverty levels are already high. Modest changes in rainfall and temperature patterns can push marginalized people into poverty, as they lack the means to recover from shocks. Changes in the frequency of extreme events in a 1.5°C warmer world, with the added danger that they can occur in series, may significantly erode the poor people's already limited resources and adaptation and mitigation capacity, and further undermine their economic assets, housing, infrastructure, and social networks.{1.4.2} [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
4710	6	2	6	21	The word "may" provides no useful indication of likelihood. Given IPCC's development of a likeihood lexicon, this finding needs to be redone to avoid meaningless words like "may"--here it would seem that "are likely to" would be the appropriate substitution--or even "are very likely to" given the phrase "where poverty levels are high". In general, the whole chapter and report should be scrubbed of meaningless words such as "may" and "could" that give no sense of likelihood and can be interpreted all the way from a rare chance to extremely high possibillity. [Michael MacCracken, United States of America]	sentence deleted
17930	6	2	6	21	particularly in countries and regions where poverty levels are high: This is unsubstantiated. More developed countries are experiencing a polarisation of wealth, with increasing poverty. Climate change impacts are likely to accelerate this process and push increasing segments of society into poverty. Experiences form Katrina and Puerto Rico seem to suggest that the impacts are substantial and not easily reversible, even if the society at large would have the resources. Whilst the absolute impact on poverty may be less in developed countries than in poor ones, their relative increase of poverty may be similar or even much bigger (as they have more to lose). [Andrea TILCHE, Belgium]	sentence deleted
40116	6	2	6	26	Why specify "particularly in countries…"? There is no mention of this in the referenced section of the chapter [1.4.2] Consider deleting this paragraph in favor of the next, well written paragraph. [Ko Barrett, United States of America]	sentence deleted
45554	6	2			I find that specific issues related to gender are necessary in the summary. Impacts of climate change will increase gender inequality in the next years in a very worry way, but not only because women are already in a disadvantage situation compared to men, also because many of the 'classical women responsibilities' will be strongly affected by climate change, as women are the main responsible for looking for water, taking care of the whole family's nutrition, safeguarding children's health and diet, etc. Children will be highly vulnerable, but girls will be more vulnerable than boys; poor people will be more affected than rich people, but poor women will be more affected than poor men, and so on. This should be reflected in this summary, when possible as an independent point. [Adela M Sánchez-Moreiras, Spain]	Noted
45556	6	2			I find the executive summary quite complete, but further specifications about the social impacts of climate change are necessary in the summary. Impact of climate change on already existing social conflicts, will increase tensions and migrations and will generate even more inequalities through over the world. In my opinion this should be also reflected on this general summary. [Adela M Sánchez-Moreiras, Spain]	Noted. The Executive summary needs to be short, but important issues addressed. It is rewritten following comments, and this comment is included.
45734	6	2	6	26	For greater impact, could cities/regions/countries anticipated to be most adversely affected be named? [Louis Brown, United Kingdom (of Great Britain and Northern Ireland)]	sentence deleted
54392	6	2	6	2	may is rather weak-there is some evidence of climate variability and change, andy IPCC confidence statement possible? See also chapter 3, page 12, 38 [Reinhard Mechler, Austria]	sentence deleted

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4224	6	22	6	26	In this study (Nunes, submitted), participants' asset portfolio (tangible: financial, physical and place-based assets; and intangible assets: human and social assets) were found to determine their ability to adapt to extreme temperatures. Extreme temperatures were found to increase pressure on existing human assets (e.g. health status) with implications to the way older adults responded to extreme temperatures. For example, Nunes (2016) shows gaps in the literature and research concerning the need to mitigate the impacts of climate change on human health, which include a need for better understanding the role assets (tangible: financial, physical, place-based) and intangible: human and social) play in human vulnerability, resilience and adaptation; http://www.tyndall.ac.uk/sites/default/files/publications/twp163.pdf [Ana Raquel Nunes, United Kingdom (of Great Britain and Northern Ireland)]	sentence deleted
8520	6	22	6	22	shock does not seem to be the right word here if you are talking about "modest changes" - rethink [Pauline Midgley, Germany]	sentence deleted
17190	6	23	6	23	Replace "an" with "a". [David Schoeman, Australia]	Noted
53600	6	23	6	23	Extreme events can occur "in a series" or parallel as a "cascading disaster" [AKM SAIFUL ISLAM, Bangladesh]	Obsolete. Text revised
53710	6	23	6	23	Change "an" to "a": … a 1.5°C warmer… [Patrik Winiger, Netherlands]	Obsolete. Text revised
57248	6	23	6	23	What does occurring in a series mean? [Hans Poertner, Germany]	sentence deleted
40630	6	24	6	24	The term 'poor people' is inexact and inapropriate and must be changed here. [Jonny Williams, New Zealand]	Accepted. Text was revised
40632	6	26	6	26	I think that 'societal networks' would be more appropriate here rather than 'social networks'. [Jonny Williams, New Zealand]	Obsolete. Text revised
55932	6	26	6	26	An important aspect of equity is greater exposure of poorer populations to land loss associated with SLR, add "Higher loss of low-lying land areas, associated with higher levels of irreversible sea-level rise at higher temperatures and land loss impacts continuing well beyond 2100, disproportionately impact the poor and vulnerable on low-lying regions. [Pamela Pearson, United States of America]	sentence deleted
63122	6	26	6	39	While the impacts of climate change are socially inequitable, the assumption made here is that mitigation and adaptation can also be inequitable. Yet if there are inequities in mitigation and adaptation strategies or implementation, that needs to be weighed against their benefits of reducing inequitable impacts inherent in climate change that is being mitigated or adapted to. There needs to be a discussion of equity and ethical tradeoffs and balancing. [Greg Rau, United States of America]	sentence deleted
24272	6	28	6	39	This point is not 1.5°C specific, and as such was already made in AR5. I suggest to remove it as it does not provide any new information. [Joeri ROGELJ, Austria]	Taken into account - text altered
33010	6	28	6	37	add to this paragraph i) ethics, equity, justice and human rights; ii) a reference to gender inequities [Tara Shine, Ireland]	Taken into account - not all of these terms attract equal support.
50622	6	28	6	39	Adaptation and mitigation pathways have profound implications for equity and marginalized socio-ecological systems. Certain socio-ecological systems (eg fresh-water aquatic and fishers, semi-arid and pastoralists, estuaries and fisheries) are likely to be highly impacted by adaptation and mitigation pathways [Jagdish KRISHNASWAMY, India]	Editorial
51012	6	28	6	3	Essential point that should also be included in SPM. [Doreen Stabinsky, United States of America]	Noted.
52732	6	28	6	3	The point made in the first sentence about implications of warming at 1.5 degree on poor and vulnerable, ethics and equity is clear. But given the conceptual framing of these concepts, is there a difference in such impacts between 1.5 degree warming and 2 or well below 2 degree warming? [Iulain Florin VLADU, Germany]	Taken into account - text revised.
57250	6	28	6	32	The second sentence should be the headline sentence for this section [Hans Poertner, Germany]	Noted
40634	6	29	6	29	Again, use of the word 'poor' here is ill-advised and subjective. [Jonny Williams, New Zealand]	Noted - text altered.
2514	6	31	6	32	organizing framework for understanding the asymmetry, among present and future generations, in the distributions of opportunities, benefits and costs related to climate change. Three key [Christophe Deissenberg, Luxembourg]	Obsolete. The sentence is deleted.
8550	6	32	6	32	generational equity is part of this but not the only issue of equity as hinted at in the initial sentence but not developed here. Either expand or I suggest inserting "including" before "among present and future generations" [Pauline Midgley, Germany]	Taken into account - main text and ES revised.
33012	6	37	6	39	add especially if framed without consideration of human rights, gender equality and the complex local to national…. [Tara Shine, Ireland]	Rejected - not quite reflective of main text and comments.
51014	6	37	6	39	This is an important point which should also feature more prominently in the discussion on chapter 5 on possible means to address trade-offs between land-use for mitigation and food security. A facile conclusion that more trade or food subsidies is the answer does not reflect the complexity highlighted in this sentence. [Doreen Stabinsky, United States of America]	Noted.
7260	6	41	6	43	I bet you could say the same thing about SRM. [Ben Kravitz, United States of America]	Noted
7438	6	41	6	41	Replace "is associated with an opportunity" by "requires" (opportunity sounds much too optimistic, given the barriers) [Axel Michaelowa, Switzerland]	Noted
33016	6	41	6	52	there are also opportuinities for respecting and protecting human rights and gender equality [Tara Shine, Ireland]	Noted
40118	6	41	6	52	This paragraph makes no case for the "opportunity" particular to limiting global warming to 1.5C. It is a theoretical endorsement for governance. Is there nothing specific to 1.5C to highlight? If not, consider deleting because poverty, ethics and equity are addressed well in the previous paragraph. [Ko Barrett, United States of America]	Noted and revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
45732	6	41	7	22	Could the reader gain greater initial insight into the consistent elements or fundamentals of pathways limiting warming to a 50/50 chance of 1.5 C? E.g. all pathways include non-carbon emission mitigation [Louis Brown, United Kingdom (of Great Britain and Northern Ireland)]	Noted
46368	6	41	6	42	In the statement "… global, national and sub-national governance …." regional may also be added. [Ijaz Ahmad, Pakistan]	Noted and revised
63124	6	41	6	52	Seems to suggest that mitigation and adaptation must be part of the solution to sustinable developement, poverty eradication, ethics and equity goals. Rather than placing this potentially impossible restriction on climate solutions, the more logic thrust should be that climate mitigation and adaptation must not IMPEDE sustinable developement, poverty eradication, ethics and equity goals. If we demand that both climate and social ills be solved together we run the risk of solving neither. [Greg Rau, United States of America]	Note - there was an understanding that effective climate action would be most easily realized when taking into account sustainable development
7440	6	43	6	45	Replace "work … emissions" by "It will be challenging to strengthen mitigation policies to a level where emissions paths become consistent with 1.5°C" [Axel Michaelowa, Switzerland]	Noted and revised
39080	6	43	6	52	The AR5 states economic growth and population growth as main CO2 drivers, yet this is not reflected in these statements A serious consideration of the role of current economic paradigms/approaches in GHG mitigation is important. Otherwise, this SR risks ignoring some basic drivers of modern GHG emission rises. [Lindsey Cook, Germany]	Noted and revised
7416	6	44	6	44	The concept deecoupling the economic growth with the greenhouse gas emissions is a very controvertial assumption where because the introduction of the steady-state economy and the tendency to a post-growth society which will refuse this decoupling; it we should talk about decoupling it will be better to talk about the intergenerational wellbeing and the greenhouse gas emissions and not about the economic growth. What also goes in line with the state that the existing societal patterns (over-consumption) are intrinsically unsustainable (line13, page 10) [Manuel MORALES, France]	Noted
17932	6	44	6	44	Policy experimentation: This is a very good point, but it is not further detailed in the chapter (and only indirectly or implicitly) in the following chapters. Some examples of experimentation in this chapter would be welcome. [Andrea TILCHE, Belgium]	Noted
50624	6	44	6	45	Would be desirable to state that there is also an opportunity to decouple adaptation and mitigation pathways from the most negative impacts on ecosystems and ecosystem services [Jagdish KRISHNASWAMY, India]	Noted and revised
50448	6	45	6	45	Based on a widely shared opinion that continued economic growth in already highly developed economies is a main driver of climate change and the unsustainable exploitation of natural resources (and that alternatives, such as Daly's proposal for a steady state economy, exist), I suggest replacing the word 'economic growth' with 'human development'. This would make the paragraph less biased towards liberal environmentalist/ecomodernist worldviews and more inclusive towards a wider realm of political thought. [Ina Möller, Sweden]	Noted
2372	6	48			I don't think "Congressional Budget Office" is a term that can be globally applied. [Debra Roberts, South Africa]	Accepted.
8552	6	48	6	48	Does any country other than the USA have a Congressional Budget Office? Could be generalised. [Pauline Midgley, Germany]	Accepted. Text revised
39496	6	48	6	48	NGOs has not been previously defined in this chapter, consider to include also its full wording. [Hernan Edgardo Sala, Argentina]	Accepted. Text removed
51016	6	48	6	48	How many countries have "Congressional Budget Offices"? [Doreen Stabinsky, United States of America]	Noted and revised
53380	6	48	6	48	NGOs This term is not usually used to include "community-based organisations or CBOs". There is a lot of peer reviewed literature which indicates that NGOs and CBOs are very different in terms of size, structure, ways of working and role. The WB and regional banks all make this distinction in their guidance, and using this restrictive term risks communicating a lack of professional social science input into the report, and a lack of understanding of civil society organisations in governance. See Barr and Decker 2015 The Formation of Community-Based Organizations: An Analysis of a Quasi-Experiment in Zimbabwe https://doi.org/10.1016/j.worlddev.2014.08.003 [Elizabeth Penelope Davies, United States of America]	Accepted. Text removed
54114	6	48	6	48	Congressional Budget Offices is too specific to a speciac political system. Removing "Congressional" should solve that issue [Ayman Bel Hassan Cherkaoui, Morocco]	Accepted. Text removed
55610	6	48	6	48	Congressional budget offices too specific. Perhaps: "national audit agencies"? [David Cooper, Canada]	Accepted. Text removed
57806	6	48	6	48	Not all countries have a Congress, so the inclusion of 'Congressional Budget Office' as a label seems overaly specific- a more general term should be found here [Kate Dooley, Australia]	Accepted. Text removed
7842	7	1	7	1	This entire paragraph could be ommitted, as it contains general discussion rather than concrete statements appropriate for Executive Summary. [Petr Zavialov, Russian Federation]	Noted. The executive summary is completely rewritten.
17192	7	1	7	1	Needs careful editing for grammar. There is an especially long sentence filled with aspirational jargon to conclude. [David Schoeman, Australia]	Obsolete. Paragraph reworded
37134	7	1	7	1	The paragraph is uncertain as to whether it is about mitigation of adaptation. Suggest reformulation to only refer to mitigation planning. In that context, consideration should also be given to including the role of vested interest groups in the list of barriers. [John Sweeney, Ireland]	Obsolete. Paragraph reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51442	7	1	7	1	this applies equally to limiting temperature to 2°C [Astrid Schulz, Germany]	Noted. The executive summary is completely rewritten.
54470	7	1	7	2	These two paragraphs should be reversed. The first paragraph is focused on the challenge of response; the second on fine-grained understanding of CC. If the latter comes first, the second paragraph can speak to it more clearly at the substantive level by emphasing the TYPE of challenge(s), namely a major ORGANIZATIONAL challenge. This goes beyond cross linkages between sectors but redefining sectors and the nature of the human economies in relation to sustainable development principles and environmental (CC) imperatives resulting from a 1.5 degree target. The whole focus on sectors should be problematized throughout, or at least needs to be more clearly justified. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. The executive summary is completely rewritten.
56838	7	1	7	5	World trade (Globalization) is the key to the transition. Suggest inserting the following text "Barriers which als apply to adaptation include trade, finance …" [Penehuro Fatu Lefale, New Zealand]	Noted. The executive summary is completely rewritten.
2516	7	2	7	2	Barriers which apply to adaptation [Christophe Deissenberg, Luxembourg]	Obsolete. Paragraph reworded
4090	7	2	7	2	Change "global temperature" to "the rise in global temperature". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Paragraph reworded
39082	7	2	7	5	Barriers also include insufficient political will - please include. [Lindsey Cook, Germany]	Noted. The executive summary is completely rewritten.
40120	7	2	7	4	The inclusion of the sentence about adaptation, finance, etc. dilutes the key message about the continuum between mitigation planning and implementation. If there is a similar message for adaptation, I suggest splitting the discussion into a separate paragraph. Alternatively, take "mitigation" out of the topic sentence and bolster adaptation references in the paragraph. [Ko Barrett, United States of America]	Obsolete. Paragraph reworded
40908	7	3	7	3	add behavior - ….public attitudes and behaviour,... [Neelam Singh, United States of America]	Noted. The executive summary is completely rewritten.
8554	7	4	7	4	social values, and practices should surely be "social values and practices"; delete the comma [Pauline Midgley, Germany]	Obsolete. Paragraph reworded
13018	7	5	7	5	Delete the text ", including highly fossil-fuel-invested and emerging economies,". [Eleni Kaditi, Austria]	Noted. The executive summary is completely rewritten.
8556	7	6	7	6	in a limiting should be "in limiting" [Pauline Midgley, Germany]	Obsolete. Paragraph reworded
8558	7	6	7	1	This is a very complicated, condensed sentence and the phrase "with the support of national government " seems to be floating without clear purpose. I suggest trying to disentangle all these thoughts into a couple of sentences.Alternatively turn it around, thus: "The following are key to implementing identified response options: ....." [Pauline Midgley, Germany]	Noted. The executive summary is completely rewritten.
38726	7	6	7	1	Thisi is a very long sentence ("Incorporating…"). May be shortened or split. [Jan Fuglestvedt, Norway]	Noted. The executive summary is completely rewritten.
50450	7	6	7	6	Extra 'a' in sentence (before 'limiting'), and consider adding 'rise' after 'global temperature' [Ina Möller, Sweden]	Obsolete. Paragraph reworded
51404	7	6			in limiting in place of "in a limiting" [PRIYANKA LAHA, India]	Noted.
56166	7	6	7	6	Remove "a", so that it reads: "consideration in limiting…". [Annika Herbert, Australia]	Obsolete. Paragraph reworded
13412	7	1	7	1	Omit 'identified'. ..implementing response option. [Sergio Aquino, Canada]	Obsolete. Paragraph reworded
9656	7	12	7	21	A diverse set of state-of-the-art assessment methodologies that ignore to take account of cost and benefits are not usefull for decision analysis. Arguing that costs and benefits differ across time and spacial scales is not a good reason for not quantifying and reporting them. Indeed in real life decions making very often involves problems with benefits and costs that occur at different time and spacial scales. [Mustafa BABIKER, Sudan]	Noted. More framing was included as well as discussion of literature limitations
10472	7	12	7	21	The key message here is 'a diverse set of state of art assessment methodologies provides enhanced capacity to understand and specify potential conditions of a 1.5 c warmer world. Cost-benefit analyses are only one of the methodologies. But there, it is presented as the only one. Should use 'for example', and also mention some other methodologies to be consistent with the 'diverse set'. [Hong Yang, Switzerland]	Noted. Text has been improved.
33574	7	12	7	45	The box 2.1 indicate a high confidence in the increase of different risk. In the last bullet of this page indicate again the increase of most intense cyclones when compared 1.5 vs 2.0. As in the case of the previous comment, this conclusion have low support from the literature related with differences between 1.5 and 2.0, considering the very low number of studies. It should be noted, that box 2.1 indicate a high confidence for different risk, including storms. [Abel Centella, Cuba]	Noted. The executive summary is completely rewritten.
2518	7	14	7	14	from different sources, as well as educating and building awareness at various levels may provide for [Christophe Deissenberg, Luxembourg]	Noted. Reworded
13414	7	14	7	14	missing comma: at various levels, could provide [Sergio Aquino, Canada]	Noted. Reworded
13416	7	15	7	15	no comma: warming and the associated uncertainties [Sergio Aquino, Canada]	Noted. Reworded
454	7	16	7	16	data are not data is [David Reay, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Text removed
2374	7	16			reliable climate data are [Debra Roberts, South Africa]	Obsolete. Text removed
4712	7	16	7	16	Change to "data are" [Michael MacCracken, United States of America]	Obsolete. Text removed
40636	7	16	7	16	Consider changing 'low-income' to 'developing'? [Jonny Williams, New Zealand]	Obsolete. Text removed
56840	7	16	7	2	The word "low-income" does not capture the essence of this para. Suggest deleting it and replace with the following "Reliable climate data is insufficient in many areas, ….especially in developing countries, small islands and Least developed countries in particular.." [Penehuro Fatu Lefale, New Zealand]	Noted and revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5558	7	17	7	18	too specific reference to instrument data and indigenous knowledge, the topic is much braoder [Kirsten Halsnaes, Denmark]	Noted and revised
9548	7	17			Very glad to see the acknowledgement of Indigenous knowledge (IK) here as well as further on in the report. Indeed, Indigenous knowledge systems MUST be considered alongside western knowledge systems and understood as equally important, informative, and valuable. The Inuit Circumpolar Council advocates for the utilization of Indigenous knowledge rather than the integration or incorporation of this knowledge into the western system as these latter terms imply that IK is attempted to be fitted and molded into the scientific knowledge form (i.e. something that IK is not), instead of it being recognized and applied on equal footing. Furthermore, it is important to differentiate between IK and local knowledge/observations. They are not synonomous. IK went through a long process of validation, and is therefore more akin (quality-wise) to science. Lastly, on the topic of IK, as the report indicates it is crucial to include IK in assessments (eg. IPCC reports) and ideally this would be done in a co-production of knowledge approach. That is, in a way that recognizes IK (and particularly IK holders) right from the start, and works with them throughout the process. It is not appropriate to try and fit IK into assessments or research later on as the worst case scenario is that IK may be completely taken out of context, and the knowledge may be used in a way it wasn't intended for. Unfortunately, this has been a common approach to date and therefore in this report where the importance of IK is noted, it is equally important to accompany this with an explanation of the above points so that researchers and acadmics aren't led to believe that they should just add in IK to their work as an afterthought. [Joanna Petrasek MacDonald, Canada]	Noted
50536	7	17	7	18	This seems to miss out other sources such as paleo data in including only instrument data and indigenous and local knowledge and experience. [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Noted
53382	7	17	7	19	Indigenous and local knowledge is referred to only with respect to manifestations and impacts of climate change. No reference is made to this knowledge as part of any solution. Growing evidence that where Indigenous people and local communities have a long standing relationship with their forests and lands, there is better forest cover and lower deforestation than under other forest management regime. Allen Blackman et al 2017 Titling indigenous communities protects forests in the Peruvian Amazon https://doi.org/10.1073/pnas.1603290114 Also Steves, Winterbottom et al 2017. WRI. https://www.wri.org/sites/default/files/securingrights-full-report-english.pdf [Elizabeth Penelope Davies, United States of America]	Noted
63126	7	17	7	21	Suggested wording: "Instrument data along with indigenous and local knowledge and experience are needed for verifying climate models and for evaluating climate change scenarios for 1.5°C warming. Cost benefit analyses are essential for assessing a 1.5°C world. However, costs and benefits can be spatially and temporally decoupled, and need to account for tranregional feedback loops and impacts.{1.5} [Greg Rau, United States of America]	Obsolete. Text removed
17934	7	18	7	21	The critical assessment of cost-benefit analysis and its limitations in a context of climate change is welcome, but it is unclear why the emphasis on this technique (which is one decision-making approach, for both business and policy, amongst others). See for instance the European Commission's "Better Regulation Toolbox": http://ec.europa.eu/smart-regulation/guidelines/docs/br_toolbox_en.pdf). The reason of the focus on cost-benefit analysis should be explained. [Andrea TILCHE, Belgium]	Noted
36940	7	18	7	21	The challenges of CBA is not directly related to the analysis for the 1.5? target in this context. CBA is not a perfect tool for sure, but it is a useful tool, providing valuable information/implication. This statement seems biased and not required for the SR1.5. Delete or revise. [Keigo Akimoto, Japan]	Noted and revised
52734	7	19	7	19	In addition to the sceintific argument for 1.5 degree, this part of the report refers to cost and benefits that are associated with it. The reference here is rather superficial and does not help to understand whether there is also an economic argument for 1.5 degree warming in addition to the scientific argument or not. It might be overly ambitious to expect a kind of full fledged Stern review report, yet the notion of the scales of costs and benefits and assiciated uncertainties would be helpful. The SPM 10/35-43 could be used here [Iulain Florin VLADU, Germany]	Noted and revised
2520	7	21	7	21	completely capture unpredictable feedback loops and impacts for other regions.{1.5} [Christophe Deissenberg, Luxembourg]	Obsolete. Text removed
51406	7	37			arise in that both climate change and any potential [PRIYANKA LAHA, India]	Noted and revised
51408	7	37			arise in climate change and in any potential in plcae of "arise in that both climate change and any potential" [PRIYANKA LAHA, India]	Noted and revised
51410	7	4			systematical approach in place of " systems approach" [PRIYANKA LAHA, India]	Noted and revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
510	8	1	6	1	The use of the term "Anthropocene" in this chapter is problematic. This chapter uses the unmodified term "Anthropocene" to refer to both a proposed geological epoch and some vaguer conceptual framework. While it defines it as the former, the duality of use renders most of the relevant discussion next to unintelligible. For example, it makes no sense to talk about the "intent behind the Anthropocene" if "Anthropocene" is defined (as I understand it to be) as a geological epoch. Geological epochs do not have intents. This does make sense if the clause is meant to refer to the "intent behind defining the Anthropocene" or the "intent behind the Anthropocene framing". Similarly, it makes sense to talk about being "in the Anthropocene" but not "under the Anthropocene", although it might make sense to take about being "under the Anthropocene framing." Similar problems occur throughout the chapter. Please use "Anthropocene framing" or "Anthropocene concept", or a similar phrase, when talking about the conceptual framework and retain "Anthropocene" as a noun for the geological epoch. Alternatively (though not preferred from my perspective), you could define "Anthropocene" as a framing, in which case you would need to use "Anthropocene epoch" when referring to the temporal/geological definition. [Robert Koppu, United States of America]	Rejected. The discussion of the Anthropocene has been edited, and is now commensurate with the profile of this term in the literature.
7068	8	1			World --> world [Dmitry L. Musolin, Russian Federation]	accepted- text revised
14094	8	1			This section has been significantly improved since FOD, especially regarding the ethical implications of mitigation and other issues covered on the assessment [Meimalin Moreno, Venezuela]	noted
51222	8	4	8	7	In the statement "average global surface temperature" does not mention the time period used for working out the average, whereas "monthly average temperature" indicates one month time period for working out the average. Wthin the same statement, it is suggested that time period for calculation of "average global surface temperature" may also be specified. [Muhammad Latif, Pakistan]	Obsolete - since monthly temp now removed.
38732	8	5	8	5	You may consider writing the same number as was used by AR5 instead of approx 1 deg C. [Jan Fuglestvedt, Norway]	Accepted - text revised
39084	8	5	8	6	Please check reference to 1C - the IPCC 2013 was 0.85C - see quote from SPM AR5 Physical Science "The globally averaged combined land and ocean surface temperature data as calculated by a linear trend, show a warming of 0.85 [0.65 to 1.06] °C3 , over the period 1880 to 2012, when multiple independently produced datasets exist. The total increase between the average of the 1850–1900 period and the 2003–2012 period is 0.78 [0.72 to 0.85] °C, based on the single longest dataset available 4 (see Figure SPM.1). {2.4}" [Lindsey Cook, Germany]	Accepted - text revised
50538	8	5	8	5	It looks like there is a mixing of precisions going on here regarding the warming to date relative to pre-industrial. The AR5 headline figure was 0.87 which is approximately 1C (to the nearest half degree) but not as close to 1C as the number given at page 4 line 47 (which is calculated as 0.87+0.13). Of course the 0.87 and 1.0 numbers refer to different things but don't equate two different things at two different precisions or it will just lead to confusion. [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Accepted this text revised
4092	8	6	8	6	Change 1.4 deg C to 1.5 deg C. Evidence for the 1.5 deg C limit having been briefly reached or breached can be found in a peer-reviewed publication that is not cited in the Special Report. The paper is doi: 10.1002/qj.2949. See in particular the final sentence of the abstract of the paper. Consistent with this paper, Figure 1.2 of the Special Report also shows the 1.5 deg C level as having been breached - the Berkely Earth Surface Temperature crosses the 1.5 deg C line in what looks like one month, which I assume to be February 2016. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete
4094	8	7	8	7	Change "observed" to "estimated from observations" or "analysed from observations". As noted in comment (3) above, the global-mean surface temperature is not observed. Temperatures are observed locally, and the global mean has to be estmated/analysed based on a gappy observational record (which may include observations of variables other than surface air temperature and sea-surface temperature in the case of reanalyses). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete
4718	8	7	8	8	This needs to say not only are there observable changes at this point, but there are commitments to significant further impacts as equilibrium is reached. This applies particularly for sea level rise, but I'd suggest that this is also the case, for example, for a number of ecological forests and land cover where the present established cover is highly stressed (e.g., dead trees on the western mountains of North America; permafrost starting to thaw) and the new equilibrium conditions have simply not been reached. I think it would also be appropriate to be indicating that observed impacts to date indicate a significant increase in the incidence of what in the past have been considered quite rare events (e.g., the Hansen et al. shifting bell curves of summertime NH land temperature anomalies are starting to show five-sigma events based on mid-20th century statistics, and conditions that used to have a likelihood of 1 in a thousand are now occurring about 10% of the time. The phrasing here, "has generated observable impacts world-wide," is just too mild a presentation of the situation and needs to be more fully explained. [Michael MacCracken, United States of America]	Taken into account - this text revised.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4720	8	8	8	8	It is not just the "risk" that is the concern (in both uses on this line), which really is saying the likelihood is increasing. As the people experiencing these increased impacts would note, great damage is being done. Saying they are under greater risk is not at all speaking to the misery that is actually being experienced by an increasing fraction of the public. As an analogy to get this point across, it is not just that people are a bit further out on the plank--quite a number have already been pushed off the plank--"risk" is just not what is moving people, it is the greater number who are being flooded out and more. [Michael MacCracken, United States of America]	Accepted, text was revised
4722	8	8	8	11	This paragraph provides another opportunity to indicate the significance of choosing 1.5 C, versus choosing some other number. Basically, how "wonderful" of the negotiators to be saying to the increased numbers of those who are already being impacted by the changes in climate that have occurred so far that their objective is to take action that will mean things are forever going to be significantly worse than the conditions that are already prompting them to start to take action. So, for those living in the Arctic and dependent on it being frozen, we are going to try to take action that will only allow a good bit more change--sort of like a fire chief telling people trapped in a building and suffering already from the impacts of smoke that they should feel good because they are going to try to take actions to make sure the whole building does not burn down quite as quickly as the situation indicates is likely. The phrasing here is just all very abstract and academic--the readers need to be more forthrightly told the situation and about the limited commitments that have been made to date to deal with it---it is technologically possible to do much more than is being done and what is lacking is the political spine to do it as the actual projected costs of doing it are really quite modest. [Michael MacCracken, United States of America]	Accepted. the section has been significantly reviewed
54116	8	9	8	9	It is this rising risk that underpins the ambition of the Paris COP21 agreement. The Paris COP21 agreement is too heavy. In the context of this report, the Paris Agreement is enough. [Ayman Bel Hassan Cherkaoui, Morocco]	accepted- text revised
54118	8	9	8	9	This sentence implies that the Paris Agreement only has a mitigation ambition. It doesn't. There are three objectives set in the article 2. [Ayman Bel Hassan Cherkaoui, Morocco]	Accepted. the section has been significantly reviewed
2522	8	13	8	13	The present report assesses the enabling conditions and challenges to limiting the rise in global [Christophe Deissenberg, Luxembourg]	accepted- text revised
4724	8	13	8	15	This is the first indication that the report will describe the impacts of a 1.5 C world--that is not mentioned in the Executive Summary. And there is no mention that the description will provide an indication of what this choice means as compared to making other choices (which would seem to be quite plausible in the future--why should the world forever be limited to the choice made at Paris and not be provided information about how that choice compares to making other choices?). [Michael MacCracken, United States of America]	Taken into account -impacts are now on the ES but this report is focused on the Paris Agreement of limiting temperature well below 2 degrees
45738	8	13	8	13	Consider 'The report' instead of 'The present report'. It could be interpreted that 'the present report' is suggesting that that the report is subject to change. [Louis Brown, United Kingdom (of Great Britain and Northern Ireland)]	accepted- text revised
4726	8	15	8	18	Omitted from this list is a discussion and evaluation of making the 1.5 C choice itself, in and of as a choice with respect to climate, and with no consideration of how this choice as compared to other choices might fit in wth the Sustainable Development effort. Basically, this report seems to be accepting that the temperature objectives of the Paris Accord are carved in stone and cannot be questioned or changed--I think this is just not what the scientific community should be doing, somehow cowed into silence. [Michael MacCracken, United States of America]	Rejected. A discussion of the temperature objectives of the Paris Accord itself would be beyond the scope of this report, although it does discuss their implications.
52736	8	15	8	18	It seems to me that the notion of the equity that you are referring to refers to the Paris Agreement and not the UNFCCC (meaning the Convention) as there is no explicit reference in the Convention as such to equity. [Iulain Florin VLADU, Germany]	Taken into account - UNFCCC does mention equity (Art 3.1) - though it is true the PA expands and the text now centres on PA
2524	8	16	8	16	achieving sustainable development and eradicating poverty while addressing the long–standing ethical [Christophe Deissenberg, Luxembourg]	Accepted - text revised
7072	8	18			Fig. 1: 2005-2015 as written on the top OR 2006–2015 as in the legend? [Dmitry L. Musolin, Russian Federation]	accepted- text revised
13020	8	18	8	18	Reference to the principle of common-but-differentiated-responsibilities (CBDR) and historical responsibilities (HR) of the UN Climate Convention should be made. [Eleni Kaditi, Austria]	Rejected - CBDR already underpins much of this text.
33018	8	18	8	18	replace notion of equity with principle of equity [Tara Shine, Ireland]	Accepted - text revised
53726	8	18	8	2	In my opinion easier to read if we reposition "while": Economic growth has been accompanied by increased life expectancy, educational attainment and income, while many regions are characterised by severe inequity in income distribution that amplifies vulnerability to climate change. [Patrik Winiger, Netherlands]	accepted- text revised
57808	8	18	8	18	The UNFCCC contains what is commonly referred to in International Environmental Law as a a principle of equity, not a notion. This should be changed to say principle. The concept of equity in international environmental law is rooted in recognition of differentiated obligations among states, depending on their relative contribution to the problem and differing capacities to act, a concept which is not well reflected in this chapter. See: Phillipe Sands, Principles of International Environmental Law (Second edition, Cambridge University Press), who on page 152 notes that equity is a 'general principle directly applicable as law'. Hence to refer to equity as a 'notion' disregards this meaning. [Kate Dooley, Australia]	Accepted - reference now to 'principle'.
38734	8	25	8	25	You may delete the word "material" since there are other forms of consumptions that matters as well. [Jan Fuglestvedt, Norway]	Taken into account - text altered.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39086	8	25	8	27	Very important point, thank you. [Lindsey Cook, Germany]	noted
2526	8	27	8	27	gas (GHG) emissions (Fleurbaey et al., 2014b). The profound global–scale changes currently [Christophe Deissenberg, Luxembourg]	accepted- text revised
53926	8	27	8	29	Based on the problematic normative assumptions underlying the Anthropocene term (cf. Hamilton et al. 2015), I would like to question the repeated use of this label throughout the first part of the introductory chapter. It is not clear to me why this particular concept should be used to circumscribe the planetary changes we are observing, and does it not play any significant role in the subsequent sections and chapters. (In fact, the term is not mentioned once in chapters 2,3 & 4, or the SPM). It seems to me that the term not wide-spread enough amongst policy makers or the scientific community to warrant such importance, considering the substantial introduction needed and the lack of further reference. The term is just as normatively charged as its explicitly normative synonym - the 'capitalocene' (Moore 2017). Considering that the report aims to 'incorporate knowledge from different sources', it should make clear why it chooses this particular term over other conceptualisations of human-nature interactions. It should also consider very carefully which concepts (and whose concepts) it promotes, considering that endorsement by the IPCC implies significant political legitimation. [Ina Möller, Sweden]	Rejected - IPCC conduct a balance assessment of literature and there is bourgeoning literature on climate and the Anthropocene that needed to be considered. The comment does not point to any other climate change related framing that has been overlooked for e.g. the report covers SDGs climate resilient pathways. The Anthropocene term appears in Chapter 1 because this is a framing chapter that points to available framing approaches that could be used. The Anthropocene lens could be a useful boundary concept, linking disciplinary perspectives and understandings of the drivers and consequences of planetary change. It places climate change in the broader context of planetary change, as well as in a longer time perspective. Both are essential in considering responses to the challenges of the Paris accord.
45458	8	28	8	28	Personally not excited by introducing the notion of the anthropocene in this chapter. The word doesn't appear once in chapters 2-5 (checked). So clearly it hasn't done much framing. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account - It is fair to say that the Anthropocene concept has not been adopted by what might be called the "mainstream climate science" community, although it should be. It is a very important bounding concept for placing contemporary climate change in a broader Earth System perspective.
4096	8	29	8	33	Many would regard sea level rise as a component of climate change, not a separate global-scale imprint of humans. Some would say the same of ocean acidification, and some aspects of the changes in phosphorus and nitrogen cycles. This even applies to this Special Report, which on page 1-35 lines 20-22 refers to impacts of climate change being "consequences not only of rising temperatures, sea level and ocean acidification, but also ...". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. the section has been significantly reviewed
50242	8	29	8	33	Essential elements missing: ocean warming; ice melt? Change in water cycle? [Karina VON SCHUCKMANN, France]	Accepted. the section has been significantly reviewed
50626	8	29	8	33	Include regulation and abstraction from rivers and loss of wetlands which is one of the most pervasive global change phenomena [Jagdish KRISHNASWAMY, India]	Accepted. the section has been significantly reviewed
53728	8	29	8	33	Suggest to remove entire sentence. [Patrik Winiger, Netherlands]	accepted- text revised
8560	8	3	8	33	As written this says that only sea level rise is characteristic of the Anthropocene. Is that what is meant or should the phrase "characteristic of the Anthropocene" be qualifying "numerous other global-scale human imprints "? [Pauline Midgley, Germany]	Noted the text has been significantly reviewed
39942	8	31	8	31	Too long and complex sentence. Suggestion: simplify the following sentence as follows. Current sentence: "Climate change is one among numerous other global-scale human imprints such as large scale conversion of Earth's land surface from forest and grassland to croplands, grazing lands and cities; significant biodiversity loss, changes in the global phosphorus and nitrogen cycles; ocean acidification; and sea level rise characteristic of the Anthropocene". Change to this simplified sentence : "Climate change is one among numerous other global-scale human imprints such as large scale conversion of Earth's land surface uses, significant biodiversity loss, changes in the global phosphorus and nitrogen cycles; ocean acidification; and sea level rise characteristic of the Anthropocene" [JOFRE CARNICER, Spain]	Accepted. the section has been significantly reviewed
2528	8	35	8	43	The present report provides an assessment of current knowledge on the extent and the interlinkages of the global environmental, economic, financial, social, and technical conditions relating to a 1.5°C warming world. Climate change, and the responses it may elicit, raise complex ethics questions as they may exacerbate poverty and inequality, globally and locally, and carry implications for inter–generational justice. An interdisciplinary research and reflection, a systems approach that considers not only social inequalities but also the unequal distribution of the exposure to risks and of the ability to respond to climate change, are unescapable. (Bäckstrand et al., 2017; Dryzek 2016; Lövbrand et al., 2017; Pattberg and Zelli, 2016). [Christophe Deissenberg, Luxembourg]	accepted- text revised
4728	8	35	8	42	Good to hear the report will be doing this, but this is really the first indication of this--this is not indicated in the Executive Summary of this chapter. [Michael MacCracken, United States of America]	Accepted. Ethical and equity considerations are now highlighted in the ES.
40380	8	35	8	42	This chapter should include a paragraph to develop more precise references on the concepts of «inter–generational justice», «intergenerational equity», «right to the future», «rights of future generations» and «interspecies justice» (which includes the rights of non-human species). [Erick Pajares, Peru]	Taken into account - some but not all of these concepts now further expanded.
45736	8	35	8	52	The fourth paragraph appears to be repetitive of the second paragraph (from lines 13-23). Consider revising. [Louis Brown, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, the section has been reviewed extensively
680	8	37	8	39	Complex ethics questions arise in that both climate change and any potential responses to it that exacerbate poverty and inequality, globally and locally, and carry implications for inter–generational justice. The last 'and' should be deleted. [Robert Shapiro, United States of America]	Taken into account - text revised
2376	8	37	8	39	This sentence seems incomplete [Debra Roberts, South Africa]	Accepted - text revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3172	8	37	8	37	I think the word "ethics" should be "ethical" [Vassilis Daioglou, Netherlands]	Noted - text altered
8522	8	37	8	39	This sentence did not make sense in the FOD and is still not clear. The second "that" is problematic. Do you mean: "both climate change and any potential responses to it may exacerbate poverty and inequality" ? [Pauline Midgley, Germany]	Taken into account - text refined.
37136	8	37	8	39	Bad sentence construction. Omit 'and..' after locally,..' [John Sweeney, Ireland]	Taken into account - text revised
53730	8	37	8	37	Suggest to rewrite: Complex ethic questions arise for both climate change and any potential responses to it, that exacerbate poverty and inequality - globally and locally - and carry implications for inter–generational justice. [Patrik Winiger, Netherlands]	Accepted - text revised
56168	8	38	8	38	Rephrase. [Annika Herbert, Australia]	Accepted - text revised
682	8	39	8	41	This set of conditions demands interdisciplinary research and reflection, pointing to a systems approach that takes into account social inequalities and the unequal distribution of both, risks in exposure, and ability to respond, to climate change. no comma between 'both' and 'risks' [Robert Shapiro, United States of America]	Taken into account - text altered.
37138	8	39	8	42	Omit comma after 'both' [John Sweeney, Ireland]	Taken into account - text altered.
8524	8	4	8	41	as rewritten, this sentence is not clear due to the multiple commas; do you mean "the unequal distribution of both risks in exposure and the ability to respond to climate change"? [Pauline Midgley, Germany]	Taken into account - text altered.
38736	8	4	8	4	Re "systems approach": If you mean integrated or holistic, perhaps that could be added? [Jan Fuglestvedt, Norway]	Noted - the text has been revised
53732	8	41	8	41	Suggest to rewrite: ...of risks in exposure, and ability… [Patrik Winiger, Netherlands]	accepted- text revised
54120	8	41	8	41	I think the comma after "both" should be removed [Ayman Bel Hassan Cherkaoui, Morocco]	accepted- text revised
39088	8	47	8	48	Based on the above statement, it is important to include 'economic' alongside 'societal and technological transformations' [Lindsey Cook, Germany]	Accepted, the section has been reviewed extensively
45460	8	47	8	47	The report is about impacts as well as limiting to 1.5 - work in. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, the section has been reviewed extensively
50628	8	47	8	51	Any linkages or knowledge from ongoing IPBES? [Jagdish KRISHNASWAMY, India]	Noted.
2530	8	49	8	49	implementation strategies, to understand the enabling conditions required for these transformations. [Christophe Deissenberg, Luxembourg]	Accepted - text revised
2532	8	5	8	5	These pathways and strategies are framed operationally within the context of the United [Christophe Deissenberg, Luxembourg]	Accepted - text revised
9658	8	5	8	51	SDGs are relevant but "the Anthropocene" is not clear that it is part of the terms of reference for the assessment of 1.5c. [Mustafa BABIKER, Sudan]	Accepted, the section has been reviewed extensively
63128	8	52	8	52	Should read: "The enabling conditions required for limiting warming to 1.5°C..." [Greg Rau, United States of America]	Accepted - text revised
8562	8	53	8	53	Shouldn't "conditions required for achieving the 1.5°C warming " be rather "conditions required for achieving the limitation to 1.5°C warming "? [Pauline Midgley, Germany]	Noted and revised
51412	9	4			requirements of in place of "requirements for" [PRIYANKA LAHA, India]	Accepted - text has been revised
63130	9	4	9	5	Should read: "Some pathways are more consistent than others in advancing sustainable development (see Chapter 5 of this report)." [Greg Rau, United States of America]	Accepted - text revised
9660	9	7	9	17	Three types of impacts are present: impacts occuring after achieving 1.5c, impacts avoided by limiting temperature to 1.5c, and impacs associated with the responses to achieve 1.5c.The two later impacts though appear principally important are largely missing from the narrative of the chapter. [Mustafa BABIKER, Sudan]	Accepted - covered but details left to chapter 3
31808	9	1	9	11	AR5 is quite equivocal about the evidence for trends in some of these indicators and this should be reflected here [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted - the text has been significantly reviewed
50244	9	1	9	12	ocean acidification needs to be mentioned here as well [Karina VON SCHUCKMANN, France]	Obsolete
51414	9	1			increase in place of "increases" [PRIYANKA LAHA, India]	Accepted - text has been revised
53604	9	1	9	1	The idea of organizing global conferences for SDG is highly appreciable. However, it will be useful to indicate the modalities of organizing this conference such as "Who will organize, will it be part of COP meetings, frequency of the conference" etc. [AKM SAIFUL ISLAM, Bangladesh]	Accepted - but too much detail that fall outside this chapter
61714	9	1	9	1	Increases in extreme weather events, droughts, floods…. are already affecting…. Please check very carefully this statement. It implies that there is already a discernable increase in floods and droughts, which contradicts the conclusions of SREX and AR5, WGI reports. The whole sentence lacks adequate references supporting the statement that economic development worldwide is already affected. I suggest to remove this sentence. Similarly, the first sentence of the paragraph (line 7) refers to "profound alterations to human and natural systems" due to temperature rise. These words were not those of the AR5, WGII report. If you check the SPM of WGII, AR5 report, you will see different conclusions, not supporting the statement of "profound alterations". Please ensure coherency across reports. [Valérie Masson-Delmotte, France]	Accepted. the section has been significantly reviewed and revised; reworked text to reflect WGII AR5 text and ongoing literature

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4730	9	13	9	16	It seems to me that these sentences need to mention the consequences of extreme precipitation and tropical cyclones, etc.--so give a sense of what has been imposing the impacts. The most powerful tropical cyclone on record hitting the Phillipines, flooding rains in Pakistan and France, wildfires, and more--so mention not just food security as the cause of the impact, but the other types of situations affecting the regions indicated. Perhaps mention what have been the causes of increasing insurance losses, etc. [Michael MacCracken, United States of America]	Obsolete
2534	9	14	9	14	have already experienced a decline in food security, linked in turn to rising migration and poverty. [Christophe Deissenberg, Luxembourg]	accepted- text revised
51416	9	14			have already been experiencing in place of " have already experienced" [PRIYANKA LAHA, India]	Accepted - text has been revised
326	9	17	9	18	It is difficult to understand the population figure of Figure 1.1. Please add some explainations. [Zong-Ci Zhao, China]	Noted - we have tried to provide an explanation of the population figure in the technical appendix, but due to constraints on the length of the chapter do not expand further in the main text
7006	9	17	19	19	Figure 1.1. showing the warming in the land in most strongly warming seasons. India and China are seen as the regions that get the most heat in Fig. 1.1. However, we know that the northern latitute's heating is more than the other regions as shown in Figure 1.3. Figure 1.1 contradicts with Figure 1.3. [Serhat Sensoy, Turkey]	Obsolete. Figured revised and clarified
14096	9	17	18		The grays used on the SDG Global index score scale don't allow to distinguish between the upper levels of the scale (70 to 90), please increase the contrast [Meimalin Moreno, Venezuela]	Obsolete. Figured revised and clarified
24274	9	17	9	27	This figure is conceptually confusing, because it does not make clear that the UNFCCC long-term temperature goal of 1.5°C is set at a global level. The figure could also be accused of showing cherry-picked data, by focussing on the warmest season only. I understand there is a reasoning behind this, but the relationship between the topic of this report (1.5°C of global warming) and the levels shown in this figure can be clarified. [Joeri ROGELJ, Austria]	Taken into account - We have tried to be clearer about the distinction between the temperature data shown in the figure and what 1.5 means in context of the report
45700	9	17			Caption for Figure 1.1 states that GISTEMP dataset was used, for Figure 1.3 HadCRUT4 seems to be used; The choice of different datasets needs clarification [Astrid Kiendler-Scharr, Germany]	Taken into account - text revised, Cowtan and Way dataset is now used in both figure 1.1 and 1.3
45702	9	17			Figure 1.1. refers to Figure 1.3 which refers to Figure 1.2. The order of figures should be reconsidered. [Astrid Kiendler-Scharr, Germany]	Rejected - we choose to keep the figure ordering to reflect the evolution of the concepts in the chapter
45704	9	17			check first line of figure caption: "……warming in over the over 2006-2015….." [Astrid Kiendler-Scharr, Germany]	Accepted
50630	9	17	9	18	Figure 1.1, the overlay of SDG index and warming is not clear, especially for strongly warming nations, could use hatching for one of them instead of shades? [Jagdish KRISHNASWAMY, India]	Rejected - trial versions with hatching didn't seem to improve clarity, we have tried to improve readability with a revised greyscale for the SDG index
51556	9	17	9	26	Don't use white to indicate lack of (or missing) data, it's visually confusing since it implies a very low SDG score (granted, the particular countries in white would have very low SDG scores if the data were available). It's already confusing having two different colour schemes on this heat map, having white on the map further confuses the issues. [Jason Donev, Canada]	Accepted - the missing data indicator has been changed
53602	9	17	9	19	Caption of the Figure 1.1 presented the changes of warming for the period "2005-2015" but caption of the Figure showed it as "2006-2015". [AKM SAIFUL ISLAM, Bangladesh]	Accepted - the 2005-2015 is now correctly referenced in the figure and text
55934	9	17	9	18	Seems a potentially complex (difficult to understand) choice for the very first first figure in the SR, as visually implies no high latitude warming though this is the most extreme. Suggest an earlier or paired figure showing present-day observed warming paired with this figure of population-based experienced warming, which will make the purpose of this figure more easily understood. [Pamela Pearson, United States of America]	Noted - this figure has been kept though simplified in some respects.
325	9	18	9	26	most strongly warming season? Please give the real years or seasons. [Zong-Ci Zhao, China]	Taken into account - We provide a map of seasons of most warming in the technical appendix
2536	9	18	9	27	The readability of Figure 1.1. could be improved – what is e.g. the SDG index for India? The caption is very difficult to understand for a non-specialist and should be revised and preferably simplified (use the Technical Annex to a maximum). Here my suggestion. Figure 1.1: The colours indicate (for the season where warming is maximal – this season can vary from location to location)) the observed warming due to human activity over 2006–2015 relative to 1850–1900, based on the GISTEMP dataset (Hansen et al., 2010b). The density of dots indicates the population (2010) in a 1°x1° grid box. The warming trends are calculated in an identical way to Figure 1.3. The underlay shows the SDG Global Index Score ranks at the country level. It indicates performance across sustainable development goals. White indicates missing data. The histogram shows the number of individual affected by different levels of warming. See the Technical Annex to this chapter for details. [Christophe Deissenberg, Luxembourg]	Accepted - we have tried to improve the visual effect of this figure and have revised the caption
44690	9	18	9	26	this is a very useful and clear diagram. Could be improved by stating what may seem obvious, but probably is not to many, regarding the SDG Global Index score - i.e. higher is better. [Penny Urquhart, South Africa]	Taken into account - We provide an explanation in the technical appendix
678	9	19	9	19	Caption of figure 1.1 has a typo "...warming in over the over 2006…" [Francisco Molero, Spain]	Accepted
684	9	19	9	21	Colours externally–forced warming in over the over 2006–2015 relative to 1850–1900 for the most strongly warming season at any location using the GISTEMP dataset 'over the over' should be deleted [Robert Shapiro, United States of America]	Accepted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4098	9	19	9	19	What is shown is not the "Realised experience of present-day warming" but rather the "Realised present-day experience of past warming". Climate over the past few decades has been warming much more rapidly than it did over earlier decades. What we see in the plot is the consequence of past warming, not the warming that is going on at present. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Rejected - in the report we distinguish level and rate of warming. This figure refers to warming to mean the 'level' of warming experienced to the period in question consistent with the rest of the chapter and the report
4100	9	19	9	19	in over the over needs changing. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted
4732	9	19	9	19	Don't you mean to say "Colours indicate" and what does "in over the over" mean? [Michael MacCracken, United States of America]	Accepted
7162	9	19	9	26	Figure caption not clear, esp. 2nd sentence. Not clear what the figure shows. [Petra Tschakert, Australia]	Accepted
7844	9	19	9	26	Caption to Fig. 1.1 needs revision. There seem to be typo errors (lines 19-20). How does the density of dots " indicate population in any 1x1 degree box"? Please explain. Also, it is not right to refer to Fig. 1.3 at this point, because the reader has not seen it yet. [Petr Zavialov, Russian Federation]	Taken into account -text revised
8564	9	19	9	19	assume "warming in over the over 2006-2015" should be "warming in 2006-2015" [Pauline Midgley, Germany]	Accepted
8932	9	19	9	2	Colours externally forced warming in over the over 2006-2015 relative to … needs at least a ":" after Colours and a sentence correction for "in over the over" [Heike Huebener, Germany]	Accepted
10474	9	19	9	19	...in over the over 2006-2015'. Check the typo. [Hong Yang, Switzerland]	Accepted
13022	9	19	9	19	Delete the text "in over the". [Eleni Kaditi, Austria]	Accepted
17194	9	19	9	19	Revise "warming in over the over". [David Schoeman, Australia]	Accepted
29284	9	19	9	19	delete "over" [Yuanyuan Huang, France]	Accepted
31810	9	19	9	19	over repeated in figure caption [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted
36356	9	19			I would write "warming over 2006-2015….", instead of "warming in over the over 2006-2015…" [Emilio Cerdá, Spain]	Taken into account -text revised
40638	9	19	9	21	These lines do not make sense. [Jonny Williams, New Zealand]	Taken into account -text revised
40796	9	19	9	26	This graph results need to be put in the executive summary. About half of population are already experiencing temperatures above 1.5oC rise. [NARESH KUMAR SOORA, India]	Accepted - we include results from this figure in the revised executive summary
40910	9	19	9	2	Typo in Figure title - Colours externally-forced warming in over the over 2006-2015…? [Neelam Singh, United States of America]	Accepted
48214	9	19	9	26	Not sure of the message conveyed by the title of Figure 1.1 i.e. "Realised experience of present–day warming" ? Is this the observed warming over a 20-years period (2006-2015)? What is the SDG Global Index Rank at country level? This adopoted the following definition of warming: a 1.5°C warming relative to pre–industrial conditions corresponds to 0.86°C (±0.05°C 5–95% range) warmer than the period 1986–2005, or 0.63°C (±0.10°C) warmer than the decade 2006–2015, the periods 1986–2005 and 2006–2015 having been 0.64°C and 0.87°C warmer than 1850–1900 respectively, with corresponding uncertainties. Is this to imply that warming on Fig 1.1 ranges from -2.37 to 2.37 with respect to 206-2015? [Sarah Connors, France]	Accepted - title changed.
53734	9	19	9	21	This sentence is incomprehensible: "Colours externally–forced warming in over the over 2006–2015 relative to 1850–1900 for the most strongly warming season at any location using the GISTEMP dataset (Hansen et al., 2010b)". Please change it. For example: "Colours show externally–forced warming over 2006–2015, relative to 1850–1900, for the most strongly warming season at any location using the GISTEMP dataset (Hansen et al., 2010b) " [Patrik Winiger, Netherlands]	Accepted
55266	9	19	9	26	Figure 1.11. Are points with negative values shown? If so, they are not visible. If there are not negative values, why having a scale ranging from -3.0 to +3.00? [ELISA BERDALET, Spain]	Taken into account - We choose the scale to allow data across all the versions of the figure to be shown on just one axis
55268	9	19	9	26	The meaning of the histogram is not clear. [ELISA BERDALET, Spain]	Noted - we have aimed to clarify
56170	9	19	9	19	Remove "over the over". [Annika Herbert, Australia]	Accepted
57252	9	19	9	19	Realised experience - Needs to be clear this is experienced by human populations [Hans Poertner, Germany]	Accepted text changed
57498	9	19	9	2	revise sentence [Hans Poertner, Germany]	Accepted
57926	9	19	9	19	The words "in over the" in the description of Figure 1.1 may be deleted in "forced warming in over the over." [Siir KILKIS, Turkey]	Accepted
40640	9	21	9	21	The dots mentioned in this line are very difficult to see and hence interpret. [Jonny Williams, New Zealand]	Taken into account - we have tried to improve the visual clarity of the figure as much as possible whilst preserving the large difference in population density across the globe
53736	9	21	9	22	The density of dots indicates the population (2010) in any 1°x1° grid box. Arguably not the best way to depict this. How many people does one point represent? Could we give this information? [Patrik Winiger, Netherlands]	Accepted - this information is provided in the technical appendix
4734	9	22	9	24	From the shading relating to the SDGs, it seems to me that it makes it look as if the world is doing pretty well on these goals--that is, most of the areas have pretty dark grays. It seems to me that there may be a need for a bit more explanation of the scale, etc. or one might get the (mis)impression that the world is not so far away from the goals and no special effort is really needed. Basically, most of the world looks to be in as good shape as much of Europe as the shading gradations seem pretty fine. [Michael MacCracken, United States of America]	Taken into account - We have tried to improve the greyscale in the revised version
53738	9	22	9	22	Warming trends are calculated in an identical way to Figure 1.3.. This figure comes first. Perhaps the calculation of warming trends should be explained here first also? [Patrik Winiger, Netherlands]	Rejected - for the consistency of the flow of concepts in the chapter, we choose to keep the figure ordering the same
31812	9	23	9	23	Presumably high SDG is "good"? [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account - We provide an explanation of the index in the technical appendix

Comment No	From Page	From Line	To Page	To Line	Comment	Response
29286	9	24	9	24	white color is confusing. Here says missing data but the legend "SDG Global Index score" also have white color [Yuanyuan Huang, France]	Accepted
2538	9	28	1	8	The feasibility of any global commitment to a 1.5°C pathway depends, in part, on the nationally determined contributions (NDCs) that commit nation states to specific GHG emission reductions. The current NDCs are not ambitious enough to secure the 1.5°C objective. Rather, they are tracking toward 3–4°C above preindustrial temperatures by 2100, with possibly further warming thereafter (Rogelj et al., 2016; UNFCCC, 2016). Moving toward 1.5°C requires an increased decoupling of economic growth from the rate of GHG emissions. The analysis of pathways in this report reveals opportunities for boosting this decoupling. Integrated reflexive policy institutions capable of operating at multiple scales (from local to regional and international) will be essential to realize the far–reaching policy change required to bring about reductions in GHGs consistent with a 1.5°C warmer world, while simultaneously strengthening global responses to poverty and addressing associated emerging ethics and equity issues (Bäckstrand et al., 2017; Dryzek and Pickering, 2017; Lövbrand et al., 2017). [Christophe Deissenberg, Luxembourg]	accept - the text was significant revised
4738	9	28	9	28	In my review of the FOD, I complained a lot about using "1.5 C pathway" to describe emissions pathways that could lead to significantly overshoot 1.5 C despite the name of the pathway saying 1.5 C. The revision up to this point has finessed this pretty well, but it would seem here that such a problematic and misleading terminology is returning. How about on this line replacing "to a 1.5 C pathway" by simply "to 1.5 C"--the "pathway" just need not be mentioned. [Michael MacCracken, United States of America]	Noted - we have aimed to clarify
17196	9	28	9	28	It's not the commitment that needs to be feasible, but rather the attainment of the goals committed to. [David Schoeman, Australia]	good point, accepted and edits
24276	9	28	1	8	This should be coordinated with Chapter 2 and the NDC box in Chapter 4. Chapter 1 should not pre-empt the assessment of following chapters based on limited literature. [Joeri ROGELJ, Austria]	Accepted, text was revised
45558	9	28	9	29	For non-expert readers, a better explanation of NDCs (nationally determined contributions), defining what this means (specifying at least that they are voluntary actions) and what this implies will help to understand the following sentences. [Adela M Sánchez-Moreiras, Spain]	Noted - we have aimed to clarify
50632	9	28	1	8	Further risks from withdrawal of major emitting countries from commitments made under Paris should be mentioned here without naming them [Jagdish KRISHNASWAMY, India]	Noted - the text has been significantly reviewed
51418	9	28			partially or to some extend in place of "in part" [PRIYANKA LAHA, India]	Obsolete
13418	9	29	8	29	substitute ',' for 'of'. (NFCs) 'of' commiting nation states [Sergio Aquino, Canada]	Taken into account - text altered.
38428	9	29	9	31	When Parties put forward their NDCs for the Paris Agreement, they were asked to explain why these were ambitious and they did so. Therefore the statement “The current NDCs are not ambitious enough to secure the 1.5°C warmer world and are instead tracking toward a warming of 3–4°C above preindustrial temperatures by 2100” sounds challenging to Parties. Suggest adding the likelihood/confidence of “a warming of 3–4°C above preindustrial temperatures by 2100”. [Volodymyr Demkine, Kenya]	Noted - we have aimed to clarify
44692	9	29	9	31	Specific point that the NDCs are tracking to 3 or 4 C should be added to the SPM - which currently only states that the NDCs will not deliver 1.5. [Penny Urquhart, South Africa]	noted - we did so
54122	9	29	1	1	It is not enough to discuss the NDCs in that fashion. The conditionality of many of the commitments made under the NDCs should also be referred to [Ayman Bel Hassan Cherkaoui, Morocco]	Noted - the text has been significantly reviewed and revised
38738	9	31	9	31	I think you need to stress that this really depends on emisison developments after 2030. [Jan Fuglestvedt, Norway]	Accepted, clarity improved
39348	1	1	1	1	This report responds to the invitation made in Article 21 of the Paris Decisions. In this package of decisions (Article 17) it says that: "17. Notes with concern that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within least-cost 2 ?C scenarios but rather lead to a projected level of 55 gigatonnes in 2030, and also notes that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2 ?C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5 ?C above pre-industrial levels by reducing to a level to be identified in the special report referred to in paragraph 21 below". This article identifies the level of 55 GtCO2eq in 2030 in the INDCs scenario and points out a necessary reduction of 40 Gt to achieve the 2 ?C goal. Moreover, it says that the SR15 has to identify the reduction level to achieve the 1.5 ?C goal. This reduction could be a figure that enlightens the decision-makers; we suggest to put this figure in the line 1 pag. 10, after the full stop. [Olga Alcaraz, Spain]	Noted - this point is made but there is not space to expand on it.
48216	1	1	1	2	The concept of pathways looks obscur at this point and it migh be worth point to the Cross-Chapter Box 1.1 at the end of the following sentence: "The analysis of pathways in this report reveals opportunities for greater decoupling of economic growth from the rate of GHG emissions" [Sarah Connors, France]	Noted. The sentence is revised.
53928	1	2	1	2	Based on a widely shared opinion that continued economic growth in already highly developed economies is a main driver of climate change and the unsustainable exploitation of natural resources (and that alternatives, such as Daly's proposal for a steady state economy, exist), I suggest replacing the word 'economic growth' with 'human development'. [Ina Möller, Sweden]	Noted - there was need to be specific to economic growth

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4736	1	3	1	3	This sentence seems very strange as I really want to keep from overshooting 1.5 C and not move toward it, except after I have exceeded it and want to come back down (and at that point I want to be heading to even lower than 1.5 C). I'd suggest dropping this sentence and then insert in the next sentence the need to accelerate the trend mentioned in the sentence on line 1-2. [Michael MacCracken, United States of America]	Noted - this text sharpened.
13420	1	3	1	3	A' movement 'towards' [Sergio Aquino, Canada]	accepted- text revised
17198	1	3	1	3	Movement toward 1.5ºC… A cursory reading of this sentence seems to impy that warming of 1.5ºC is beneficial. Yes, it is, relative to greater warming, but not otherwise… [David Schoeman, Australia]	accepted- text revised
17200	1	3	1	8	Long sentence; could be broken up and modified to emphasise [David Schoeman, Australia]	accepted- text revised
44694	1	3	1	4	Integrated reflexive policy institutions capable of operating at multiple scales (from local to regional and international) is usefully specific wording that should be added to the SPM, where the kind of governance systems needed for 1.5 are noted. [Penny Urquhart, South Africa]	Noted - this was accomplished to the SPM
52738	1	3	1	8	Not sure that "reflexive policy institutions" is the right way to describe institutions that can drive transformational changes. [Iulain Florin VLADU, Germany]	accepted- text revised
53276	1	3	1	7	This is an example of the excessive use of jargon noted in the general comments above. This section that starts with “integrated reflexive policy institutions” – what does that mean? [Mary Booth, United States of America]	accepted- text revised
40416	1	4	1	13	The paragraph refers to several articles of the Paris Agreement (dealing with NDCs and mitigation) as relevant for the report, but does not mention Article 7 (Adaptation), which is clearly also very relevant. <PA, Article 7 : “2.- Parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems, taking into account the urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change.”> [Pedro Alfredo Borges Landaez, Venezuela]	noted
63132	1	6	1	8	Should read: "..... 1.5°C warmer world, while simultaneously not impeding global responses to poverty and addressing associated emerging ethics and equity issues (Bäckstrand et al., 2017; Dryzek and Pickering, 2017; 8 Lövbrand et al., 2017)." [Greg Rau, United States of America]	accepted- text revised
51420	1	1	1	13	too many "that", only first "that" will do the work [PRIYANKA LAHA, India]	Accepted, text was revised
57928	1	1	1	14	The repetitive use of the word "that" in the sentence may be deleted to read "AR5 (IPCC, 2014b) concluded that climate change constrains possible development paths, synergies and trade–offs exist between climate responses and socio–economic contexts, capacities for effective climate responses overlap with capacities for sustainable development, and existing societal patterns (e.g., overconsumption) are intrinsically unsustainable (Fleurbaey et al., 2014b)." [Siir KILKIS, Turkey]	accepted- text revised
512	1	14	1	17	This jargon-ridden sentence is practically unintellgible. [Robert Koppu, United States of America]	accepted- text revised
2540	1	14	1	2	2014b). Attempts to limit warming to 1.5°C while at the same time reducing poverty should benefit from considering the Anthropocene narrative on the ongoing unprecedented social–ecological and technical change that makes sustainable development indispensable (Delanty and Mota, 2017) (Box 1.1 on the Anthropocene). Numerous established or emergent knowledge bases allow a fuller understanding of 1.5°C related impacts, risks, and actions, and provide critical information for strengthening the sustainable development agenda (Olsson et al., 2017). [Christophe Deissenberg, Luxembourg]	accepted- text revised
38740	1	14	1	17	This sentence is long and difficult. I suggest you shorten and simplfy. [Jan Fuglestvedt, Norway]	Accepted, text was revised
7164	1	15	1	15	Again the debatable Anthropocene framing. What is the added value to the SR? Why is the ethics and equity framing that we have been discussing all along not sufficient? Ch5 (which closes the arc of the SR) draws heavily on the ethics and equity framing, but has no use for the Anthropocene framing as it doesn't add anything tangible. Suggest removing. [Petra Tschakert, Australia]	Rejected, the Anthropocene is an important boundary concept for framing the challenge to limit climate change to a 1.5C temperature rise. Climate change is part of a broader, highly interactive planetary challenges that we face and hence provide a better context for the ethics and equity which needs to be considered with a holistic lens.
49704	1	22	1	26	In this assessment, the definition of sustainable development, rooted in the 1987 report Our Common Future, includes ‘… development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987). The recent UN Sustainable Development Goals (SDGs) are an interlinked network of targets that are crucial to addressing the interconnected challenges of advancing human wellbeing. Note that the "definition" is SD, that the SDGs are "targets" for "wellbeing" [Michael Wadleigh, United States of America]	Taken into account - new cross-chapter box on SD and SDGs refines these ideas.
8606	1	24	1	25	suggest including a reference to Box 1.2 here where the SDGs are first discussed in some detail [Pauline Midgley, Germany]	taken into account -text revised
39090	1	3	1	37	Excellent [Lindsey Cook, Germany]	Noted
51422	1	31			eradicating in place of "ending" [PRIYANKA LAHA, India]	Noted - this text sharpened.
55522	1	33	1	33	making energy affordable and clean is a narrow view of SDG 7 since this misses the key idea of universal access to energy. I suggest: "providing affordable and clean energy to all". [Maryse Labriet, Spain]	Taken into account - new cross-chapter box on SD and SDGs refines these ideas.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51424	1	34	1	37	The SDGs require assessment of the achievement of targets through suitable indicators periodically at global conferences, offering a useful forum so as to monitor and promote efforts for managing climate change sustainably in the context of other global challenges. [PRIYANKA LAHA, India]	Taken into account - new cross-chapter box on SD and SDGs refines these ideas.
2542	1	35	1	36	achievement of targets be periodically assessed at global conferences, offering a useful forum to monitor and promote efforts to manage climate change [Christophe Deissenberg, Luxembourg]	taken into account -text revised
38742	1	39	1	52	Relevant info here, but this can be said with fewer words. And not all points are needed; e.g. 47-49. [Jan Fuglestvedt, Norway]	Taken into account - new cross-chapter box on SD and SDGs refines these ideas.
51426	1	4			is applied in place of "apply" [PRIYANKA LAHA, India]	Noted - this text sharpened.
514	1	41	1	43	This sentence is practically unintelligible. [Robert Koppu, United States of America]	taken into account -text revised
2544	1	41	1	52	to all countries as global goals (see Box 5.1). Achieving these aspirations alongside the transitions needed to secure a 1.5°C warming world require innovative planning efforts. The new approach signalled by the Paris Agreement does not leave mitigation entirely to bottom–up efforts or top–down directives. Instead, voluntary country pledges are embedded in 'an international system of climate accountability and a "ratchet" mechanism' (Falkner, 2016), encouraging additional actions by non–state actors such as sub–national entities including cities (Morgan and Northrop, 2017), and fostering citizen involvement through reduction of their personal emissions and lobbying for structural changes through legislative and regulatory measures. Limiting the rise in global temperatures to 1.5°C while meeting the ambition of the SDGs requires adjustments of the current lifestyles, development trajectories, and economic systems, and the exploration of new ways of facilitating social investment, of reducing inequality, and of delivering ecological and financial stability (Jackson, 2017). [Christophe Deissenberg, Luxembourg]	taken into account -text revised
33020	1	41	1	43	to illustarte this point a reference would be added to: Shine, T (2017) Integrating Climate Action into National Development Planning – Coherent Implementation of the Paris Agreement and Agenda 2030. Sida, https://www.sida.se/contentassets/d69702947cb241d1ab77c414af6f9bcd/integrating_climate_action_into_national_development_planning_webb.pdf [Tara Shine, Ireland]	Rejected - insufficient space.
54124	1	41	1	42	Not sure about the grammar there. Shouldn't it be is instead of are ? Unclear. [Ayman Bel Hassan Cherkaoui, Morocco]	taken into account -text revised
54454	1	43	1	43	he sentence may read as "……innovative planning efforts and design thinking". Add "……design thinking". [RABIZ FODA, Canada]	Rejected - insufficiently clear and no space to expand.
58214	1	43	1	43	Suggest to add: "There are some positive signs. A new IEA scenario suggests that action on climate change can be achieved simultaneously with achieving universal energy access (SDG 7) and reducing health impacts of airpollution (SDG 3.9) (IEA 2017, World Energy Outlook 2017). [Andrew Prag, France]	Rejected - new SDG box needed to reduce text.
39498	1	44	1	44	Please, check the use of the hyphen in "top–down". [Hernan Edgardo Sala, Argentina]	taken into account -text revised
13024	1	45	1	45	Delete the text "and a 'rachet' mechanism". [Eleni Kaditi, Austria]	Obsolete
36358	1	46			Please write "actors such as sub-national entities", instead of "actors such sub-national entities". [Emilio Cerdá, Spain]	accepted- text revised
40642	1	46	1	46	This line does not make grammatical sense. [Jonny Williams, New Zealand]	taken into account -text revised
40912	1	46	1	46	…encouraging actions also by non-state actors AND sub-national entities…? [Neelam Singh, United States of America]	Obsolete
54126	1	46	1	46	Should be "such as" instead of "such" [Ayman Bel Hassan Cherkaoui, Morocco]	taken into account -text revised
54128	1	47	1	49	I have an issue with "This extends to the efforts by citizens where individuals take measures to reduce their personal emissions in order to lobby for structural changes through legislative and regulatory measures within their jurisdictions". Why is there an attribution to a specific objective of lobbying ? This seems to me to be fairly baseless interpretation. This type of behaviour could be as well out of a sense personal accountability, ethics, religion, etc. I suggested deleting the part that states "in order to lobby for structural changes through legislative and regulatory measures within their jurisdictions" [Ayman Bel Hassan Cherkaoui, Morocco]	Obsolete. (Although this is defensible it has been removed)
53606	1	48	1	48	The word "Structural" can be replaced by "Systematic" [AKM SAIFUL ISLAM, Bangladesh]	Accepted, clarity improved
13026	1	5	1	5	Reference to voluntary SDGs to be achieved by 2030 should be made. [Eleni Kaditi, Austria]	Taken into account - see cross-chapter box on SD.
54130	1	5	1	5	meeting the ambition of the SDGs is a bit strange. The SDGs are, as their name indicate, goals. I propose "meeting the SDGs" instead of "meeting the ambition of the SDGs" [Ayman Bel Hassan Cherkaoui, Morocco]	taken into account -text revised
40644	1	52	1	52	Replace 'deliver' with 'delivering'. [Jonny Williams, New Zealand]	taken into account -text revised
9550	11	2			An important contextual framing piece here (i.e. equity and ethics). However, not only should this report examine 1.5 warming through the lens of human rights, but it should also indicate how it is including the voices, experiences, and knowledge of the populations it mentions (i.e. urban and rural poor, indigenous communities, women, etc.) into the report itself. Is there a framework for this type of engagement and inclusion? Indeed, the process itself of doing so could contirbute to building adaptive capacity and empowering vulnerable populations. -DOES THE REPORT DO THIS? [Joanna Petrasek MacDonald, Canada]	Noted - the report follows IPCC procedures and is inclusive within them.
24278	11	2	11	32	This sections provides great potential for either shortening or removal. [Joeri ROGELJ, Austria]	Taken into account - much of it removed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4740	11	4	11	5	a USGCRP report) seemed to indicate that 1.5 C was scientifically acceptable as a new planetary equilibrium value for the planet, and I know of no scientific acceptance of it. Having a discussion then of possible meanings of this phrase I think could then be quite helpful--if the world goes off of fossil fuels (and the causes of related GHGs) and the world is at 1.5 C, it is quite likely we would actually be on a path to an even lower forcing and so response-and so the effort to get us to 1.5 C, if continued, could carry us to even lower increases, and indicating the issues involved in this happening I think would be helpful, if not here, somewhere. [Michael MacCracken, United States of America]	Noted
5560	11	4	11	32	Ethichs is also about consequences and outcomes in terms of climate risks in different part of the world. Rights are here getting a too dominant position, and this is not consistent with the Chapter 5 conclusions [Kirsten Halsnaes, Denmark]	Taken into account - mention is now made.
54132	11	4	11	13	There is no Mention here to the fact that equity is also mentioned in the preambles of both the Paris Agreement and the Adoption Decision whereas this is adequatly referred later on (p. 40, line 38) [Ayman Bel Hassan Cherkaoui, Morocco]	Accepted - mention is now made.
38744	11	5	11	5	Not sure if "debate" is the right word. If you mean the policiy development process, then you can say that. [Jan Fuglestvedt, Norway]	Obsolete
13422	11	7	11	7	parties. No caps. [Sergio Aquino, Canada]	taken into account -text revised
7418	11	9	11	13	The concept of povert eradication should be defined because as a social defined concept with different representations according to the contextual dimension it is a strong assumption and even not desirable the eradication pursuit even if it is accomplishing the human rights concept (generally accepted); meanwhile we consider that the concept poverty mitigation could be more more astonishing and pertinent. [Manuel MORALES, France]	Taken into account - section on poverty eradication has been revised.
57500	11	1	11	1	use acronym, GHG already introduced on page 8 [Hans Poertner, Germany]	taken into account -text revised
2546	11	11	11	12	and efforts to eradicate poverty', while Article 14 requires that the 'global stocktake' be undertaken 'in light of equity and the best available science'. All these Articles place 'equity' in the context of [Christophe Deissenberg, Luxembourg]	accepted- text revised
40382	11	15	11	22	Talking about ethics, equity and human rights, this part of the chapter should include another relevant questions: How will an average global temperature rise of 1.5°C impact on rights of future generations? In this respect, it is extremely important to recall that UN Special Procedures mandated by the Human Rights Council have further elaborated the responsibilities of States towards future generations on the basis of international human rights instruments. In his 2008 report, the UN Special Rapporteur on toxic and dangerous products noted that «States need to take into account the future costs and long-term consequences of environmental degradation, as well as their obligation to save future generations from a multitude of health problems» (Cfr. United Nations, General Assembly, Promotion and Protection of All Human Rights, Civil, Political, Economic, Social and Cultural Rights, Including the Right to Development, Report of the Special Rapporteur on the Adverse Effects of the Illicit Movement and Dumping of Toxic and Dangerous Products and Wastes on the Enjoyment of Human Rights, Okechukwu Ibeanu. A/HRC/9/22, August 2008). [Erick Pajares, Peru]	Noted - this point is made but there is not space to expand on it.
2548	11	17	11	22	2015; OHCHR, 2009). How, for example, will an average warming of 1.5°C impact the human rights of already vulnerable persons, including their rights to water, shelter, food, health, and life? How will it affect the rights of the urban and rural poor, of indigenous communities, women, children, of the elderly and of people with disabilities? How will mitigation efforts to meet the 1.5°C target in [Christophe Deissenberg, Luxembourg]	Obsolete
33022	11	17	11	17	Additional references: Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change. Mary Robinson Foundation – Climate Justice (2015a) Right for Action: Putting People at the Centre of Action on Climate Change. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-Rights-for-Action-edition-2.pdf Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Taken into account - first text now referenced.
40798	11	18	11	18	Replace 'persons' with families [NARESH KUMAR SOORA, India]	Obsolete
45462	11	21	11	21	The Paris Agreement does not include a 1.5 target - careful in interpreting [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Accepted - 'target' language removed.
2550	11	24	11	32	This report examines the possible human-rights consequences of failing to limit warming to 1.5°C. It assesses the extent to which a warming at 2°C instead of 1.5°C increases the likelihood of drought, flooding, resource depletion, conflicts, and forced migration, potentially affecting human rights in many parts of the world and damaging the global economy (See Chapter 3) (Adger et al., 2014; Campbell et al., 2016; FAO et al., 2015; OHCHR, 2009). It also investigates whether the mitigation and adaptation policies might have profound human rights implications of their own, especially if they are framed without considering the complex local–national to regional interlinkages and the feedback loops in socio–ecological systems (Dryzek and Pickering, 2017; Knox, 2015; UNHRC, 2016). [Christophe Deissenberg, Luxembourg]	Obsolete

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4742	11	24	11	25	And I would hope the chapter would also discuss the human rights consequences of being at 1.5 C versus being at lower values--even at 1.5 C, the impacts of sea level rise are going to be, over time, very significant. So, I'd suggest having a comparison of the human rights consequences of a range of various temperature increases. [Michael MacCracken, United States of America]	Obsolete - this text no longer in.
33024	11	24	11	25	This issue - the human rights consequences of a failure to achieve 1.5 - needs to be better reflected in chapters 2, 3, 4 and 5. [Tara Shine, Ireland]	Noted
39092	11	24	11	32	This focus on human rights, including UNHRC, is an excellent development for an IPCC report, thank you. [Lindsey Cook, Germany]	Noted
46332	11	24	11	27	This sentence is over ambitious. In order to prevent misplaced expectations it should be clear from the beginning that the current state of scientific knowledge on the issue of CONFLICT and on the issue of FORCED MIGRATION does NOT allow to differentiate the impact between 1.5 and 2 deg. [Etienne Piguet, Switzerland]	Noted - the discussion is Chapter 4.
456	11	25	11	25	…assess the degree… [David Reay, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete
4102	11	25	11	25	Delete "at". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete
4104	11	25	11	25	This one example where 2 deg C rather than "well below 2 deg C" appears - see overall comment (1). I will not list the many other examples. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted. comparing the impacts of climate change at 1.5C and 2C is within scope of this report.
8526	11	25	11	25	should read " It assesses the degree to which .. ", i.e. delete "at" [Pauline Midgley, Germany]	Obsolete
8934	11	25	11	25	It assesses at the degree … delete "at" (I think) [Heike Huebener, Germany]	Obsolete
56856	11	29	11	3	On the question of "whether mitigation and adaptation policies will have potentiallyprofound human rights implications of their own" see Caney (2016) 'Climate Change and Non-Ideal Theory: Six Ways of Responding to Noncompliance' in Climate Justice and Non-Ideal Theory (Oxford: Oxford University Press) edited by C. Heyward and D. Roser, 21-42 [Simon Caney, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete
57254	11	34	12	29	This content is repeated in 1.7 Storyline of the report. I suggest this section is either removed or shorten considerably [Hans Poertner, Germany]	Accepted, sections were reviewed
38746	11	36	11	39	It is strange that the geophysical aspects are not mentioned here. These aspects (climate senstivity etc) are after all some very important elements in the assessment. [Jan Fuglestvedt, Norway]	Noted - this text sharpened.
45464	11	36	11	39	Impacts missing again. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. text was revised
46456	11	36	11	37	I suggest that the text reads "within the context of the 2030 Agenda for Sustainable Development including the Sustainable Development Goals (SDGs)", as the overall 2030 Agenda provides an important framing beyond the SDGs [Sven Harmeling, Germany]	Taken into account - see x-chapter SD box
50246	11	37	11	37	SDG abbreviation already given before; add only "SDG" [Karina VON SCHUCKMANN, France]	Taken into account - see x-chapter SD box
2552	11	38	11	41	above pre–industrial levels, and to address adaptation to the associated impacts inclusive of poverty eradication, equity, and ethics issues. The report consists of five chapters and a summary for policy makers. It also includes a set of boxes to elucidate specific or cross–cutting themes, frequently asked questions for each chapter, and a glossary. [Christophe Deissenberg, Luxembourg]	Noted. this section was significantly reduced and reworked
2560	11	42	12	29	The section does not give a logically compelling introduction to the contents. A deeper reformulation might be useful. [Christophe Deissenberg, Luxembourg]	noted. this section was significantly reduced and reworked
2554	11	43	12	3	Chapter 1, on "framing and context", has seven major sections linked to the remaining four chapters that form the body of the report. The introduction section of Chapter 1 situates the assessment within social–ecological systems in the context the Anthropocene. It points to the central role of governance in constraining the warming to 1.5°C and in responding to the associated impacts within the sustainable development framework. The next section focuses on the difference between global and regional warming and on the linkages to 1.5°C –consistent pathways and associated emissions WHAT DO YOU MEAN EXACTLY – LINKAGES BETWEEN WHAT AND WHAT?, further developed in Chapter 2. The section on the multiple dimensions of impacts at 1.5°C opens the way to Chapter 3 on the impacts of 1.5°C global warming on natural and human systems and on coupled social–ecological systems. [THIS SENTENCE CANNOT BE UNDERSOOD AS IS AND NEEDS TO BE REFORMULATEDWhile the section on strengthening the global response to the threat of climate change is the basis for Chapters 4 and 5 and, respectively, cover implementing the global response to the threat of climate change, and sustainable development, poverty eradication and reducing inequalities in the context of 1 1.5°C global warming.] Chapter 1 also provides a framing on the assessment methods used in the report and on confidence, uncertainty and risk. [Christophe Deissenberg, Luxembourg]	noted. this section was significantly reduced and reworked
50456	11	43	12	3	The description of Chapter 1 is difficult to follow, consider reformulating by using a more repetitive sentence structure. (Section 1 discusses… Section 2 discusses… etc.) [Ina Möller, Sweden]	noted. this section was significantly reduced and reworked
4744	11	45	11	45	I would think this should say "in the context of the Anthropocene." [Michael MacCracken, United States of America]	accepted- text revised
17202	11	45	11	45	I understand the power of the "Anthropocene" as a narrative tool, but it really should be used in quotes, if at all. As pointed out later in the Chapter, it is not a formmaly accepted construct, yet. Chapter 3 does not mention the word a single time in 190 pages. Is it really necessary here? [David Schoeman, Australia]	Rejected, literature that demonstrate that the Anthropocene is an important boundary concept for framing the challenge to limit climate change to a 1.5C needs to be incorporated in the search for strengthening the response- recognising that it has limitations. Not all terms used in this assessment have been formally accepted, some are still debated.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4746	11	46	11	46	Two things: It is important to say "the increase in the global average temperature" and drop "warming"--one is not talking about the temperature itself; while I guess the present phasing can be interpreted as correct, why not make things simpler? And "temperature" needs to be singular--there is only one global average of the temperature increase. [Michael MacCracken, United States of America]	noted. this section was significantly reduced and reworked
31814	11	49	11	52	chapter = "section"? [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	noted. this section was significantly reduced and reworked
57256	11	49	11	53	Content repeated in the next paragraph [Hans Poertner, Germany]	Accepted, text has been reviewed
4748	11	52	11	52	Change "cover" to "covers" as "section is the subject and is singular. Or, perhaps the second "and" on this line needs to be "which", making "Chapters 4 and 5" the subject. Basically, the sentence seems awkward to me. [Michael MacCracken, United States of America]	noted. this section was significantly reduced and reworked
38426	12		13		Comment to Box 1.1: "The Anthropocene as Framing". Actually an early concept for the Anthropocene was the Noosphere by Vladimir Vernadsky. As back as in 1938, in “Scientific Thought as a Planetary Phenomenon” (http://vernadsky.name/wp-content/uploads/2013/02/Scientific-thought-as-a-planetary-phenomenon-V.I2.pdf), he wrote of “scientific thought as a geological force”. The authors might wish to appreciate this fact in the Box. [Volodymyr Demkine, Kenya]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
17204	12	1	14	7	This is a vast improvement over the FOD. Yet the concept is still anthropomorphicsed. On Page 12, line 35, it "expresses empirical evidence"; on Page 13, line 6, it provides framing; and on Page 13, line 9, it has "intent". The Anthropocene is, for the time being a narrative construct, so should be emphasised that the concept of the Anthropocene can do these things, but not the Anthropocene itself. [David Schoeman, Australia]	accept - the text was significant revised
2556	12	5	12	17	Chapter 2 addresses 'how 1.5°C global warming could be achieved'. It covers the greenhouse gas emissions consistent with warming of 1.5°C and the characterization of mitigation and development pathways compatible with a 1.5°C world. It also assesses technological, environmental, institutional and socio–economic opportunities and challenges related to 1.5°C pathways, building upon IPCC AR5 WGII with an emphasis on sustainable development in mitigation pathways. Responding to the Chapter 2 assessment, the impacts and risks on social–ecological systems of a 1.5°C global warming are evaluated in Chapter 3, which focuses on observed and attributable global and regional climate changes and impacts, vulnerabilities, and the adaptation experiences to key global and regional impacts and risks at 1.5°C. It links adaptation potential and limits to adaptive capacity and delineates the impacts and risks at 1.5°C with those 2°C and higher levels of warming,. It also includes assessments of system level conditions such as timeframes, slow versus fast onset impacts, irreversibility and tipping points. [Christophe Deissenberg, Luxembourg]	noted. this section was significantly reduced and reworked
4750	12	5	12	7	It seems that here the discussion is going from having 1.5 C as an aspirational upper limit to accepting 1.5 C as an acceptable new equilibrium value for the Earth--this seems to me a huge jump. Where is that there was this agreement to be accepting a 1.5 C world for some indefinite time in the future--that has not been done by the scientific community nor is it clear that the negotiators intended this? The idea has been to limit the world to a maximum of 1.5 and then presumably come down, so I think this needs to be rephrased and indicated as a temporary peak and not staying at 1.5 C. [Michael MacCracken, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
53280	12	5	12	6	This is unfortunate phrasing: “The report flows from this initial framing to Chapter 2 and ‘how 1.5°C global warming could be achieved’” [Mary Booth, United States of America]	noted. this section was significantly reduced and reworked
53742	12	5	12	6	I would rewrite ‘how 1.5°C global warming could be achieved‘ to ‘how global warming could be limited to 1.5°C‘ [Patrik Winiger, Netherlands]	noted. this section was significantly reduced and reworked
8566	12	9	12	9	probably best to spell out "Working Group II" here as the acronym is not used elsewhere in the Chapter [Pauline Midgley, Germany]	noted. this section was significantly reduced and reworked
4752	12	9	12	9	And then also, here is where "1.5 C pathways" comes back as a term that would allow large overshoots and then an eventual return to 1.5 C--a terminology that seems to me terribly misleading as an indication of what the likely impacts would be. How about at least coming up with different names for the two types of pathways, so perhaps saying the "1.5 peak pathways" and the "1.5 overshoot pathways". And given that I really want the temperature to eventually come back to 0.5, one could have the "0.5 overshoot pathways" and, if one were to allow for climate intervention, have, perhaps, a "1 C peak pathway" or a "0.5 overshoot pathway", etc. That is, I think the pathway name needs to be more descriptive and we need a broader set of possibilities. At least, on line 9, change it to "1.5 C outcomes" and don't talk about "1.5 C pathways". [Michael MacCracken, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
13424	12	19	12	19	This third chapter 'focuses' or 'emphasises' [Sergio Aquino, Canada]	noted. this section was significantly reduced and reworked

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2558	12	19	12	29	Chapters 4 and 5 focus on development–linked solutions and their implications for the short and longer term. Chapter 4 considers the costs and benefits of 1.5°C warming, synergies, and trade–offs, and the integration of adaptation with mitigation and development, and addresses governance approaches and implementation strategies cognizant of equity and justice. It includes a section on case studies of implementation of adaptation and mitigation options under different scales and circumstances, and on lessons learned that are valuable to strengthening the global response to climate change. Chapter 5 covers linkages between achieving the SDGs and limiting the warming at 1.5°C. Positive and unintended effects of adaptation and mitigation response measures and pathways for a 1.5°C warmer world are examined with their implications for sustainable development, poverty eradication, reducing inequalities, and for the SDGs. The chapter discusses opportunities and challenges for climate–resilient development pathways, supported through emerging evidence from case studies at different scales, from national to communal. [Christophe Deissenberg, Luxembourg]	noted. this section was significantly reduced and reworked
51428	12	29			ranging from national in place of " from national" [PRIYANKA LAHA, India]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
5494	12	31	14	7	I do not see a specific connection between the anthropocene concept, the Paris agreement, and global warming of 1.5C. If there is not a specific connection (e.g. as opposed to some relevance to any climate agreement or any level of warming), then I suggest that this box be omitted. [Haroon KHESHGI, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
2562	12	31	14	7	Anthropocene is a strong reminder to the public that we are now having massive impacts on the environment at the scale of the planet. However, I am not convinced that putting so much emphasis on the Anthropocene in this report is useful: 1. It is not necessary. Every argument in the report could be made with reference to facts without ever using the word. The case made in the box for using the concept as scientific framework is superficial at best. 2. It is potentially counterproductive. There is serious amount of polemic around the Anthropocene concept, which is considered by some as a fad rather than a mature scientific concept and which tends to have strong political and ethical connotation. Using it indiscriminately may open the report to attacks as non-scientific and biased. [Christophe Deissenberg, Luxembourg]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
7166	12	31	14	7	I suggest removing the entire box. See also my comments on the FOD and the internal draft. The text misses the critical literature on the A, including re separation of nature and society, and the haunting question of what it means to be human in the A. The largely geosciences-driven framing undermines the ethics and equity framing that this SR has adopted to understand implications for sustainable development and poverty reduction, and reducing inequalities. EG. see critique by Noel Castree 2015 "Changing the Anthropo(s)cene" to include essential contributions from other disciplines, for instance the environmental humanities, and attention to care, responsibility, hope, solidarity etc. The A framing here is an artificial lens that is not reflected in most of the underlying literature in the various chapters. [Petra Tschakert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
17936	12	31	14	7	The box can be made shorter e.g., third para pg 13 , ln 9 -14 can be merged with Introduction on p 12 [Andrea TILCHE, Belgium]	accept - the text was significant revised
24280	12	31	14	7	The glossary already contains an item on the Anthropocene. That might suffice and this box can be summarized in a few sentences or removed in its entirety. [Joeri ROGELJ, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
30732	12	31	14	7	Could the language of Box 1.1 be simplified? In many sentences I lost track of the connections between the parts and had to read several times to understand the sentence. This additional communication effort (just guessing as I just started reading the report) may be applied to all boxes, which compile key concepts of the report? [Érika Mata, Sweden]	Accepted - box was revised
38748	12	31	14	7	the box contains some interesting information. But still I wonder if this is really needed. [Jan Fuglestvedt, Norway]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
50446	12	31	14	7	In Box 1.1 'The Anthropocene as Framing', I would strongly suggest to include a cautioning paragraph on the normative foundations that this concept entails. Although it can be understood as reflecting the intricacy of human-environment relations, the initiator of the concept (Paul Crutzen) was also immensly sceptical of the political process around climate change and is considered responsible for bringing forth stratospheric sulphur injections as a viable policy solution to climate change (Crutzen 2006). The concept is intrinsically anthropocentric, and the notion of planetary stewardship which it entails implies a degree of control and knowledge over Earth that is far beyond what we actually have. In combination with the narratives of catastrophe and imminent tipping points, adopting it as a core framing could easily serve as an opening toward intentional manipulation of the global commons. For critiques of the concept, consider Hamilton, Bonneuil, Gemenne 2015: The Anthropocene and the Global Environmental Crisis (in particular chapters 7, 10 and 11). [Ina Möller, Sweden]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
57660	12	31	13		The discussion of Anthropocene is interesting but one wonders whether 2 pages are needed to emphasize (w.o. data) the magnitude of human influence on the planet. [Hans Poertner, Germany]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
61716	12	31	13	53	Please ensure that this framing is used in other chapters, or revise the box to introduce the concept as used in this report. I suggest to shorten this very nicely and useful box to at most one page. [Valérie Masson-Delmotte, France]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
13426	12	33	12	33	insert space between lines 33 and 34. Same for other titles in the blue box. [Sergio Aquino, Canada]	noted. this section was significantly reduced and reworked

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2564	12	33	12	44	Introduction The concept of the Anthropocene and the aspirations of the Paris Agreement are linked. The Anthropocene is defined as the new geological epoch which started when human activity began to have significant impacts on the Earth's geology and ecosystems, including among others anthropogenic climate change (Crutzen, 2002; Crutzen and Stoermer, 2000; Gradstein et al., 2012). Abundant observational data support the fact that the world is indeed entering a new geological epoch (Steffen et al., 2016; Waters et al., 2016). The rates of change with which the transition to this new epoch is occurring are very high compared to previous abrupt shifts in the Earth's climate. Among others, the rate of CO2 increase, currently about 20 ppm per decade, is 100 times faster than any sustained rise in CO2 during the past 800,000 years (Wolff, 2011) and at least an order of magnitude greater than the rates observed over short periods during the last deglaciation (Marcott et al., 2014; Rhodes et al., 2017). The global average surface temperature is currently rising at a rate 170 times faster than the average rate of change since the mid–Holocene (ca. 7,000 years BP) (Marcott et al., 2013). [Christophe Deissenberg, Luxembourg]	noted. this section was significantly reduced and reworked
51430	12	36			which have led in place of "they led" [PRIYANKA LAHA, India]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
53714	12	36	12	36	Suggestion. Emphasise the long stable period of the Holocene: ...Earth has left the ~11'000 years long stable period of the Holocene and entered … [Patrik Winiger, Netherlands]	accepted- text revised
4754	12	39	12	39	I think the word "abrupt" here is not the right word to be used. While the changes that occurred in going from one period to the next might have been large in comparison to the variations within a period, very few were what one would call "abrupt". Perhaps, instead of "abrupt shifts" it would be better to say "significant realignment of the Eart's climate"--such, as, for example, caused by the closing off othe the Atlantic and Pacific before the time of Panama, etc. In any case "abrupt" seems to me to only apply given the asteroid impact at 65Ma--other shifts were apparently pretty slow. [Michael MacCracken, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
36360	12	39			The rate of CO2 accumulacion increase (because we refer here to CO2 accumulation, not to CO2 emission). [Emilio Cerdá, Spain]	noted. this section was significantly reduced and reworked
42732	12	39	12	44	The rate of carbon missions is greater than in the past 66 million years. Zeebe et al. 2016, Anthropogenic carbon release rate unprecedented during the past 66 million years, Nature Geoscience 9:325–329 (“We calculate that the initial carbon release during the onset of the PETM occurred over at least 4,000 year. This constrains the maximum sustained PETM carbon release rate is unprecedented during the past 66 million years. We suggest that such a ‘no-analogue’ state represents a fundamental challenge in constraining future climate projections.”). [Kristin Campbell, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
42946	12	39	12	44	The rate of carbon emissions is greater than in the past 66 million years. See Zeebe et al. 2016, Anthropogenic carbon release rate unprecedented during the past 66 million years, Nature Geoscience 9:325–329 (“We calculate that the initial carbon release during the onset of the PETM occurred over at least 4,000 year. This constrains the maximum sustained PETM carbon release rate is unprecedented during the past 66 million years. We suggest that such a ‘no-analogue’ state represents a fundamental challenge in constraining future climate projections.”). [Durwood Zaelke, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
57502	12	39	12	39	please be specific: CO2 increase in the atmosphere [Hans Poertner, Germany]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
516	12	42	12	44	sentence fragment [Robert Koppu, United States of America]	accepted- text revised
686	12	42	12	44	While global average surface temperature is now rising at a rate 170 times faster than the average rate of change since the mid–Holocene (ca. 7,000 years BP) (Marcott et al., 2013). 'While' doesn't seem right. [Robert Shapiro, United States of America]	accepted- text revised
4756	12	42	12	44	This is not a sentence [Michael MacCracken, United States of America]	accepted- text revised
40914	12	42	12	44	Delete 'While' at the beginning of the last sentence (While global average surface….) [Neelam Singh, United States of America]	accepted- text revised
50248	12	42	12	44	Something wrong with the sentence… [Karina VON SCHUCKMANN, France]	accepted- text revised
55270	12	42	12	44	Check grammar, incomplete sentence, or cut from the previous one. [ELISA BERDALET, Spain]	accepted- text revised
57930	12	42	12	42	The sentence will read correctly if the word "While" is deleted as the first word of the sentence. [Siir KILKIS, Turkey]	accepted- text revised
5806	12	43	12	43	The statement of 130 times faster is just ridiculously over-confident here. Instead a range should be given that recognises the uncertainties in the palaeo-record (and the inherent limitations on resolving decadal scale variation / changes) and the observed record. The number is large regardless but the implied certainty here is unwarranted and easy pickings for anyone who may wish to discredit the report as a whole. I would replace this number with a range you can more easily defend, preferably that is not uniquely dependent upon a single study. The recent study by colleagues of Marcott should be included (https://www.nature.com/articles/nature25464) and the findings nuanced here accordingly. [Peter Thorne, Ireland]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
51432	12	43			at a rate which is in place of " at a rate 170" [PRIYANKA LAHA, India]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments

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56172	12	44	12	44	The rate of change is faster today than during the mid-Holocene because the Holocene has been a period of unique climatic stability, which some authors have attributed to human influence, suggesting that the Anthropocene should start around the mid-Holocene (e.g. Ruddiman, 2017). [Annika Herbert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
13428	12	46	12	46	shorter title: The Anthropocene and 1.5C Global Warming [Sergio Aquino, Canada]	Rejected-a more explanatory title required
2566	12	46	13	22	The physical dimensions of the Anthropocene and 1.5°C global warming Although there is no unanimous recognition yet of the Anthropocene as a subdivision of geological time (Zalasiewicz et al., 2017), a strong majority of the Anthropocene Working Group (AWG) of the Sub–Committee on Quaternary Stratigraphy of the International Commission on Stratigraphy agreed that (i) the Anthropocene is real from a geological perspective; (ii) it should be formalized as an epoch and included after the Holocene in the Geological Time Scale; and that (iii) it is most appropriate to use the mid-20th century as the start of Anthropocene. Markers in the stratigraphic record that indicate a substantial global impact of humans on the total environment include an array of manufactured materials such as aluminium, concrete, plastics; particulates from fossil fuel combustion; radionuclides from the fallout of nuclear tests; widescale changes in the soil composition and properties; etc., leading to the conclusion that “these combined signals render the Anthropocene stratigraphically distinct from the Holocene and earlier epochs” (Waters et al., 2016). The literature on the Anthropocene has expanded rapidly beyond the geological science to other earth system sciences and the social sciences and humanities. Increasingly, the social science and humanities literature show that the Anthropocene concept provides a framing to understand pathways through which society could pursue equitable, innovative and responsible approaches for a warming planet. // NEW PARAGRAPH // The underlying narrative of recent IPCC reports and the Paris Agreement are closely related to the Anthropocene concept. Human action is driving global change, and human action can be consciously applied to steer this change. The ambition of the Paris Accord to ‘pursue efforts to limit’ the rise in global temperatures to 1.5°C above pre–industrial levels’ recognizes that humanity has achieved an unprecedented ability to influence geophysical planetary processes. That is, it appears natural to understand and assess the Paris Agreement within the Anthropocene context. . // NEW PARAGRAPH // This assessment report employs the Anthropocene as a framing to advance an understanding of the impacts and risk of a 1.5° C warming and the multiple pathways that define the trajectory of the physical and societal systems during this transition. The assessment of limiting global warming to 1.5° C above pre–industrial levels in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, requires a holistic approach that integrates human–biophysical interconnectivity across multiple scales. [Christophe Deissenberg, Luxembourg]	accepted- text revised
57504	12	48	12	52	Is there a reference available? [Hans Poertner, Germany]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
14162	12	51	12	52	Zalasiewicz(2017) pointed out that It is a misleading term of non-stratigraphic origin and usage, is based on insignificant temporal and material stratigraphic content unlike that used to define older geological time units, is focused on observation of human history or speculation about the future rather than geologically significant events, and is driven more by politics than science. Why is a mid-20th century beginning of the Anthropocene the most appropriate? Why is that not from the industrial revolution? [Rongshuo Cai, China]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
56174	12	52	12	52	There is a yet no clear agreement of when the Anthropocene began, it is still very much in debate, and therefore not appropriate to use in a report like this. The profound impact humans have had on the planet since the mid-20th century can be stated without bringing an unsubstantiated geological epoch into it. [Annika Herbert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
13028	12	53	13	2	Delete the text ", such as aluminium, concrete and plastics; particulates from fossil fuel combustion; radionuclides from the fallout of nuclear tests; and others". [Eleni Kaditi, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
4758	13	1	13	1	particulates is an adjective, not a noun. Either say "particulate matter" or "particles". And for "radionuclides" you mean "radioactive particles" or "deposited radionuclies" or something similar. [Michael MacCracken, United States of America]	Accepted - box was revised
37352	13	1	13	2	Very impressive Figure, excellent! [Helmut Haberl, Austria]	Noted with thanks
4760	13	4	13	4	Capitalize "Earth"--you are referring to the planet and not soils or dirt, etc. It makes no sense to be using lower case here (or anywhere, when referring to the planet). On line 44, the phrase "Earth System" has both words capitalized, so there is consistency needed, and this should at the least have "Earth" capitalized. [Michael MacCracken, United States of America]	Accepted - box was revised
37346	13	5	13	7	The formulations here suggest that "society" (or perhaps even "humanity") were a homogenous entitity, which is obviously not the case and probably also not intended. But such formulations do not support linking the concerns being formulated here to social/economic/political agendas respectively the social and human sciences. In order to better link to the social sciences more strongly differentiated statements would be helpful, e.g. by analysing specific drivers (often of specific social groups or countries or kinds of social organization) behind the high and growing unsustainable use of natural resources that in turn drives GHG emissions. See e.g. Pichler et al., 2017, Current Opinion in Environmental Sustainability, vol 26, p32ff [Helmut Haberl, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
51434	13	5			the not required before social science [PRIYANKA LAHA, India]	Accepted

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49574	13	6	13	7	The is a very generic statement which should (and can) be made more specific, towards the various strands of social sciences and humanties and their contribution, as well as towards a more differentiated view on what "society" is. In its current form, the text suggests there would be something like a hjomogeneous socialScience/humanity reserach field (in "contrast" to the nuanced geosciences) and -more importantly- as if there would be a homogeneous global society. Lastly, thje "innovative" seems to be on an other normative level as "equitable" and "responsible" and I suggest deleting it. Innovation for the sake of innovations is not really senseful in the context of sustainability. [Karlheinz ERB, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
30730	13	1	13	1	and THAT human action… I think THAT may be erased (language). [Érika Mata, Sweden]	Accepted - Text revised
51436	13	1	13	11	Human action is driving global change but human action can also be [PRIYANKA LAHA, India]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
4106	13	11	13	11	Change "Accord" to "accord" or "Agreement". The "Paris Agreement" is the name given by UNFCCC parties to the agreement reached in Paris. So it should be capitilized. The Paris Agreement is an accord reached in Paris, so it can be referred to as the Paris accord in an appropriate context such as here, but the word "accord" should not be capitilized, as it is not the formal name given to the accord. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted - box was revised
4762	13	11	13	11	Note that the phrase is "to limit"--this does not mean that this is value that is acceptable to be sustained long term--there is no real indication that this is the interpretation (unless one goes back to the UNFCCC objective where it does seem to indicate this, but this is well before what this would really mean has been understood). I just do not think there should be a jump from the phrase "to limit" to meaning that the maximum value under the limit is acceptable for the long-term, especially in that the value was politically rather than scientifically chosen. Had the island nation leaders who petitioned for the 1.5 C value been able to get it through, I would suspect their choice would have been a good bit lower rather than this compromise value. [Michael MacCracken, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
39500	13	11	13	11	Replace "Accord" by "Agreement" [Hernan Edgardo Sala, Argentina]	Accepted - box was revised
53716	13	12	13	12	Suggestion: Substitute "achieved" with "reached" [Patrik Winiger, Netherlands]	Accepted - Text revised
39502	13	17	13	17	I suggest to delete the space inside "1.5° C", in order to keep consistency with the rest of the chapter. [Hernan Edgardo Sala, Argentina]	Accepted - box was revised
37348	13	2	13	22	In my view, this sentence is quite vague and could be a lot more effective if it were more specific. What exactly is "human-biophysical interconnectivity"? To begin with, humans are physical as well, which is why many social scientists (who focus more on communication, values, power relations, etc.) even exclude human bodies from their definition of society. In my view, it would be a lot more specific to speak about social or socio-economic use of natural/biophysical resources respectively wastes/emissions following resource use, as investigated, for example, in Industrial Ecology and other disciplines within the "socioeconomic metabolism" framework (material flow analysis, etc.). Also, "holistic approach" is a multi-faceted word with many different meanings, some of which are quite un-scientifical in essence. I think it would not be missed here, and could even be damaging if not well explained... Using systems language could be a lot more effective [Helmut Haberl, Austria]	Rejected - this is linked to the concept of socio-ecological systems
49576	13	2	13	21	eradication of poverty (and many more targets) are a integral part of sustainable development, and not two entities at the same normative level. The term "human-biophsical interconnectivity" is not straigthforward and needs revision. Humans are biophysical, too (we form a biological species, and our bodies are subject to biophysical laws, isn't it?), so maybe: a holistic approach that acknowledges the mutual interdepedency of social and natural processes, or similar. [Karlheinz ERB, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
38750	13	22	13	22	Re sentence "This makes this report amenable to the concept of the Anthropocene": I would think a concept should serve the report, not the other way, that the report can be aa place where the concept can be used. This is confusing and needs reformulation. [Jan Fuglestvedt, Norway]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
56176	13	22	13	22	A geological epoch is just a way to measure large expanses of time and planetary change on a geological scale. A different term could be coined with the definitions used here, but it has nothing to do with the geological time scale and its divisions. [Annika Herbert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2568	13	24	14	7	Framing in the Anthropocene The Anthropocene is emerging as a “boundary object” enabling communication between scholars spanning different branches of the physical, life, social sciences, and humanities, and. encouraging exploration from a wide range of perspectives, including the more subtle and political dimensions of global change, in responding to the ambition of keeping global temperature well below 2° C and adapting to a 1.5° C warmer world (Brondizio et al., 2016). It offers a structured understanding of past and present human–environmental relations and provides an opportunity to better visualize the future and minimize pitfalls (Delanty and Mota, 2017; Pattberg and Zelli, 2016). By acknowledging the dominant influence of human action on planetary functions, society is recognising responsibility and opportunity to probe its capacity to maintain planetary viability and prospects for climate resilient sustainable development (Harrington, 2016). Humanity, while facing high uncertainty and poor control over the trajectory of planetary processes (Shove and Walker, 2007), also has the reflexivity, the anticipatory capacity, and the ability to learn necessary to alter the climate change trajectory and its impacts (Palsson et al., 2013). As a result, a major question for this assessment is: how can climate mitigation and adaptation be better integrated with sustainable development to reduce negative environmental impacts and minimize poverty? Such climate resilient sustainable development pathways are assessed in the latter chapters of this report (especially Chapter 5). // NEW PARAGRAPH //Human–driven climate change is the most visible expression of the depth of the global interlinkages of the human and nature interactions embodied in the Anthropocene concept. While human influence over the Earth has increased over the last 60–150 years through accelerated economic and demographic growth and connectivity, the result has not been uniform (Lövbrand et al., 2015; Palsson et al., 2013). The Anthropocene epoch is in fact a manifestation of the differential influence that some populations, specific activities and technologies, and, importantly, worldviews and associated values have on planetary functions (Brondizio et al., 2016; Castree, 2015; Lövbrand et al., 2015; Palsson et al., 2013). // NEW PARAGRAPH // Employed with proper care and modesty, the Anthropocene provides an opportunity to raise questions regarding the regional differences, social inequities, and uneven capacities and drivers of global social–environmental changes, which in turn motivates the search for solutions as explored in Chapter 4 (Biermann et al., 2016). It links the uneven influence of human actions on planetary functions to the uneven distribution of impacts (assessed in Chapter 3) and to the responsibilities in tackling climate change. Efforts to curtail greenhouse gas emissions without incorporating the intrinsic interconnectivity and disparities in the Anthropocene world may have very different impacts on development in various regions (see Chapter 2 and Chapter 5). [Christophe Deissenberg, Luxembourg]	Accepted - box was revised
49322	13	24	14	7	Anthropocene framing and reference to issues under various chapters under this framing at the SOD stage need more discussion to allow bottom up process and comfort to chapters. In none of our discussions we did consider this framing so now seeing issues under this framing need some substantial discussion. Whether the box can stay this way or need to change can be decided after discussion at LAM4. There is need for understanding the comfortlevel from various chapters. It is indeed a major shift in scientific framing with which 1.5 report start nor even in scoping meeting. [Joyashree Roy, India]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
39504	13	27	13	27	I suggest to delete the space inside "2° C" and "1.5° C", in order to keep consistency with the rest of the chapter. [Hernan Edgardo Sala, Argentina]	Accepted - Text revised
53718	13	29	13	3	I can't follow the exact meaning of the sentence. As it reads now it sounds like : to better visualize ... minimizing pitfalls. Try to rewerite. Suggestion 1: "… minimze pitfalls". Suggestion 2: "… while minimizing pitfalls" [Patrik Winiger, Netherlands]	Accepted - Text revised
4764	13	3	13	3	Replace "minimizing" with "minimize" [Michael MacCracken, United States of America]	Accepted - Text revised
7424	13	3	13	4	The concept about resilient sustainable development have not been fairly discussed in the conceptual framework chapter and lets room to ambiguities and biases; Does a systems need to be resilient if looking for sustainability? Or maybe the opposite… it needs to be sustainable if looking for resilience? In both cases I don't think that we can consider both of them as independent variables in the equation of climate change pathways. Specially if we're looking for an equitable and sustainable world, resilience undestood as the capability of a system to absorb disruption and reorganize while undergoing change to keep essentially the same structure, function, drivers and flows (Gunderson, 2000), from the complex systemic approach; seems to present a better holistic logic if resilience is underlinging to the underpinning sustainability. [Manuel MORALES, France]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
53278	13	31	13	33	Another example of jargon: “society is acknowledging differentiated responsibility and opportunity to probe its capacity to mobilize activities to realize desirable change in ways that will maintain planetary viability and prospects for climate resilient sustainable development.” What does this even mean? Why do you make the reader work so hard? [Mary Booth, United States of America]	Accepted - box was revised
56178	13	31	13	31	Humans have not had a dominant influence on most planetary functions, but rather "only" on climate and ecosystem functions, which are not the main functions of a planet. [Annika Herbert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
56180	13	33	13	33	Earth will be viable for life no matter how extreme anthropogenically induced climate change gets. It might not be any form of life that lives here now, but it will still be life. [Annika Herbert, Australia]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40916	13	34	13	35	Humanity, while facing…poor control over the trajectory of planetary processes….- Instead of 'control', suggest using 'being the main driver of changes being observed, and yet with poor control ..' - Sure, we have unleashed these changes but humans don't have a control over what follows but the way it's phrased right now seems to ignore our direct role here. [Neelam Singh, United States of America]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
53720	13	37	13	37	Missing comma? E.g.: … how, under the Anthropocene, can… [Patrik Winiger, Netherlands]	Accepted - Text revised
37350	13	42	13	49	I appreciate that this paragraph tries to differentiate the "human" in the Anthropocene discussion, but I think very important aspects are left out. In particular, given the high importance of the social organization of production and consumption activities for the use of biophysical resources (materials, land, energy, water etc.), I think it is indispensable to talk more about the role of economic structures and organization of the economy here. I see that economic growth and connectivity are mentioned, but what about institutional structures such as the way markets are organized, the build-up of infrastructures resulting in long-term lock-in (settlement patterns, transport networks, etc.)? These are not subsumed in formulations such as "specific activities and technologies", as this formulation hides the many, and hugely influential long-lasting legacies resulting from the build-up of capital stocks. See e.g. Pichler et al., 2017, COSUST vol 26, pp32ff, Weisz et al., 2015, PNAS vol 112, p.6260ff, Hertwich et al., 2015, PNAS vol 112, p 6277, Haberl et al., 2017, Sustainability, 9, 1049, Görg et al. 2017, Sustainability, 9, 1045. Moreover, it hides important aspects such the organization of labour, time use and other hugely important social variables (e.g., Haselsteiner et al. 2015. Sustainability 7, 8022; Wiedenhofer et al., Current Opinion in Environmental Sustainability, http://dx.doi.org/10.1016/j.cosust.2018.02.007 [Helmut Haberl, Austria]	noted - we have merged 1.1.3 and 1.7 together and reworked the text and placed it within section 1.7. In doing so we have attempted to address all substantial comments
53722	13	42	13	43	Suggestion to rewrite: Human–driven climate change is another expression of the strong bond linking global human and nature interactions that are an embodiment of the Anthropocene concept. [Patrik Winiger, Netherlands]	Accepted- text revised
8568	14	2	14	2	an unevenly distribution should be " an uneven distribution " [Pauline Midgley, Germany]	Accepted - Text revised
17206	14	2	14	2	Replace "unevenly" with "uneven". [David Schoeman, Australia]	Accepted - Text revised
40646	14	2	14	2	unevenly distribution' does not make sense. [Jonny Williams, New Zealand]	Accepted - Text revised
56182	14	2	14	2	Change "unevenly" to "uneven". [Annika Herbert, Australia]	Accepted - Text revised
53724	14	4	14	4	Insert comma: As a result, efforts…. [Patrik Winiger, Netherlands]	Accepted - Text revised
56184	14	4	14	4	A geological epoch has by definition a similar impact globally, otherwise it is a local or regional event. [Annika Herbert, Australia]	taken into account -text revised
5808	14	1			While I have great sympathy with the authors approach to both defining and then quantifying the status of the climate system relative to the 1.5/2C thresholds that are the subject of the report, my overall feeling is that both research of what defines the pre-industrial but also, and in particular, our understanding of the centennial timescale records has moved on so far since AR5 that it is necessary for the SR15 to undertake a much more substantive assessment of these issues than is done here presently. I shall split the remainder of this into a number of subsiduary point-by-point style comments for ease of author team consideration and response. [Peter Thorne, Ireland]	Taken into account: A more extensive discussion has been provided in the FGD
5810	14	1			I think when defining your working definition of pre-industrial it is essential to acknowledge that in AR5 different WGs took very different approaches. WG1 as the present co-chair can confirm spent a lot of time in plenary and breakouts at the final plenary defending a decision not to call 1850-1900 pre-industrial. My understanding is that WG2 took a contrary view. Reading the current text not even a sense of this is conveyed presently. It is important that the SR15 text be consistent with the AR5 in this regard. [Peter Thorne, Ireland]	Taken into account: We have emphasised this is a working definition, consistent with the reference period used as an approximation for pre-industrial by WG2. No definition of pre-industrial was agreed by WG1.
5820	14	1			you wish to include should go to the lead. [Peter Thorne, Ireland]	Accepted: subject to the constraint that we cannot provide a comprehensive assessment of these new datasets in the space available, and this is to be undertaken by AR6.
5812	14	1			While I could support a working definition of 1850-1900 as pre-industrial I think that a greater recourse to the available literature on a. deciding when true PI may be and b. what the GMST value at that time relative to today / 1850-1900 may have been is important. Arguably the uncertainty in the estimate of where we stand today relative to pre-industrial should be inflated, and that inflation may be substantively positively skewed in that 1850-1900 may be warm biased relative to a true PI by anywhere from 0 to 0.1K based upon the available literature. I would urge Section 1.2 to start with a discussion and meaningful assessment of true PI that far more robustly defends the choice of an 1850-1900 baseline as the choice of 'PI' in the report. This is such a key underpinning concept to the entire premise to SR15 that it really requires and demands that there be a brief section that properly defines, justifies and caveats the choice of 1850-1900. I would expect this to conclude something like that: Sufficient modern meteorological records to directly infer GMST are only available since the mid-19th Century. Based upon several lines of evidence, there is high confidence that 1850-1900 is a reasonable proxy for true pre-industrial era global mean temperatures. Differences to true pre-industrial are virtually certain less than 0.25K and likely less than 0.1K. I would then infate your estimate of where we stand today by 0.1K if you want it to truly reflect relative to true pre-industrial or be explicit that your subsequent numbers ignore this additional uncertainty term. [Peter Thorne, Ireland]	Taken into account: The period referred to as PI is to some extent a matter of convention, and the estimate of the level of human-induced warming to date has been raised to ±20%.

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5814	14	1			The observational evidence basis has shifted substantially since AR5. While the new literature and insights do not fundamentally alter a bottom-line finding of warming on the centennial timescale and therefore would not impact the AR5 assessment arising from WG1, sadly for the SR15 the question is not of a binary warming yes/no nature, but rather of the specificity of the magnitude of that warming. For that question the new insights are of potentially critical import and these post-2013 papers require a substantive assessment here to support a more definitive assessment of the true changes since 1850-1900 (assuming you wish to retain that as a working proxy for PI) which would in turn strengthen the remainder of the report. That said, if the new assessment changes, in either direction, the central estimate then it would I fully recognise have very substantive impacts on downstream assessment chapters. [Peter Thorne, Ireland]	Taken into account: These new papers have been assessed, and in particular our new estimate now includes the Cowtan-Way GMST average.
5816	14	1			Since 2013 several new estimates of GMST have arisen. Cowtan and Way infilling of HadCRUT4 is at least as independent as NASA GISS is from NOAA GlobTemp. Arguably more so. NASA GISS uses exactly the same basis of both SSTs and LSATs as NOAA differeing only in the interpolation technique and a modicum of post-processing for UHI effects which Hausfather et al 2013 (http://onlinelibrary.wiley.com/doi/10.1029/2012JD018509/abstract) implies is, anyway, at best not required. The Berkeley Earth land estimate was assessed in AR5 and they have since combined with an SST estimate based off of HadSST3. While the lack of a paper describing the global analysis may count against it warrants consideration. Also missing was JMA from AR5 for reasons of a lack of a peer reviewed basis. Again, this seemingly remains, but equally it is adding a sea surface temperature estimate degree of freedom via the use of COBE SST. Then there is a new Chinese effort described at http://onlinelibrary.wiley.com/doi/10.1002/joc.5384/abstract for the land side that I believe a full global analysis may have been submitted in time for the cut-off. While recognising that at some point on this continuum the authors may sensibly draw a line I believe that at a minimum Cowtan and Way and Berkeley Earth should be added to the analysis and the estimate recalculated accordingly. I suspect that this will nudge up by up to 0.1K the estimated change since PI. [Peter Thorne, Ireland]	Accepted: our new estimate now includes the Cowtan-Way GMST average. No peer-reviewed publication exists for the global land-sea datasets of both Berkeley Earth or JMA. Fortunately, they are at opposite ends of the spectrum, so their omission balances out.
5818	14	1			In addition to the new kids on the block, substantive changes to the two existing US datasets arising from the change from ERSSTv3b to ERSSTv4 have occurred. The changes are largest in the early period of record despite attention being put on the latter period thanks to Karl et al. There are large changes throughout the record driven by ERSST for which Huang et al rather than Karl et al should be cited. These changes increase the long-term warming trend in these two datasets as outlined in Huang et al. I would also note that NOAA have just submitted the GHCNv4 paper. This may be too late for consideration but depending upon how the review goes this may be important. GHCNv4 warms by c.0.1K more than GHCNv3 over the period of record. If GHCNv4 gets published quickly NOAA GlobTemp (and NASA GISS) may move over to using GHCNv4 and ERSSTv5 (already published) almost contemperaneously with publication of SR15. [Peter Thorne, Ireland]	Accepted: we have used the most up-to-date published versions of these datasets available.
5822	14	1			To assess the change since PI robustly may also require recourse to different statistical methods of calculation of the change. In AR5 WG1 we used two simple approaches in Chapter 2 while placing a box that discussed likely limitations. For the assessment purposes (binary yes/no) there arguably that was okay. But, for the purposes of the current SR15 where details of the magnitude matter acutely, arguably the sensitivity to choice of trend fitting procedure is also important if we want to answer robustly whether we have breached some nominal threshold beyond PI. The analysis of Visser et al., 2018 amongst others may need to be considered. [Peter Thorne, Ireland]	Accepted: multiple methods are now used, and our estimate of the level of total and human-induced warming to 2017 is precisely consistent with the results of Visser et al, 2018.
5824	14	1			All told, if the assessment were expanded to include a more robust assessment of A. what is PI? B. The new data products. C. The new methodological insights. D. the trend fitting method uncertainty the assessment would be considerably strengthened. Based upon the literature the upshot would likely be an estimate that we are somewhat (by o.0.1K) closer to the 1.5K threshold than implied in the present assessment but with a greatly expanded uncertainty on that estimate that was considerably positively skewed. But, the lines of evidence would allow a statement with at least medium to high confidence and probably likelihood. It overall feels like the assessment tries to duck this issue, possibly for the understandable reason that the latter chapters are based off of the Structured Expert Dialogue premise of 0.85K as a starting point. But, equally, as the authors themselves state any offset between that and any new estimate of a change since PI is simply a transformation by definition. I think the assessment should take a best shot at estimating the true change since PI and incorporating the new literature, datasets and insights since 2013. This will help minimise the downstream step between SR15 and AR6 which shall otherwise necessarilly occur. But, when all is said and done the assessment should then note that given the large and likely irreducible uncertainty in change since PI all downstream chapters will necessarilly work from some assumption and specify, explicitly, what that is. In doing so the case should be made that such an approach, being based off a well-observed and understood period can be quantified in a much more robust manner than using some PI change estimate that is always going to be hugely uncertain (relative to the target the change to date since true PI uncertainty is likely 25%+ of the target itself - this strikes me as somewhat crazy). [Peter Thorne, Ireland]	Rejected: we have not revised our overall philosophy of providing an estimate of warming relative to pre-industrial that is consistent with the findings of the IPCC 5th Assessment as regards methodological choices such as the definition of reference period and the use of multi-dataset averages including datasets with incomplete coverage. Only using a slightly earlier reference period, or exclusively in-filled datasets (which achieve global coverage at a price in methodological sensitivity) would consistently raise the expected warming level relative to pre-industrial, but also be inconsistent with the estimate of observed warming provided in AR5. Other innovations act either way.

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48334	14	1	18	8	Summary of necessary revisions to section 1.2.1: Main analysis of warming since pre-industrial should be based on blend of 5 available operational GMST datasets, per IPCC AR5 methodology of including all available datasets without discrimination. These data sets include three GMST datasets from AR 5, namely HadCRUT4 (Morice et al, 2012), NASA GISTEMP (Hansen et 2010) and NOAA NCEI, as well as two newer datsets, Cowtan & Way (Cowtan & Way, 2013; Cowtan et al, 2015) and Berkeley Earth (Rohde et al, 2013). Note that a land only version of the latter was included in AR5, so the statistical methodology employed was included in that assessment, and is not strictly speaking a "development since AR5". These are the 5 datasets available back to the late 19th century that have been used in recent instrumental warming assessments (Lovejoy, 2015; Hawkins et al, 2017; Jones, 2016). Since non-interpolated series clearly suffer from observational bias (Dodd et al,2016), the evaluation should also include a sensitivity check using the "full global" subset (NASA GISTEMP, Cowtan & Way, Berkeley Earth) as outlined in greater detail below. [David Clarke, Canada]	Accepted: (partially) we now use the 4 datasets whose global land and sea variants have been published in peer-reviewed publications. The remaining two (Berkeley and JMA) happen also to be the upper and lower outliers in terms of trend.
48336	14	1	18	8	New references cited above and following: Dodd et al 2015: Dodd, E. M. A., Merchant, C. M., Rayner, N. A. and Morice, C. P. (2015). An Investigation into the Impact of using Various Techniques to Estimate Arctic Surface Air Temperature Anomalies. Journal of Climate 28, 5, 1743-1763. doi:10.1175/JCLI-D-14-00250.1 Lovejoy 2015: Lovejoy, S. How accurately do we know the temperature of the surface of the earth? Climate Dynamics, vol. 49, pp. 4089-4106, 2017. http://dx.doi.org/10.1007/s00382-017-3561-9 [David Clarke, Canada]	Accepted: (partially) we now use the 4 datasets whose global land and sea variants have been published in peer-reviewed publications. The remaining two (Berkeley and JMA) happen also to be the upper and lower outliers in terms of trend.
53740	14	1	14	1	remove spave between "°C" and the comma [Patrik Winiger, Netherlands]	Accepted.
43996	14	12			This is a very sensitive section and in its current form very problematic. In particular, it fails to acknowledge the scientific basis of temperature levels in the Paris Agreement, the IPCC AR5. These temperature levels are not magic numbers, but the results of thorough risk assessments of climate risks happening at these warming levels (e.g. in the Structured Expert Dialogue). Theese risk assessments, and thereby the PA, were based on the science of the time, the AR5 science and AR5 methodology (see e.g. Rogelj et al 2017, GRL). This means observed warming until 1986-2005 and GCM (global TAS) warming thereafter. The IPCC should reflect on the nature of these warming levels and what it implies for its assessments and in particular for our ability to track progress towards the PA warming levels. Issues of blended-masking are discussed, but not with sufficient rigour and the choice of the 2006-2015 period also masks the scale of the problem (the 2015 differences are higher). See Pfleiderer et al. (submitted) for an analysis of the implications of tracking with observed records like HadCRUT4 against the PA limits. Rebasing like in Millar et al. could lead to increased carbon budgets of ~350 Gt CO2 and warming of ~1.67°C in AR5 terms. As illustrated by this example, there is a very high risk that these mismatches if not clarified and rigorously assessed here can effectively, and probably unwillingly, lead to shifts in goal posts effectively rewriting the Paris Agreement. [Carl-Friedrich Schleussner, Germany]	Noted: there is no consensus that "warming" refers to observed warming to 1986-2005 and GCM TAS thereafter. The Pfleiderer et al, 2018, paper is now cited, but we have remained consistent with statements, e.g. about warming 1880-2012 in AR5 referred exclusively to observations.
2570	14	14	14	22	What is meant by 'the increase in global average temperature … above pre–industrial levels' referred to in the Paris Agreement depends on three factors: 1. the choice of pre–industrial reference period; 2. whether 1.5°C refers to the total or to the human–induced warming; and 3. which variables and geographical coverage are used to define global average temperature change. Depending on the definition chosen, the measured warming may differ (e.g. Hawkins et al., 2017) by a couple of tenths of a degree, which is of the same order of magnitude the natural multi–decade temperature variability on continental scales (Deser et al., 2012). Most practical mitigation and adaptation decisions do not depend on quantifying warming to this level of precision, but a consistent working definition is helpful to ensure consistency across chapters and figures in this report. [Christophe Deissenberg, Luxembourg]	Rejected.
2572	14	14	14	22	REPLACES THE COMMENTS ON LINE 61, THAT I COULD NOT EDIT! What is meant by 'the increase in global average temperature … above pre–industrial levels' referred to in the Paris Agreement depends on three factors: 1. the choice of pre–industrial reference period; 2. whether 1.5°C refers to the total or to the human–induced warming; and 3. which variables and geographical coverage are used to define global average temperature change. Depending on the definition chosen, the measured warming may differ (e.g. Hawkins et al., 2017) by a couple of tenths of a degree, which is of the same order of magnitude the natural multi–decade temperature variability on continental scales (Deser et al., 2012). Most practical mitigation and adaptation decisions do not depend on quantifying warming to this level of precision, but a consistent working definition is helpful to ensure consistency across chapters and figures in this report. For consistency with AR5, the reference period 1850–1900 is used to in this report represent pre–industrial conditions. The implications of this choice are discussed in 1.2.1.2 below. [Christophe Deissenberg, Luxembourg]	Rejected.
38752	14	14	14	17	I suggest you mark the three points by i, ii, ii and iii. [Jan Fuglestvedt, Norway]	Rejected.
55272	14	14	14	17	Complex, too long sentence, too many subordinates that confuse the message. [ELISA BERDALET, Spain]	Rejected.

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4108	14	18	14	22	These sentences are rather dissmissive (and rightly so in my view) of ambiguities or uncertainties of "a couple of tenths of a degree". But this does sit awkwardly with the wording of the aim of the Paris Agreement, which distinguishes between "well below 2 deg C" and "1.5 deg C", as noted in comment (1). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: it is important to place these ambiguities into the context of multi-decadal variability.
54414	14	18	14	18	If, for example, the first half of the last millennium or the mean temperature of the last two millennia (hard to constrain exactly, making it impractical), would instead have been used as a “pre-industrial” baseline the change vis-à-vis 1850–1900 would exceed “a couple of tenths of a degree” and may be in the order of up to 0.5°C. It would be an advantage to cite the article Luening and Vahrenholt (2017) with regard to the sensitivity of “pre-industrial” if an earlier and/or longer baseline is used (see especially there Fig. 2). Reference: Lüning, S, and Vahrenholt, F. 2017: Paleoclimatological Context and Reference Level of the 2°C and 1.5°C Paris Agreement Long-Term Temperature Limits. Front. Earth Sci. 5, https://doi.org/10.3389/feart.2017.00104 [Fredrik Charpentier Ljungqvist, Sweden]	Noted: the pink range on figure 1.2 makes it clear that the chosen reference period was cooler than average temperatures for the Holocene as a whole, and we have emphasised that the use of the 1850-1900 reference period is for consistency with AR5.
2574	14	24	14	38	Independently of the choice of reference period, the increase in global average temperature above pre-industrial levels can be estimated in many different ways (e.g., Foster and Rahmstorf, 2011; Haustein et al., 2017; Medhaug et al., 2017). This section does not endorse a particular method but aims to clarify the approach followed in this report. It defines the increase at a given point in time as the global average of combined land surface air and sea surface temperatures over a 30–year period centred on that time, excluding the impact of any short–term natural forcing fluctuations and assuming that any existing secular trend continues throughout that 30–year period. Under this definition, an explosive volcanic eruption might temporarily reduce the observed global temperatures but would not reduce the estimated overall warming relative to pre–industrial levels. Likewise, if temperatures are increasing at 0.2°C per decade (Kirtman et al., 2013), then under this definition warming at the end of a 30–year period would be 0.3°C above the average over that 30 year period, because the definition assumes that the existing trend would continue. In the context of ambitious mitigation goals, using a traditional definition of “observed climate” using an average over a recent multi–decade period can introduce a substantial bias unless the trend is considered. [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
10476	14	24	14	38	The explanation on the increase in global average temperature above pre-industrial levels at a given point in time … is not very clear. It is difficult for an non expert to understand why 'if temperatures are warming at 0.2C per decade, the warming on the definition proposed here at the end of a 30 year period world be 0.3 higher than the average over that 30 year period, because this definition assumes that this trend world continue'. Need to give a further elaboration to assist readers to understand the point. [Hong Yang, Switzerland]	Noted: we have revised the text to elaborate this point.
17208	14	24	14	27	This is a good definition, but it does imply that no comments can be made for any year later than that centred on 2017 - (30/2) = 2002, since temperatures need to be considered as a 30-year mean centred on the year under consideration. The remainder of the Chapter and all of Chapter 3 seem to violate this principle. [David Schoeman, Australia]	Noted: the revised text stresses that accounting for any secular trend may extrapolate into the future if necessary. There are multiple methods of estimating the trend component of a non-stationary time-series right up to the end-point: we present only examples.
50540	14	24	14	29	While this definition sounds precise, it isn't precise enough. What are the short term natural forcing fluctuations considered? How is short term defined? How also is long-term secular defined? Feels like if you're going to stick with this a detailed footnote is going to be required somewhere. [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Noted: our aim is not to provide a recommended recipe, which would be overly prescriptive, but to describe the objective. The revised text makes clear that short-term means <30 years, and a secular trend refers to the trend over that 30-year period.
54226	14	24	14	38	This paragraph is quite confusing. It is difficult for the reader to understand the terms of the definition of "the increase in global average temperature above pre–industrial levels at a given point in time". In my opinion a formula should be more clear than the wording. An example would also help. [Jordi Salat, Spain]	Noted: we have attempted to clarify this paragraph.
55274	14	24	14	27	This is a key concept that should be highlighted somehow. It should be easy to find. [ELISA BERDALET, Spain]	Obsolete
4110	14	26	14	26	Here the report refers to using 30-year averaging (see earlier comment (4)), but later on this page it refers rather confusingly to the 20-year period 1986-2005 and the ten-year period 2006-2015. As the mean temperature for 1986-2005 is negligibly different to that for 1981-2010 (by only around 0.01C for the ERA-Interim reanalysis processed at described in paper doi: 10.1002/qj.2949), perhaps 1986-2005 could be replaced by the WMO standard period 1981 -2010. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: we accept that the use of a 20-year reference period 1986-2005 as opposed to the WMO standard period 1981-2010 is confusing, but we are constrained by the need to be consistent with AR5.
50250	14	26	14	26	Use of experssion "short-term": Which scales of variability are adressed here? Does this also includes interannual to decadal scale? Either a clear definition of scales when using "short-term" is needed, or it needs to be removed. [Karina VON SCHUCKMANN, France]	Accepted: we have clarified that short-term means <30 years.
5826	14	27	14	28	Bethke et al 2017 specifically assessed the possible impacts of plausible 21st Century eruptions on climate projections using NorESM. One of the metrics considered was how long in the mean and the distribution volcanic activity consistent with ice-core palaeo-records would affect passing a 1.5K threshold. Citing this would considerably strengthen this passage. https://www.nature.com/articles/nclimate3394 [Peter Thorne, Ireland]	Accepted.
24282	14	27	14	27	Is my understanding correct that this also assumes the trend over the period to be linear? Please clarify. [Joeri ROGELJ, Austria]	Noted: it need not be linear, depending on the origin of the trend (e.g. Haustein et al, 2017; Visser et al, 2018), but in most methods assessed trends are effectively linear on timescales <30 years.
2576	14	29	14	32	I do not find these lines and the numerical example enlightening, but am unable to suggest a better alternative. [Christophe Deissenberg, Luxembourg]	Noted: we have attempted to clarify this example.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4112	14	3	14	3	Replace "temperatures are warming at 0.2 deg C per decade" to "temperatures are rising at 0.2 deg C per decade". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted.
45560	14	3	14	3	Page 4 line 46 says that temperatures were assessed to be rising 0.17 ºC per decade, but in this page (an so on) the text talks about 0.2 ºC. I think that is better including always the same values regarding temperature increase to avoid confusions, or specifying that the value is rounded up. [Adela M Sánchez-Moreiras, Spain]	Obsolete. Text revised
39944	14	33	14	33	If possible avoid repeating this expression in this sentence (repeated word: "using")- Sentence: "In the context of ambitious mitigation goals, using a traditional definition of “observed climate” using an average over a recent multi–decade period can introduce a substantial bias unless the trend is taken into account". Change to "In the context of ambitious mitigation goals, using a traditional definition of “observed climate” estimating an average over a recent multi–decade period can introduce a substantial bias unless the trend is taken into account"" [JOFRE CARNICER, Spain]	Accepted: the sentence has been shortened and clarified.
4114	14	37	14	37	Delete "For consistency with AR5". The reason is given in earlier comment (2). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: in the scoping for this report, authors were instructed to be as consistent as possible with AR5.
31818	14	37	14	37	I am missing a critical discussion, even if it is just to reiterate WG1-AR5 conclusions (see e.g. their Fig 8.11), of the possible role of solar variability in the late 19th century. Although on current evidence the influence was small, some reflection of the uncertainty in that conclusion seems justified [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: a discussion of the possible role of solar variability is now included in 1.2.1.3
2578	14	4	14	5	Using the global temperature datasets in AR5, combined and updated, this report therefore considers that 1.5°C relative to pre–industrial conditions corresponds to 0.86°C (±0.05°C 5–95% range) warmer than the period 1986–2005, or 0.63°C (±0.10°C) warmer than the decade 2006–2015, the periods 1986–2005 and 2006–2015 having been 0.64°C and 0.87°C warmer than 1850–1900 respectively, with corresponding uncertainties. This assumes that the temperatures in both periods 1986–2005 and 2006–2015 are representative of a 30–year period centred on them. Where possible, the period 2006–2015 is used, because temperatures in the period 1986–2005 were affected by the eruption of Mount Pinatubo. These figures are consistent with the overall assessment of the current level and rate of warming in AR5 and the 2013–15 Structured Expert Dialogue. Where possible, estimates of impacts and mitigation pathways are expressed relative to these more recent periods to avoid conflating uncertainty in projections with uncertainty in historical changes. [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
5828	14	4	14	44	This text was really confusing. There must be a cleaner way to articulate this information to the reader. Perhaps a figure would help if this text were retained to illustrate to the reader conceptually what you are saying in words and (to the redaer) instead of an endless stream of numbers here? [Peter Thorne, Ireland]	Noted. Text streamlined and figure 1.2 clarified
17210	14	4	14	5	Demonstrating the point above, it is great that the assumption is mentioned here (that 20 and 10-year periods, respectively are representative of the surrounding 30-year period). But the time series is non-stationary by default (the entire work is motivated by the fact that the world is warming), so this cannot be the case. [David Schoeman, Australia]	Noted: a 10-year average can be representative of the mean of a 30-year period centred upon it: it just need not be. We now include an analysis updating Foster and Rahmstorf (2011) in the Technical Annex to argue that both these periods are acceptably close.
8636	14	4	14	5	Please consider also using the period 1981 - 2010 in addtion to 1986 - 2005 and 2006 - 2015) for the modern reference. I recommend inserting a smal table listing the respected avg. warming for the different reference periods; or include the period 1981 - 2010 in Table 1.1. Reason: The period 1981 - 2010 is is the period that the WMO is using and I see benefits from having identical periods for the modern reference. From WMO Press Release 18-01-2018: "The globally averaged temperature in 2017 was about 0.46°C above the 1981-2010 long-term average (14.3°C). This 30-year baseline is used by national meteorological and hydrological services ..." (Link: https://public.wmo.int/en/media/press-release/wmo-confirms-2017-among-three-warmest-years-record) [Urs Ruth, Germany]	Noted: as noted by Adrian Simmons, 1981-2010 is within 0.01C of 1986-2005. We have retained the latter period for consistency with AR5.
29326	14	4	14	51	A reference to Fig.1.2 (page 1-16) could be included in order to make it easier to understand [Borbala Galos, Hungary]	Accepted: we now make reference to the figure.
37140	14	4	14	5	I can appreciate why standard WMO 30 year periods were not used for comparison purposes, but going forward they would be more logical than mid decadal 20 year averages. [John Sweeney, Ireland]	Noted: the point is well taken, and it is possible that AR6 may transition to consistent use of 30-year running averages, but we are constrained by the literature focussed on AR5 here.
38754	14	4	14	44	I wonder if this can be presented (even) clearer. [Jan Fuglestvedt, Norway]	Noted: we have tried.
48344	14	4	14	43	Using five main global temperature datasets, combined and updated to present, … corresponds to 0.83°C (±0.05°C 5–95% range) warmer than the period 1986–2005, or 0.60°C (±0.10°C) warmer than the decade 2006–2015, the periods 1986–2005 and 2006–2015 having been 0.67°C and 0.90°C warmer than 1850–1900 respectively, [David Clarke, Canada]	Accepted: (partially) we now use the 4 datasets whose global land and sea variants have been published in peer-reviewed publications. The remaining two (Berkeley and JMA) happen also to be the upper and lower outliers in terms of trend.
50542	14	4	14	44	Could you more precise about what Combined and updated means? Do you average over three datasets? [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: the table now makes clear that we use the most up-to-date versions of the 4 datasets, and average over all 4.
31816	14	43	14	46	Although addressed a bit later, this seems odd - the 1850-1900 period was also quite heavily affected by volcanic eruptions - according to Crowley and Untermann 10.5194/essd-5-187-2013 as well as Krakatau, there was an eruption of similar size to the 1963 Agung eruption in 1862 and possible leftovers from several large eruptions in the first half of the 19th century [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted: no reference period is ideal, and the choice of the 1850-1900 period is for consistency with AR5.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4116	14	44	14	45	The sentence that spans these lines should be rewritten. It is not an assumption that the temperature for 1986-2005 is representative of the 1981-2010 temperature, but rather a matter of fact - see comment (19) - subject of course to analysis uncertainties. And 1850-1900 is a period longer than 30 years, so if it is not representative of the 30 years centred on the middle of the period, then the choice of 30-year averaging is a poor one. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: this sentence has been re-written.
17938	14	44	14	46	The sentence starting with , "This assumes .." is very confusing and needs simplification [Andrea TILCHE, Belgium]	Obsolete. Text revised
48218	14	44	14	45	What is meant by "This assumes that temperatures in both periods are representative of a 30–year period centred on them" and what 30-year centred periods are the authors refereing? [Sarah Connors, France]	Noted: this point is now unpacked in the technical annex.
4118	14	45	14	46	This sentence also needs rewriting. Yes, the period 1986-2005 (or for that matter 1981-2010) included a cool spell due to the volcanic eruption of Mount Pinatubo, but it also included an exceptionally warm spell associated with the unusually strong 1997/98 El Nino. The period 2006-2015 included the 2009/10 El Nino and the first part of the 2016/16 El Nino, but also relatively cold extratropical Pacific temperatures. There are also temperature fluctuations due to variability in polar sea-ice cover. It is risky to dismiss a period because of one particular anomaly when there are various types of anomaly that contribute to decadal and sub-decadal variability. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: we now mention the El Nino, and note that there is no particular evidence for a bias either way.
8570	14	47	14	48	the Structured Expert Dialogue probably needs explanation or at least attribution to UNFCCC and a reference [Pauline Midgley, Germany]	Noted. Referenced
39340	14	5	14	51	There must be a space between line 50 and 51. [Olga Alcaraz, Spain]	Accepted.
39506	14	5	14	51	Add a new line between lines 50 and 51. [Hernan Edgardo Sala, Argentina]	Accepted.
61718	14	5	14	51	Please insert a line break [Valérie Masson-Delmotte, France]	Accepted.
4766	14	51	18	8	These subsections seem to me rather more detail than is needed for the main likely readers of this document. Given it is considerably longer than the original objective, it would seem that these sections might better be made the content of an IPCC Technical Report, possibly expanded with related issues about exactly how best to define precisely how much warming has occurred and discuss various remaining shortcomings (e.g., the likely bias that still exists for the ocean during World War II, etc.). Having started the chapter with so much focus on looking forward and 1.5 C, this section just seems to take the reader back, with quite a bit of detail, to bit of an arcane issue that in the end is about a very fine detail of the discussion. Including the figure is fine, but the rest could essentially all be in a Technical Report. [Michael MacCracken, United States of America]	Accepted: (partially) we have moved some detail to the Technical Annex, but noting other ER comments, much has had to be retained.
13430	14	51	14	51	space needed between lines 50 and 51 [Sergio Aquino, Canada]	Accepted.
327	15	1	15	17	The observation data are surface air temperature and sea surface temperature. CMIP5 data are surface air temperature. Is there a big difference between surface air temperature and sea surface temperature? [Zong-Ci Zhao, China]	Noted: the dashed line is SAT while the solid CMIP line is combined, with incomplete coverage, illustrating the difference.
4124	15	1	15	39	Including discussion of reanalysis does not imply any need to reconsider the use of the conventional GMST datasets for the purpose of this Special Report. But reanalysis will likely have a bigger role to play when the UNFCCC's stocktakings of progress since the 2015 Paris Agreement are undertaken, as although effects of coverage limitations and blending may decline in the future, the future change from 2015 will be subject to much less uncertainty in general than the change from the pre-industrial level to 2015. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: we have noted that reanalysis products can be used to inform recent trends (as in Table 1.1).
57258	15	1	15	1	legend box and graph: It is difficult to distinguish between the AR5 obs range and Berkley earth colours - it may be better to use one colour but two cotrasting shades. [Hans Poertner, Germany]	Accepted: we no longer single out Berkeley Earth, but show the full range of the 4 datasets used in the headline figures, including Cowtan Way.
57260	15	1	15	1	legend box and graph: I cannot see AR5 near term projections on graph [Hans Poertner, Germany]	Accepted.
57262	15	1	15	1	legend box and graph: Holocene temperature range could be removed from legend box and instead shown by text on the graph and is explained in figure caption (pink shading) - I was looking for a line [Hans Poertner, Germany]	Accepted.
57264	15	1	15	1	graph: the reference period, 1986-2005 and 2005-2015 could all be shown in one colour (black) and need explanation in figure caption [Hans Poertner, Germany]	Accepted.
57266	15	1	15	1	graph: the two horizontal dotted lines across 1.5 and 0 are not explained, to make the graph easier to read these could simply be heavier lines with 1.5 and 0 repeated at the right hand side of graph [Hans Poertner, Germany]	Accepted (although not the RH scale - we think it is clear enough)
2580	15	6	15	8	Cowtan6 et al. (2015) show that in the 5th Climate Model Intercomparison Project (CMIP5) ensemble the use of blended SAT/SST data gives approximately 0.1°C less warming from the 19th century to the present than the use of area–average SAT, [Christophe Deissenberg, Luxembourg]	Obsolete. Text removed
31820	15	7	15	7	The C in CMIP is "coupled" not "climate" [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted.
3174	15	8	15	12	It would be useful to briefly explain why "...coverage and blending has less impact on future warming…". This seems quite important for detailed interpretation/comparison of model results and the report should higlight how Richardson et al. showed this. [Vassilis Daioglou, Netherlands]	Noted: the Richardson study simply resampled models as the observations are sampled.
2582	15	11	15	12	coverage and blending has less impact on future than on current warming particularly under ambitious mitigation scenarios [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
43994	15	12	15	15	This is not correct (see e.g. Pfleiderer et al. (submitted)). It's already wrong for the recent decade. The treatment of the GMT record is very sensitive and has very substantial implications for carbon budgets. It should not be taken likely or seen as a 'secondary issue'. [Carl-Friedrich Schleussner, Germany]	Noted: if future temperatures are referred to 2006-2015 (as in Chapter 2), the impact of coverage and SST/SAT is minimised.
53922	15	15	15	17	Please reference "many Integrated Assessment Models" [Monika Sikand, United States of America]	Obsolete. Text removed
1536	15	19	15	2	I think "GISTEMP places the most weight on poorly-observed regions like the Arctic" is misleading and could be quoted out of context to imply GISTEMP weights Arctic temperatures more highly than temperatures in other parts of the world. How about "GISTEMP ... puts more effort than the other reconstructions into estimating temperatures in poorly-observed regions like the Arctic ..." [David Wratt, New Zealand]	Accepted: wording has been revised.
48346	15	19	15	26	Revision: The three GMST reconstructions used in AR5 differ in their treatment of missing data. GISTEMP (Hansen et al., 2010a) uses simple linear interpolation to infill over poorly–observed regions like the Arctic, thus providing near complete global coverage. NOAA (Vose et al., 2012) and HadCRUT (Morice et al., 2012) are progressively closer to a simple average of available observations, which is equivalent to assuming that the average warming in unobserved regions is the same as that in observed regions. AR5 also included a global land series from Berkeley Earth (Rohde et al., 2013), which featured more sophisticated statistical infilling than GISTEMP, an analysis since extended to a full GMST data set. A fifth GMST dataset from Cowtan and Way (Cowtan and Way, 2014; Cowtan et al, 2016) uses a similar technique. Dodd et al 2015 evaluated interpolation techniques in the Arctic and found that the kriging technique of Cowtan & Way and Berkeley Earth performed best relative to a reanalysis reference, followed by linear interpolation of GISTEMP. Simple averaging without interpolation (as in HadCRUT4) performed worse than all interpolation techniques evaluated. The main impact of statistical infilling is to increase estimated warming to date by about 0.1°C (Richardson et al., 2017). The differences in warming to date between HadCRUT4 and the three infilled data sets range from 0.07°C (NASA GISTEMP) to 0.17°C (Berkeley Earth). Several recent studies assessing temperature rise since the 19th century have used all five datasets (Hawkins et al, 2017; Lovejoy, 2015; Jones, 2016). [David Clarke, Canada]	Accepted: (partially) we now use the 4 datasets whose global land and sea variants have been published in peer-reviewed publications. The remaining two (Berkeley and JMA) happen also to be the upper and lower outliers in terms of trend.
31822	15	2	15	2	places the most weight seems confusing wording - it is given no more weight than its area deserves, but isnt the point something to do with how/whether data is interpolated/extraopolated into data-sparse regions [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted.
1270	15	25	15	25	An important paper is missing in the references: Gleisner et al. (2015; DOI: 10.1002/2014GL062596) studied the Arctic data infill method in detail and should be cited here, especially as their results differ from Cowtan & Way (2014) which has been cited. It is important to present a balanced view here, which is the key objective of the IPCC reports. [Sebastian Luening, Portugal]	Noted: Gleisner et al (2015) focussed primarily on satellite-derived tropospheric temperature trends, which are not assessed here. Their analysis of trends in HadCRUT4 is specific to the "hiatus" period.
4120	15	25	15	25	Another area in which considerable effort has been devoted is the use of reanalysis as an even more sophisticated way of dealing with the incomplete coverage of monthly temperature averages from climatological stations. It has been shown (doi: 10.1002/qj.2422) that reanalysis gives a similar enhancement of arctic warming as is given by Cowtan and Way's cited statistical modelling, and that reanalysis fits reasonably well the independent surface air temperature measurements made by drifting ice stations and ice buoys, and by Arctic shipping, observations not used in the conventional GMST (or statistically extended) datasets. It has also been shown (doi: 10.1002/qj.2949) that of the three main conventional datasets, GISTEMP, the dataset that does the most statistical infilling, is the one that agrees best with reanalysis. Reanalysis merits a mention here. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the reanalyses are mentioned, but given our length constraints, we cannot do more than that.
7846	15	27			Full assessment of reliability of these infilling methods is beyond the scope of this report - yes, but still some confidence intervals around the global average temperature values should be specified. [Petr Zavialov, Russian Federation]	Accepted: confidence intervals have been provided.
38756	15	27	15	27	You may consider adding "new" before "infilling" [Jan Fuglestvedt, Norway]	Noted: the methods themselves are not new.
48348	15	27	15	39	Comment: This section makes a questionable argument to exclude Berkeley Earth and Cowtan & Way on the basis that they somehow involve a "redefinition" of GMST. This argument fails on several counts, not least that it conflates two issues, namely incomplete coverage (coverage bias) and SST/SAT bias. Coverage bias is now addressed in three of five available datsets including NASA GISTEMP (see Hansen et al 2010 for a pre-AR5 discussion of the issue), and partially in NOAA Global Temp as well. AR5 and the ensuing SED did put forward 0.85°C increase based on the linear trend over 1880-2012 for the three datasets in AR5. The updated AR5 datasets show 0.86°C by this same metric; adding the two newer series raises this to 0.88°C; by the the same metric a blend of the three near full coverage series increased by 0.91C over 1880-2012. These relatively small differences simply reflect the evolution of GMST estimates since IPCC TAR, which featured only an earlier version of the (non-interpolated) HadCRUT, with no interpolated datasets. It is entirely plausible that AR6 WG1 report will downweight the sole remaining non-interpolated dataset still further. [David Clarke, Canada]	Accepted: (partially) we now include Cowtan and Way, which does raise the warming to date (both total and human-induced) in the multi-dataset average.
48350	15	27	15	27	Delete this sentence: Full assessment of the reliability of these infilling methods is beyond the scope of this report. Given that three different interpolation methods, including linear interpolation (NASA GISTEMP), Empirical Orthogonal Transformation (NOAA, NASA GISTEMP) and kriging (Berkeley Earth), were used in AR5 SAT/SST datasets, the SR1.5 authors' opinion of the newer methods (or older ones for that matter) is not relevant. [David Clarke, Canada]	Accepted: sentence has been deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
52740	15	27	15	34	Add a reference to the report of the Strucured Expert Dialogue (FCCC/SB/2015/Inf.1) [Iulain Florin VLADU, Germany]	Noted: the Structured Expert Dialogue is referred to in FAQ 1.1, but not in the scientific assessment because it is not considered a scientific source (although undoubtedly very useful).
32810	15	3	15	33	The sentence about using SAT and global coverage is correct, but leaves out the implication that does matter, namely that chapter 3 relies on modeling warming relative to the preindustrial of 1.5C and they do use SAT and fully global (as best as I can understand from section 3.2.1). So they're reporting on impacts at 1.5C that are equivalent to about 1.3C using the definition presented here (even though the statement here that these factors do not affect future relative to present is correct - the difference comes from the historical period in the models being global and SAT whereas here it's not). [Drew SHINDELL, United States of America]	Noted: the literature assessed in Ch3 is not fully consistent on this point, with many studies referencing to 1986-2005, which reduces this bias by 0.1C.
48352	15	31	15	32	Delete this sentence: This would be similar to the impact of adopting different reference periods to 1850–1900. For consistency with the guidance given in the Structured Expert Dialogue, therefore, this report defines warming to date using blended versions of the GMST datasets with their incomplete coverage, consistent with the use of these datasets in AR5. Insert the following: However, the various possible combinations of available SAT/SST blended datsets show much smaller differences with AR5. A blend of all five available operational datasets shows approximately 0.03°C more warming to date than limiting to the three AR5 datasets. Similarly, limiting to the subset of three near global coverage datasets results in a further 0.03°C of warming. In line with latest IPCC practice, therefore, this report defines warming to date using blended versions of five available GMST datasets with their widely varying coverage, consistent with the use of available datasets at the time of AR5. The gap between full global and reduced coverage GMST datasets is also shown by the difference between the blue dotted and solid lines and orange dotted and solid line in Figure 1.2, representing the coverage related differences in forced response in the CMIP5 model mean and observations respectively. [David Clarke, Canada]	Accepted: sentence has been deleted.
2584	15	34	15	36	1850–1900. For consistency with the guidance given in the Structured Expert Dialogue, this report defines warming to date using blended versions of the GMST datasets with their incomplete coverage, which is consistent with the use of these datasets in AR5. Compared to AR5, the datasets have been [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
52742	15	34	15	34	Consider deleting "guidance given in". The SED used the approach taken in AR5 and the reference to guidance is circular [Iulain Florin VLADU, Germany]	Accepted: sentence has been deleted.
5830	15	37	15	4	As noted earlier suggesting that the updates to the US datasets are minor is incorrect and the citation really should be to the underlying dataset papers and not Karl et al. The major change is to the ERSST product so one or more of the Huang et al papers on the dataset should be cited. [Peter Thorne, Ireland]	Noted: the advantage of the Karl et al reference is that it refers to all the others.
4122	15	39	15	39	Table 1.1 does make provision for including results from reanalysis, adding to the case for including a brief discussion in this paragraph, as advocated in comment (24). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: although for reasons of space, we have been unable to devote as much to the reanalyses as we would have liked.
36984	16		16		Figure 1.2 Berkeley is misspelled in the label [Lynn Price, United States of America]	Accepted.
458	16	1	16	18	This figure is misleading as currently presented. The legend clearly states that the red line denotes total contributions to GMST changes, yet the key denotes the red line as being 'externally forced temperature change'. In fact, it is a combination of external and internal (human activity) forcings. As currently presented readers may misinterpret this figure as showing that the bulk of temperature change over this period has been a result of external forcing when it has not. I recommend the key is adapted to clarify this or a line showing 'external forcings only' is included to avoid confusion [David Reay, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: figure legend now refers to "total forced temperature change" and the caption makes clear this includes human- and naturally-forced changes.
3176	16	1	16	18	Legend for thick red line does not agree with caption ("Externally forced" vs. "total human and naturally forced"). Legend shows a grey area labeled "AR5 observation range", while it seems like it should actually be a line (?). Legend shows a blue area labeled "IPCC-AR5 near term projections", but it is unclear where this is in the graph. [Vassilis Daioglou, Netherlands]	Obsolete. Figure revised
3178	16	1	16	18	Why was RCP8.5 selected as the "baseline" projection? As the purpose of this graph is to show the "Evolution of global mean surface temperature (GMST) over the period of instrumental observations, the figure show only show observations, and thus end at 2017 (?). Showing the RCP 8.5 projections is innapropriate and misleading. [Vassilis Daioglou, Netherlands]	Noted: the figure now extends only to 2025, minimising the impact of scenario, and the RCP8.5 projections were used in the Richardson et al (2018) study to assess the impact of coverage on GMST, so are used here for consistency with the cited literature.
5640	16	1	17	27	In Fig 1.2. one of the datasets is called 'Berkley' but on p. 17 in Table 1.1 it is 'Berkeley'. Fix to read correct version, probably the 'Berkeley' version [Marion Grau, Norway]	Obsolete. Figure revised
8638	16	1	16	1	In the legend of Figure 1.2: For the dashed blue line say: "CMIP5 Surface land air temp". For the solid blue line say: "CMIP5 Blended land air & SST and masked". [Urs Ruth, Germany]	Obsolete. Figure revised
32942	16	1	16	1	Figure 1.2: Include the thick green and black horizontal line in the legend. May be confusing to use almost the same color as for Berkely Earth. [Ragnhild Skeie, Norway]	Obsolete. Figure revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
49578	16	1	16	1	Compelling figure! I have one observation, though: why is the "peak" around 1930 in the grey-green osciallations not refelcted in the yellow-red lines? [Karlheinz ERB, Austria]	Noted: we assume the reviewer is referring to the maximum around 1940, which is the subject of ongoing research and may reflect issues in the data that are beyond our scope to assess here.
51558	16	1	16	1	The words in this graphic are a bit small, not as bad as future graphics, but be aware, they are hard to read. [Jason Donev, Canada]	Obsolete. Figure revised
48354	16	1	16	18	Figure 1.2 and caption: 1) Replace AR5 with "Oper5" (representing the five operational datasets that form the basis of warming estimate). 2) Replace Berkeley Earth with composite of three full coverage datasets "Glbl3" (i.e. NASA GISTEMP, Cowtan & Way, Berkeley Earth). 3) Add dotted orange line "Human induced temperature change (Glb3)" 4) Thick orange and red lines based on main "Oper5" datasets, not AR5 subset 5) Add "CMIP5 Blended" dotted blue line based on SST/SAT CMIP5 blend but with full coverage (between the other two). [David Clarke, Canada]	Accepted: (partially) we now use the 4 datasets whose global land and sea variants have been published in peer-reviewed publications. The remaining two (Berkeley and JMA) happen also to be the upper and lower outliers in terms of trend.
51560	16	1	16	1	There's a horizontal black bar in this figure that isn't explained anywhere. [Jason Donev, Canada]	Obsolete. Figure revised
57662	16	1		18	Caption not easily tracks figure details. [Hans Poertner, Germany]	Noted: caption has been clarified.
2588	16	2	16	18	Figure 1.2: Evolution of global mean surface temperature (GMST) over the period of instrumental observations. The grey line shows departures from the 1850–1900 reference period for monthly means of the HadCRUT4, NOAA and GISTEMP datasets assessed in AR5, with the line thickness indicating the inter–dataset range. The green line shows the Berkeley Earth Surface Temperature as an example of more recent datasets that use statistical methods to further account for the impact of incomplete coverage. All observational datasets shown represent the GMST as a blended mix of near surface air temperature over land and sea surface temperature over oceans. Human–induced (orange) and total human– and naturally–forced (red) contributions to these GMST changes are shown based on Otto et al. (2015) and Haustein et al. (2017). The proportional uncertainty in the level of human–induced warming in 2016 is set equal to that assessed in Bindoff et al. (2013). The thin blue lines show the modelled global–mean surface air temperature (dashed) and (solid) blended surface air and sea surface temperature accounting for observational coverage from the CMIP5 ensemble under the Historical and RCP8.5 scenario (Cowtan et al., 2015; Richardson et al., 2016). The pink shading indicates the range of temperature fluctuations over the Holocene (Marcott et al., 2013; Marsicek et al., 2017). Near–term predictions for global mean warming for the 2016–2035 period from Kirtman et al. (2013) are shown in light blue. See the Technical Annex 1.A of this chapter for further details. [Christophe Deissenberg, Luxembourg]	Obsolete. Figure revised
30738	16	2	16	2	IPCC AR5 near term projections can barely be seen in fig 1.2. Use a darker colour? [Érika Mata, Sweden]	Obsolete. Figure revised
31824	16	2	16	18	Figure 1.2. I found the anthropocene framing in this chapter very useful, but (and I am sorry if I miss it) I wasn't sure at what date the holocene ends and the anthropocene begins. My query here is that the pink shading on this figure shows the temperature variation through the holocene but that doesnt bracket the temperatures shown on this figure between 1850-1925. What should I conclude - this period was colder than the holocene (presuming that it is no longer defined as belonging to the holocene)? [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: our technical annex now states "Marcott et al. (2013) report data with a periodicity of 20 years, so the variability shown by the solid pink shading is not directly comparable to the higher frequency variability seen in the observational products which are reported every month), but this Holocene range can be compared to the emerging signal of human-induced warming."
46370	16	2	16	2	Gray color is spelled as "grey" while in Chaper 3, Figure 3.19 it is spelled as "gray". Same spellings may be used throught in the report. [Ijaz Ahmad, Pakistan]	Obsolete. Figure revised
46520	16	2	16	18	Colourblind check failed for this figure. The greens and reds used are hard to distinguish between. [Sarah Connors, France]	Accepted: Figure now uses an approved colour-blind-friendly table.
49414	16	2	16	18	Not all elements of the figure are explained in the caption (in particular, thick horizontal green and black lines, vertical orange line). [Alexander Chernokulsky, Russian Federation]	Obsolete. Figure revised
4126	16	4	16	4	Is Figure1.2 based on the actual versions of the HadCRUT4, NOAA and GISTEMP datasets assessed in AR5? AR5 assessed the NOAA MLOST dataset, which has since been replaced by NOAAGlobalTemp. HadCRUT4 is updated annually to a new version. NOAAGlobalTemp and GISTEMP may change with every monthly release as addtional station data are included. GISTEMP changed to a new version of the NOAA SST analysis last year; NOAAGlobalTemp is expected to change this year. IPCC reports should follow the good practice employed by some scientific journals of specifying the dates on which datasets were acquired. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: most recent versions of datasets are used with links provided in the Technical Annex.
4128	16	4	16	4	If Figure 1.2 is indeed based on the versions used in AR5 (for which acquisition dates were not quoted in AR5), why are not the newer (presumably improved) versions used? This would also enable the HadCRU, NOAA and GISS results to cover at least the period for which Berkely Earth data are shown. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: most recent versions of datasets are used with links provided in the Technical Annex.
32940	16	4	16	5	Figure 1.2: Hard to see the line thickness that indicate the AR5 inter-dataset range. [Ragnhild Skeie, Norway]	Obsolete. Figure revised
5832	16	5	16	7	Berkeley Earth was assessed in Chapter 2 of AR5. It is incorrect to infer otherwise here. At the time it was a land only product so assessed under the LSAT rather than GMST section. The text should be redrafted to note that subsequent to AR5 Berkeley extended their estimates to include SSTs. However, note as I noted elsewhere that this combined product has not been peer reviewed only the land component has a published basis. [Peter Thorne, Ireland]	Obsolete. Figure revised
50252	16	5	16	5	Use of word: "inter-dataset range not clear. [Karina VON SCHUCKMANN, France]	Rejected. We believe it is in the lexicon. No space to elaborate

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1272	16	8	16	1	The orange and red lines in Fig. 1.2 do not comprise the whole sprectrum of possibilities and are therefore misleading. The lines are supposed to show “human–induced (orange)“ and “total human– and naturally–forced (red)” contributions to the warming of the past 150 years. The lines are based on Otto et al. (2015) and Haustein et al. (2017) and do not include error bars reflecting scarios for low and high CO2 climate sensitivity cases. The CO2 climate sensitivity is still poorly known and according to the AR5 lies somewhere between 1.5-4.5°C per CO2-doubling. The respective outcomes, i.e. human forcing on temperature of the past 150 years are dramatically different which needs to be shown in this diagram for the sake of transparency. It is unacceptable to hide this aspect by concentrating on a theoretical mean case. It is good scientific practice to show the entire range of possible scenarios which should also be the case in this key figure of the framing chapter of this report. Notably, the AR5 explicitly did not state a “best estimate” for the CO2 climate sensitivity which is further evidence that a probabilistic range approach for the human vs. natural contribution to the warming of the past 150 years is the only possible option in this figure. The AR5 itself stated that the human component is more than half of the observed warming, a cautious approach which the SOD authors have unfortunately failed to honour. AR5 Synthesis Report for Policymakers (p. 5): “It is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together.” Consequently “up to half” of the observed warming could be natural. This AR5 implication is not included in the SR1.5 report. The AR5 argues that anthropogenic forcings have most probably only become important since the mid-20th century. In the AR5 Synthesis Report for Policymakers (p. 5) this reads: “Anthropogenic forcings have likely made a substantial contribution to surface temperature increases since the mid-20th century over every continental region except Antarctica“. It is unclear why my earlier comments on this subject for the FOD have been ignored by the chapter authors. [Sebastian Luening, Portugal]	Accepted: the assessed range of uncertainty in human-induced warming (based on a range of sources) is now added.
2586	16	9	16	9	and total human– and naturally–forced (red) THIS IS UNCLEAR. DO YOU MEAN: “total (human plus naturally–forced)”? [Christophe Deissenberg, Luxembourg]	Obsolete. Figure revised
46372	16	1	16	1	….. shown calculated following…. creates confusion in the sentence. [Ijaz Ahmad, Pakistan]	Obsolete. Figure revised
1274	16	16	16	16	Both the new Marsicek et al. 2018 study and Marcott et al. 2013 have major deficiencies that need to be disclosed to the report readers. The range shaded in red in Figure 1.2 is too narrow which needs to be mentioned in the text. The Marcott et al. datasets consists almost entirely of marine core data, therefore does not include the continental areas. In these terrestrial areas the warming phases such as the Holocene Thermal Maximum are expected to have been much more pronounced than in the marine realm. Reconstruction case studies have generally confirmed this. The comparison of modern temperatures (sea & land) with sea-only data by Marcott et al. is therefore like comparing apples to pears. This needs to be conceded in the main text. As a new addition from the FOD to SOD the authors have now added Marsicek et al., published in February 2018. Also this study has severe limitations, namely it only refers to the North Atlantic area and is using pollen-based reconstructions only, which seem to originate from a large “black box” pollen database rather than fully peer-reviewed case studies. Temperature reconstructions based on pollen alone are notoriously complicated because competing effects due to e.g. hydroclimatic changes cannot be easily distinguished. Other non-pollen studies from the same area have reported much higher temperatures for the Holocene Thermal Maximum. Finally, the basal limit of the Holocene range in Fig. 1.2 is too high. In reality, the coldest phase of the Little Ice Age (1750) was probably much colder than shown in Fig. 1.2 (see e.g. Berkeley Earth Land Surface Temperature, Moberg et al., 2005; Hegerl et al., 2007; Ljungqvist, 2010). [Sebastian Luening, Portugal]	Because we are showing global mean temperatures, not just regional land temperatures), we think the Marcott et al. is a better global synthesis. It is ocean-focused, but tries to correct for this, as well as 70% of a the planet is ocean, it is more representative than other approaches. Figure S26 of Marcott et al., suggests that actually the Marcott et al. is potentially biased warm because of a few points in the North Atlantic. Regarding colder LIA: The Moberg et al, 2005 paper focuses on the northern hemisphere, so is not directly comparable, while the Marcott paper is a good synthesis of the global average, thus we keep this figure as it appears here.
7042	16	18	18	25	, the simpler idea that human health and disease are linked to climate [Cate Tuitt, United Kingdom (of Great Britain and Northern Ireland)]	Misplaced comment?
328	16	21	18	8	It should indicate that the observed data before 1900 were lack, especially over the globe. It has a certain uncertaities based on 1850-1900. [Zong-Ci Zhao, China]	Noted: poor coverage prior to 1900 is mentioned several times.
329	16	21	18	8	Is it annual mean? [Zong-Ci Zhao, China]	Noted: the table refers to decadal or longer averages, or trends.
54302	16	21			Discussion of definitions of pre-industrial does not quite seem complete since Chapter 3 states that it has used 1850-79. The only mention of this range here is with respect to HadCRUT3 and separately that other modelling studies may require different definitions. [John Caesar, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: Chapter 3 no longer uses 1850-79 - this was a carry-over from the FOD.
1276	16	23	16	25	The chosen reference period 1850-1900 is assumed by the authors to “approximate ‘pre–industrial’ conditions”. This assumption is incorrect. The pre-industrial climate of the past 10,000 years has been characterized by significant natural variability, including an alternation of marked warm and cold phases. A thorough review of past temperatures shows that the temperature level reached during the interval 1940-1970 serves as a better reference level as it appears to roughly correspond to the average pre-industrial temperature of the past two millennia. See Luening & Vahrenholt 2017 (doi: 10.3389/feart.2017.00104). On an even longer timescale of the past 10,000 years, the Holocene average temperature corresponds to the temperatures reached 1970-2000 (Luening & Vahrenholt 2017). It is therefore incorrect to state, the period 1850-1900 corresponds to average pre-industrial conditions. [Sebastian Luening, Portugal]	Rejected: whether pre-industrial refers to a multi-century period prior to industrialisation, or a multi-millennial period, or a multi-million-year period, is ultimately a matter of convention, and we are adopting the convention consistent with AR5.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2590	16	23	17	5	Any choice of reference period used to define 'pre–industrial conditions' is a compromise between data coverage and representativeness. This report adopts the 51–years reference period, 1850–1900 inclusive, which was assessed as representative of pre–industrial conditions in AR5 (e.g., Box TS.5, Figure 1 of Field et al., 2014a). The years 1880–1900 are subject to strong but uncertain volcanic forcing, but the net impact of this forcing on observed temperatures over the full 51–year period appears to be small: in HadCRUT4, average temperatures over 1850–1879 differ by less than 0.01°C from the average for 1850–1900. Hawkins et al. (2017) argue that the 1720–1800 period is more representative of pre–industrial forcing conditions, at the cost of increased uncertainty. Temperatures rose by 0.0–0.2°C from 1720–1800 to 1850–1900 (Hawkins et al., 2017; Schurer et al., 2017), but the anthropogenic contribution to this warming is uncertain (Schurer et al., 2017). The 18th century represents a relatively cool period in the context of Holocene temperatures, which are estimated to have peaked around 5,000 years ago and to have declined slightly since (Marcott et al., 2013; Marsicek et al., 2017). [Christophe Deissenberg, Luxembourg]	Obsolete. Figure revised
4130	16	25	16	26	AR5, in the glossary of the WGI contribution, defined the pre-industrial period as that prior to 1750. The WGI contribution did not assess 1850-1900 as representative of the pre-industrial period. WGI used 1850-1900 as a reference period for some purposes, but also used other reference periods (see TFE.2, Figure 2, page 49, for example). WGI did not identify 1850-1900 as a pre-industrial level. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the AR5 WG2 considered 1850-1900 to be an approximation of pre-industrial temperatures.
4132	16	25	16	26	The reference to Box TS.5, Figure 1, of the WGII contribution to AR5 is not quite correct. The caption to the figure does quote the warming from 1850-1900 to 1986-2005, but does not identify 1850-1900 as representative of pre-industrial conditions. Rather it describes the 1850-1900 average as an approximation of pre-industrial levels. As discussed since AR5 by Hawkins et al.(2017) this approximation is likely to be biased warm compared with the 1720-1800 value, i.e. biased warm compared with the level for a period that more closely than 1850-1900 matches the end of the pre-industrial period as defined in the AR5 WGI glossary. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: wording has been revised to include approximation.
4134	16	25	16	26	This Special Report's use of 1850-1900 as a baseline for temperature is not unreasonable in view of the other uncertainties involved. But its use should not be at the expense of ignoring what WGI has regarded as the pre-industrial period. Note in particular Figure 6.7 of the AR5 WGI report, which shows that carbon dioxide had already risen by 1850 to a value not seen in the preceding 950 years, and that it increased more rapidly from 1850 to 1900 than it did from 1750 to 1850. The Special Report should not label 1850-1900 as pre-industrial, as it does, for example on page 1-58, line51. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: it is made clear this reference period has been adopted as an approximation of pre-industrial temperatures, but to repeat this every time to reference period is mentioned would be unfeasible.
57508	16	25	16	26	Better say "Box TS.5 and Figure 1.1" to clarify that both are found in the cited reference [Hans Poertner, Germany]	Obsolete. Figure revised
1278	16	26	16	26	The authors claim that the period 1880-1990 was subjected to strong volcanic forcing. This is not correct, considering the latest volcanic reconstructions, which show an isolated volcanic forcing phase 1790-1825, but rather low values for the period 1880-1900 AD. See e.g. Sigl et al. 2015, doi:10.1038/nature14565 [Sebastian Luening, Portugal]	Noted: the text stresses the volcanic forcing is uncertain, and it is strong in the context of the historical period discussed here. The Sigl et al paper refers to multi-millennial variability.
31826	16	26	16	29	I had a comment at 14-43 concerning the volcanic aerosol forcing in the 1850-1900 period. There is an implicit assumption here, that isnt entirely supported by reconstructions, that the 1850-1879 period was unaffected by eruptions occuring either in that period or in the period before 1850. I also note the need for at least a small mention on what we believe we know about solar forcing in this period. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the text only notes that 1850-79 was prior to the largest eruptions. The contribution of solar forcing to warming over the historical period is now addressed in 1.2.1.3
36362	16	26			Here we read Field et al., 2014a, however on page 65 appears the reference as Field at al. 2014 (without a). [Emilio Cerdá, Spain]	Accepted.
57510	16	26	16	26	Delete "a" after publication year; there is only one Field et al. 2014 in the reference list [Hans Poertner, Germany]	Accepted
29328	17		17		The (2) is missing from Table 1.1, column 1, row 2 [Borbala Galos, Hungary]	Obsolete. Table updated and revised
1280	17	3	17	5	Why do authors not use the well-known term "Little Ice Age" (LIA) here? This seems to be the 'elephant in the room'. The chosen reference level lies at the end of the Little Ice Age which (apart from the 8.2kyr event) represents the coldest phase of the entire Holocene. Luening & Vahrenholt 2017 (doi: 10.3389/feart.2017.00104) argue that the reference period 1850-1900 does not fulfill the requirements of a typical baseline. The choice of a baseline near the lower extreme of a variable parameter is uncommon in science. An average over a longer pre-industrial interval capturing several natural temperature fluctuations appears more adequate. This discussion should be added to the new IPCC Special Report, in the interest of a balanced and transparent description. Furthermore, readers expect that widely accepted terms such as "Little Ice Age" are being mentioned. [Sebastian Luening, Portugal]	Noted: the key issue is not the origins of the LIA, but the level of anthropogenic warming to 1850, which we focus on here.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
54416	17	3	17	5	The meaning of this sentence is not exactly clear. Actually, the 18th century is likely slightly warmer than the 19th century judging from available large-scale multi-proxy temperature compilations and reconstructions (see, e.g., PAGES 2k Consortium 2013, Ljungqvist et al. 2012, 2016). In fact, the 19th century seems to have been the second coldest century of the last millennium (the 17th century being the coldest). References: PAGES 2k Consortium. 2013: Continental-scale temperature variability during the past two millennia. Nature Geoscience, 6: 339–346. Ljungqvist, F.C., Krusic, P.J., Sundqvist, H.S., Zorita, E., Brattström, G., and Frank, D. 2016: Northern Hemisphere hydroclimatic variability over the past twelve centuries. Nature, 532: 94–98. Ljungqvist, F.C., Krusic, P.J., Brattström, G., and Sundqvist, H.S. 2012: Northern Hemisphere temperature patterns in the last 12 centuries. Climate of the Past, 8: 227–249. [Fredrik Charpentier Ljungqvist, Sweden]	Noted: uncertainty in pre-1850 temperatures is emphasised.
53608	17	4	17	4	This sentence stated 18th Century as relatively cool period, however, previous sentence mentioned that there is an average rise of 0-0.2 C of temperature between 1720–1800 to 1850–1900 [AKM SAIFUL ISLAM, Bangladesh]	Noted: we believe these sentences are mutually consistent.
13432	17	7	17	7	Omit: for example. [Sergio Aquino, Canada]	Obsolete. Text revised
2592	17	11	17	11	substantial impact on the results [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
17940	17	14	17	19	These sentences need shortening and simplication [Andrea TILCHE, Belgium]	Obsolete. Text revised
50254	17	16	17	17	Is there a reference for this statement? (==> compenasting effect through ENSO conditions repsonsible for the onset and end of hte "staircase warming"? There is still no considerable consensus on this, and a corresponding citation is need, and other theories adressed. [Karina VON SCHUCKMANN, France]	Noted: further analysis is provided in the Technical Annex
1282	17	17	17	2	This is a misrepresentation of a large part of the hiatus/slowdown literature. It is unclear why report authors keep quiet about the unexpected slowdown in warming (“hiatus”) that took place 2000-2014. A large number of papers have investigated this phenomenon, therefore it appears unreal that chapter authors pretend that average warming proceeded as originally anticipated. Key papers in this respect that should be cited are e.g. Santer et al. 2017 (doi:10.1038/ngeo2973), Sun et al. 2017 (doi: 10.1016/j.scib.2017.01.017), Zhou & Wang 2016 (doi: 10.1016/j.scib.2017.01.017). It is unexplainable why Chapter 1 largely ignores Asian literature and focuses mainly on studies from Europe and North America. This regional bias is against the global authorship character that IPCC reports should have. [Sebastian Luening, Portugal]	Noted: developments in GMST since 2013 suggest this period was not particularly anomalous.
34410	17	17		18	The conclusion that internal variability had little impact on mean 2006-2015 temperature is based only on an unpublished figure constructed for this report. How uncertain is this conclusion? Is there other supporting literature? [Nathan Gillett, Canada]	Accepted: supporting evidence is now provided in the Technical Annex
2594	17	18	17	19	ittle net impact on the average temperatures over 2006–2015, in that the average temperature of the decade is similar to the estimated externally–driven one, while volcanic activity significantly [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
4136	17	19	17	2	Temperatures were depressed by volcanic activity in the period 1986-2005, but they were also enhanced in this period by an exceptionally strong El Nino. See comment (23). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: sentence revised.
24284	17	2	17	23	Why this recommendation in the framing chapter? In particular when Chapter 2 is keeping to the AR5 method, and this would thus result in an inconsistency within the report. I suggest to remove this recommendation which is put forward as if it pertains to the entire report. [Joeri ROGELJ, Austria]	Accepted: sentence deleted.
50544	17	2	1	23	It would be helpful if you could trace this 0.17 number back to the relevant part of the AR5. I spent some time doing a global search for 0.17 in the report and couldn't find it in relation to warming. [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: this number is simply the average of the 0.3-0.7C/decade prediction from 1986-2005 to 2016-2035, but this has now been clarified.
1284	17	25	17	25	Why is the global dataset by Chinese researchers Sun et al. 2017 (doi: 10.1016/j.scib.2017.01.017) being left out here? IPCC reports need to make sure that contributions from all parts of the world are being recognized fairly. [Sebastian Luening, Portugal]	Noted: this dataset is land-only.
3180	17	25	17	25	In Table 1.1, if I understand correctly, linear trend is simply the difference between 1880 and 2015. In which case in term "Linear trend" is innapropriate. I would expect something like the average annual increase, assuming a linear trend. [Vassilis Daioglou, Netherlands]	Noted: the table clarifies this refers to the linear trend (in degrees per year) multiplied by the length of the period
39508	17	25	17	25	I suggest to replace "global average surface temperature" by ."global mean surface temperature (GMST)" in order to keep consistency with the main text and Figure 1.2. [Hernan Edgardo Sala, Argentina]	Obsolete. Text revised
48356	17	25	17	26	Table 1.1: Add "Oper5 avg" (1986-2005: 0.66°C; 2006-2015: 0.90°C 1880-2015 trnd: 0.94°C) . Add "Glb3 avg" averages (1986-2005: 0.68°C; 2006-2015: 0.93°C 1880-2015 trnd: 0.97°C) . Change "Average" to "AR5 avg". Change "HADCRUT4-CW" to "Cowtan & Way" (in line with most common citation of this dataset). Add "CMIP5 blend" (calculated from full global CMIP5 SAT/SST blend) and change "CMIP5 blend" to "CMIP5 blend and mask". [David Clarke, Canada]	Accepted: (partially) we now include Cowtan and Way, which does raise the warming to date (both total and human-induced) in the multi-dataset average.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
49416	17	25	17	27	The entire report missed information on absolute values of global temperature (for the preindustrial period, and hence for the 1.5ºC / 2ºC warming). It will be very useful to add the absolute values for the preindustrial period defined from different databases. The Table 1.1. is the most appropriate place in the text for that. [Alexander Chernokulsky, Russian Federation]	Noted: previous IPCC reports have addressed this issue, that absolute GMST is much less relevant to impacts than GMST changes
57664	17	25	18	8	The table and underlying text are full of jargon and acronyms which remain unexplained, e.g. differences between models. It may be useful to explain these items in the OSM [Hans Poertner, Germany]	Accepted: further explanation is provided in the Technical Annex
61720	17	25	17	35	Are the CMIP5 data reported in the table used in the text? In the caption (next page), "… to have been depressed more than observed by Mount Pinatubo" : please rewrite to make clear that the simulated response to volcanic eruption of Mount Pinatubo in 1991 appears larger than in observations. [Valérie Masson-Delmotte, France]	Accepted: we have added "observed temperatures"
7848	17	26	17	27	Table 1.1: some numbers are supplied with "error bars", and some are not. Why? And please explain what these intervals actually mean. [Petr Zavialov, Russian Federation]	Obsolete. Caption explains
1538	17	28			Replace "degrees per year" with "degrees CELSIUS per year". (For the benefit of non-specialist US readers who use degrees Fahrenheit). [David Wratt, New Zealand]	Accepted.
7076	17	28			I do not see "2)" [Dmitry L. Musolin, Russian Federation]	Obsolete. Table updated and revised
8574	17	28	18	8	It would be preferable not to break the notes to Table 1.1 over two pages; also the Table should really follow more closely after its first citation which is on page 15 so I suggest moving it to the top of page 17 [Pauline Midgley, Germany]	Obsolete.
5834	17	29			There is no corresponding (2) in the table as far as I can tell. [Peter Thorne, Ireland]	Obsolete. Table updated and revised
17942	17	29	17	29	Missing reference in the table [Andrea TILCHE, Belgium]	Obsolete. Table updated and revised
2596	17	32	17	32	this report computes the average warming [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
32944	18	1	18	1	Add here that these estimates use statistical methods to account for incomplete coverage. [Ragnhild Skeie, Norway]	Obsolete. Table updated and revised
45984	18	1	18	2	confirming current agreement and variability of available observation data. [Hiroyuki ENOMOTO, Japan]	Accepted: we have added Reanalysis and JMA figures where possible.
2598	18	3	18	3	offset in HadCRUT4 from 1850–1900. The CMIP5 [Christophe Deissenberg, Luxembourg]	Obsolete.
46374	18	3	18	3	1861–80 looks to be 1861-1880. [Ijaz Ahmad, Pakistan]	Accepted
2600	18	7	18	8	Note that the1986–2005 temperatures in CMIP5 appear to have been depressed more than the observed temperatures by Mount Pinatubo. [Christophe Deissenberg, Luxembourg]	Obsolete.
4138	18	7	18	8	The point made in this sentence is, I believe, understood. The cooling due to the eruption of Mt Pinatubo is partly offset in the observational record by an El Nino event that was in progress at the same time - see section 2.4.4.2 (page 195) of the AR5 WGI report. One would not expect the CMIP5 models to capture the timing of individual El Nino events. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: it is unclear what change is required here.
31828	18	8	18	8	You mean "the eruption of Mount Pinatubo" - the mountain is always there :-) [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted!
55276	18	14	18	16	This is also a key concept that deserves to be easily identified. [ELISA BERDALET, Spain]	Noted.
38758	18	16	18	16	externally forced may be misudnerstood. As far as I can see, it is not needed here as long as you say total, so it could be deleted. [Jan Fuglestvedt, Norway]	Accepted.
56186	18	16	18	16	Would be helpful to add your definition of external forcing to the glossary, as the definition in climatology differs from the one used by climate modellers, and here it appears as if you mean simply non-human induced warming. [Annika Herbert, Australia]	Accepted: We now refer to total warming.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1286	18	18	18	22	The authors write "In the absence of strong natural forcing due to changes in solar or volcanic activity…". This is based on the radiative forcing table in AR5 and predecessor reports. The low solar forcing in this table, however, is not unchallenged, which needs to be mentioned in the 1.5 degrees report. The AR5 openly admits that climate models are still unable to reproduce the warm phase associated with the Medieval Climate Anomaly (1000-1200 AD). If one accepts the findings of PAGES2k 2013, the period 0-1000 AD was unusually warm, which again is not replicated by any climate model. The model hindcasts, therefore, have essentially failed, resutling in low confidence of estimates of natural climate drivers in these models and IPCC radiative forcing tables. The failed hindcasts cannot be simply swept under the carpet but have to be openly presented as a major research gap that may still lead to significant changes in our understanding of natural climate drivers. The IPCC report serves as a referee report that summarizes the status quo of the diverse range of opinions in the literature. Keeping quiet about major issues such as failed model hindcasts in pre-industrial times preceding the Little Ice Age is unacceptable. In fact, solar activity has changed greatly over the past 150 years and reached one of the highest activity levels during the second half of the 20th century (e.g. Solanki et al. 2014; doi:10.1038/nature02995), interestingly coinciding with a major warming phase. Besides sun spots and total solar irradiance, amplifications mechanisms are currently being studied including for example UV and magnetic field effects. Our understanding of solar effect on climatic change is still poor, therefore the radiative forcing attributed to solar changes needs to be revisited at some point in the future. Palaeoclimate reconstructions have made major progress over the past 15 years and have empirically identified a clear and strong link between solar and climate variability, which cannot be explained by the low radiative forcing value initially interpreted by the IPCC. An overview of papers can be found here: http://chrono.qub.ac.uk/blaauw/cds.html. Climate models need to first achieve a successful hindcast performance of these solar-climate links before the solar radiative forcing value can be confidently determined. [Sebastian Luening, Portugal]	Accepted: more material on the attribution of warming to human influence has been added.
31830	18	18	18	18	I feel quite sure it is justified to assume strong solar forcing, but a few extra sentences on it somewhere in the chapter is needed [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: more material on the attribution of warming to human influence has been added.
5836	18	21	18	22	As noted earlier, Bethke et al., 2017 could be cited when discussing the potential impacts of the volcanic wildcard. [Peter Thorne, Ireland]	Accepted.
40918	18	22	18	22	rephrase as here…change if one or more large volcanoes were to erupt... [Neelam Singh, United States of America]	Accepted.
8936	18	25	18	27	Perhaps you might want to cite a paper by D. Maraun (2013): When will trends in European mean an d heavy daily precipitation emerge? Online at stacks.iop.org/ERL/8/014004 [Heike Huebener, Germany]	Accepted: section has been deleted.
17944	18	25	18	25	Discussion of impacts in this para can be removed and merely replaced with reference to the dedicated discussion of impacts in section 1.3. [Andrea TILCHE, Belgium]	Accepted: section has been deleted.
51562	18	25	18	25	The phrase 'many impacts take time to observe' is unclear. Please re-phrase [Jason Donev, Canada]	Accepted.
57268	18	25	18	25	Impacts refer to ecosystems and human systems, please correct terminology [Hans Poertner, Germany]	Accepted: section has been deleted.
53744	18	26	18	26	event or "events"? [Patrik Winiger, Netherlands]	Accepted
2602	18	27	18	28	Hence, although GMST as defined in this report is estimated to have reached [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
38760	18	28	18	29	Not sure if we can use a statement this way, even if it is meant as an example. I suggest explaining better the background instead. [Jan Fuglestvedt, Norway]	Accepted: section has been deleted.
53610	18	28	18	28	We should now able to estimate and quote the actual rise of temperature in 2017. [AKM SAIFUL ISLAM, Bangladesh]	Accepted: noting that on the definition of warming used here, this remains an estimate of the 30-year period centred on 2017
4140	18	3	18	3	0.7 deg C is too large an uncertainty. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: typo.
24286	18	3	18	3	There seems to be a typo in the uncertainty range. [Joeri ROGELJ, Austria]	Accepted.
4768	18	36	18	46	Again, there seems to be an interpretation of the "to limit" phrase in the Paris Accord to mean that the future temperature 1.5 C above preindustrial would be the new prevailing equilibrium value. I just do not read the document that way, and it seems to me that, given the effort to limit the peak warming to 1.5 C or even to return to 1.5 C after overshoot, one would need to give up a lot of the efforts in order to say at 1.5 C rather than be trending to lower temperatures. I just don't think it appropriate to be talking about a world stabilized at 1.5 C without there being an extensive discussion of the comparative situations for various stabilization levels. How is it that the scientific community is seemingly accepting a prospective world 1.5 C warmer than present for the long-term? [Michael MacCracken, United States of America]	Noted: text makes clear this is a working definition used in this report, not a recommendation.
2604	18	41	18	43	For example, Figure 1.2 indicates a substantial chance of warming exceeding 1.5°C in single months between now and 2020, but this would not constitute temperatures 'reaching 1.5°C' under our working definition. Over the period 1861–2017, the observed 20–year–average global [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
53924	18	43	18	43	20–year–average format [Monika Sikand, United States of America]	Noted: the 30-year time-period is now specified.
48306	18	49	19	8	Both spatial grid size and duration for averaging are very important to assess temperature change. The temperature change depends on the size of spatial grid and averaging time window. They show us only one data in a certain grid size (five degree resolution in HadCRUT4) in this subsection. They should show the figure which is same as Fig.1.3 except for another dataset such as GISTemp. They should also mention about how to explain annual or seasonal temperature change of observation data at each station. [Masayuki Hara, Japan]	Noted: corresponding figures with other datasets are provided in the Technical Annex

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2606	18	51	18	52	Neither the historical is nor the expected warming are spatially uniform or equally distributed across all months of the year. The warming is expected to be normally greater over land than over the oceans [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
4142	18	51	18	53	Warming has been greater over land than sea for the last 40 or so years, but was as large over sea as over land from the second half of the nineteenth century to the 1970s. It is thus not quite as obvious as the sentence beginning on line 53 implies that warming substantially greater than 1.5 deg C should already have occurred over some land regions. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: the sentence states "many" land regions, consistent with projections.
50256	18	52	18	52	ref IPCC: During the work on SROCC we had been asked to not cite IPCC in general, and to cite the corresponding chapters/authors for better guidance to the reader. [Karina VON SCHUCKMANN, France]	Obsolete. Text revised
29330	19		19		In Fig. 1.3 would suggest to indicate the threshold value 0.87deg in the colouring. In this way the regions will be visible, where the warming already exceeds this global averaged threshold compared to the preindustrial. (That would also correspond better to the text) [Borbala Galos, Hungary]	Noted: the point of the figure is to illustrate the range of temperatures in the spatial pattern of change. We think adding 0.87C would give an unrealistic impression of precision.
48358	19	3	19	3	Change 0.87°C to 0.90°C (AR5 avg replaced by "Oper5" avg) [David Clarke, Canada]	Noted: we now use the Cowtan Way dataset (the 'warmest' of all the published sets in terms of GMST change) to generate this figure.
24288	19	4	19	8	It is very confusing to seemingly in one breath discuss local and seasonal temperature change and compare it to a global-mean temperature level that is given by a global target (1.5°C). I suggest to either remove or clarify explicitly that this is not a comparison to the 1.5°C limit as included in the Paris Agreement. [Joeri ROGELJ, Austria]	Noted: we believe this figure provides useful context.
7346	19	9	19	1	In Figure 1.3 I strongly suggest showing the "December-January-February" and "June-July-August" bottom figures with the same size than the "Annual average warming" top figure. There are many small features in these figures that cannot be examined in detail in their present size. [Pedro Salvador, Spain]	Noted. Figure adjusted somewhat
10478	19	9	19	1	The font of the heading 'Regional warming in ….' should be changed for consistency. [Hong Yang, Switzerland]	Accepted.
34412	19	13		14	Annual mean regional change, decadal mean regional changes? [Nathan Gillett, Canada]	Noted: we have clarified it refers to the decadal mean
2608	19	15	19	16	White grid–boxes indicate that more than 50% of the data is missing. Stippling indicates that the regression relationship [Christophe Deissenberg, Luxembourg]	Accepted.
7850	19	16			Typo: significant, not significance [Petr Zavialov, Russian Federation]	Accepted.
13030	19	16	19	16	Replace "significance" with "significant". [Eleni Kaditi, Austria]	Accepted.
17212	19	16	19	16	Replace "significance" with "significant". [David Schoeman, Australia]	Accepted.
17214	19	16	19	17	Here and elsewehere. The unstated assumption here is that there is no temporal autocorrelation in the time series. If there were, there would be an elevated risk of Type-I error. This would mean that using alpha = 0.1 is pretty generous indeed (the actual alpha would be substantially larger). [David Schoeman, Australia]	Accepted: Stippling has been omitted: this is not a detection figure, but an illustration of the pattern.
51224	19	16	19	16	In …….statistically significance at the 10% …. "significance" may be replaced by "significant". [Muhammad Latif, Pakistan]	Accepted.
56188	19	16	19	16	Change "significance" to significant. [Annika Herbert, Australia]	Accepted
49342	19	2	19	24	The authors corrently describe the forested ecosystems but they do not mention riparian and deltaic ecosystems that are linked to forested ones. Also perhaps more references are required [Spyros Schismenos, China]	Accepted: the paragraph on impacts has been removed.
17946	19	22			The section 1.2.3. is unable to explain the link between emissions and radiative forcing. The section is highly technical at many places making it difficult to understand. The authors should either avoid using new terminologies or give some explanation e.g., what does thermal adjustment time mean [Andrea TILCHE, Belgium]	Accepted: section 1.2.3 has been moved to the Technical Annex
34414	19	23			What is the confidence in this increased rate of human-induced warming since 2000? Figure 1.2 is a figure created for this report, and even in that the change in the rate of warming is not so clear. Cite some other supporting literature. [Nathan Gillett, Canada]	Noted: we have added material, and in the Technical Annex
44800	19	23	19	23	since 2000 --> since 1975? The change of increasing rate seems to start in 1975 in Fig. 1.2. [Hiroaki Kondo, Japan]	Agreed. Text moved to technical summary, and numbers clarified.
50546	19	23	19	25	When quoting warming rates from Haustein 2017, we could really do with the uncertainties on these estimates. [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Text moved to technical summary, and numbers clarified.
2610	19	25	19	25	changes in diverse climate forcers, [Christophe Deissenberg, Luxembourg]	Moved to technical appendix.
7852	2				Fig. 1.4: Emissions of CO2 are given in gT/yr, and those of CH4 and NO2 in Tg/yr, which makes it difficult to compare them. Can same units be used in all panels? [Petr Zavialov, Russian Federation]	Noted. Moved to technical appendix. Units used here as the common units for the different constituents, and thus inconsistent.
34416	2				Is ozone included in Other GHGs here? Tropospheric ozone has a larger positive radiative forcing than N2O (see e.g. IPCC AR5 WGI Fig 8.15). [Nathan Gillett, Canada]	Noted. Tropospheric ozone has much shorter lifetime and thus is not included.
53612	2		2		Figure 1.4 (b) The legend of blue line is missing [AKM SAIFUL ISLAM, Bangladesh]	Noted. Blue line removed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2612	2	1	2	6	Most studies partition anthropogenic climate forcers into two groups according to their lifetime. Long–lived climate forcers LLCFs) such as CO2 and others (nitrous oxide, sulphur hexafluoride and some halogenated gases e.g.) contribute to forcing over decades and centuries, short-lived climate forces (SLCFs) such as halogenated gases, ozone precursors and aerosols contribute to forcing over one to several years. Methane is considered either as a LLCF or a SLCF (Bowerman et al., 2013; Estrada et al., 2013; Heede, 2014; Jacobson, 2010; Kerr, 2013; Lamarque et al., 2011; Saunois et al., 2016a; WMO, 2015). In this report we define methane as a we treat methane as a SLCF since its lifetime is comparable to or shorter than the thermal adjustment time of the climate system (Smith et al., 2012). [Christophe Deissenberg, Luxembourg]	Noted. Moved to technical appendix.
57270	2	1	2	1	lifetime in the atmosphere? [Hans Poertner, Germany]	Agreed. Text changed.
38762	2	2	2	2	Not sure if we need this new concept LLCF - even if it fits with the SLCF concept. There are no other LL forcers than the Long lived GHGs and therefore we may use the existing concepts. [Jan Fuglestvedt, Norway]	Noted. Decision made to use SLCF.
5838	2	3	2	5	I doubt you intend to imply that aersols have lifetimes of several years (except for the special case of volcanic aerosols injected into the stratosphere). [Peter Thorne, Ireland]	Agreed. Text changed.
31834	2	4	2	4	AR5 uses NTCF not SLCF. I personally prefer the latter, but I think some clarification is needed here that they are (presumably) assumed to be the same [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Decision made to use SLCF.
57512	2	4	2	4	should say "SLCFs" [Hans Poertner, Germany]	Noted. Moved to technical appendix, but editorial change not agreed to.
5840	2	7	2	9	I would at least mention that the main extinction pathway in the atmosphere for methane is to CO2 via oxidation. This seems important in the context of swapping a relatively potent GWP gas to a less potent but much longer lived one. [Peter Thorne, Ireland]	Noted. No space to include.
3182	2	1	2	1	For panel B of figure 1.4, for th carbon intensity were nominal values of $US used? It should be clear if these are normalised to a specific year. [Vassilis Daioglou, Netherlands]	Noted. Line removed.
44802	2	1	2	1	The vertical axis for carbon intensity is shown in right side of Fig.1.4b, however, there is no explanation for this in the legend. [Hiroaki Kondo, Japan]	Noted. Line removed.
51226	2	1	2	1	Figure 1.4 (b) Carbon intensity will be more meaningful if the $US is translated to a specific year ($ of 2000 or 2016). If it is already $ of some constant year, then the year may be mentioned. [Muhammad Latif, Pakistan]	Noted. Line removed.
51444	2	1	2	1	Fig 1.4 upper panel: change order of gases so that CO2 is the uppermost one: this would make it easier to see that there is much less change in the RF of the other gases. [Astrid Schulz, Germany]	Noted. Text moved to technical summary, but CO2 left in the middle of the plot, as allows flow better.
51564	2	1	2	1	Is it possible to make it more clear that this is the rate of emissions rather than the more commonly seen total amount present? The distinction is surprisingly easy to miss, but incredibly important. This is exacerbated by putting carbon intensity on graph (b), which seems better suited to its own graph. [Jason Donev, Canada]	Agreed. Moved to technical appendix and carbon intensity removed.
51566	2	1	2	1	The graphs b, c and d are misleading because they start at a strange number, a somewhat arbitrary number in fact, this is a little misleading to the eye for how much the rates have grown. [Jason Donev, Canada]	Noted. Moved to technical appendix, but editorial change not agreed to.
51568	2	1	2	1	There are too many things going on with the second graph in this set (graph (b)), it's hard to figure out what it means. Having an axis on the right side and the left side is too much. [Jason Donev, Canada]	Agreed. Moved to technical appendix and carbon intensity removed.
57272	2	1	21	5	Explain carbon intensity in panel b in the figure caption [Hans Poertner, Germany]	Noted. Line removed
61722	2	1	2	14	I think that the figure should also show the trends in observed atmospheric concentrations (to provide a comprehensive overview of changes which have occurred since 2012, as assessed in the AR5 WGI report), and should provide a representation of the uncertainties associated with GHG emissions and with the estimated RF (to ensure coherency with the same outcomes in the AR5 report). [Valérie Masson-Delmotte, France]	Noted. Figure moved to technical summary, and additional information ,as requested by reviewer was not included as would make figure unreadable.
87	2	11	2	12	Caption for Fig. 1.4 (a) should add "Other GHG" and "aerosols" to existing 3 GHG's shown to jive completely with notation on Figure itself. [Paul Doyle, Canada]	Noted. Moved to technical appendix, but editorial change not agreed to.
19102	2	11	2	12	Emissions for CO2 (at least) plotted here are fossil-fuel and industry emissions, not all anthropogenic emissions that also include LULUCF emisions. [Olivier Boucher, France]	Noted. No space to include.
31836	2	11	2	11	Panel (a) needs to state what period the radiative forcings are relative to. 1850 or the mean of 1850-1900? This is a general comment elsewhere in the chapter where forcing is stated apparently (sorry if I miss) without clearly stating the reference period [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Figure moved to technical summary and clarification included.
31838	2	11	2	11	I personally feel that concentrations as well as, or instead of, emissions would be more useful, as these map on to forcings better. Also, I would say emissions are largely a human construct, while concentrations are a well-observed quantity. This may be particularly important for CH4 if, as some propose, the kick in its concentrations in recent years may be at least partly due to climate variations/feedbacks, or changes in lifetime, and therefore not directly due to anthropogenic emissions of CH4 themselves. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted. No space to include.
45706	2	11	21	5	The scale "Carbon intensity" from Figure 1.4 b needs definition in the figure caption; CH4 and N2O are shown in panels c and d, there is no panel e [Astrid Kiendler-Scharr, Germany]	Agreed. Moved to technical appendix and carbon intensity removed.
57666	2	11	21	5	figure caption not self-explanatory with respect to terms and methods, [Hans Poertner, Germany]	Agreed. Figure moved to technical summary and clarification included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31840	2	13	2	13	I am the corresponding author on the Etminan paper, and I would like to urge some caution here - I believe that the methane forcing should be used with caution until it is properly assessed by the equivalent to Chapter 8 of IPCC WG1. At the present time, there are no other published papers that support or contradict their methane revision. In the context of this chapter it is not a big issue. Also note that this paper does not present forcings for the "Other GHGs" shown in (a) [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted. No space to include.
50258	2	14	2	14	ref. ECLIPSE data [Karina VON SCHUCKMANN, France]	Agreed.
45566	21		21		When talking about methane and other carbon sources I find necessary including those retained at the moment in permafrost, as it is starting to be released and represent an important source of greenhouse gases. [Adela M Sánchez-Moreiras, Spain]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
36364	21	1			Please, write (JRC, 2011), instead of (Joint Research Centre, 2011) (as it appears in the References on page 68. [Emilio Cerdá, Spain]	Agreed.
1566	21	6	21	14	CO2, methane, and nitrous oxide are the most prominent contributors of anthropogenic radiative forcing. Please clarify to state that they are the most prominent gas-phase contributors and that black carbon, not methane, is the 2nd-leading cause of global warming after CO2 in terms of radiative forcing. (1) Jacobson, M. Z., Strong radiative heating due to the mixing state of black carbon in atmospheric aerosols, Nature, 409, 695-697, 2001; (2) Bond, T.C., S.J. Doherty, D.W. Fahey, P.M. Forster, T. Berntsen, O. Boucher, B.J. DeAngelo, M.G. Flanner, S. Ghan, B. Karcher, D. Koch, S. Kinne, Y. Kondo, P.K. Quinn, M.C. Sarofim, M.G. Schultz, M. Schulz, C. Venkataraman, H. Zhang, S. Zhang, N. Bellouin, S.K. Guttikunda, P.K. Hopke, M.Z. Jacobson, J.W. Kaiser, Z. Klimont, U. Lohmann, J.P. Schwarz, D. Shindell, T. Storelvmo, S.G. Warren and C.S. Zender, Bounding the role of black carbon in the climate system: A scientific assessment, J. Geophys. Res., 118, 5380-5552, doi: 10.1002/jgrd.50171, 2013 [Mark Jacobson, United States of America]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
8938	21	6	21	14	The sum of all "positive" (i.e. warming) forcings is 126%, which is quite awkward. I think you substract the 27% "negative" (i.e. cooling) forcing of aerosols to reach 100%. However, I find the calculation irritating. At least, the facts as I have formulated them in this comment should be spelled out in the text. [Heike Huebener, Germany]	Agreed. Text moved to technical summary and clarification included.
34418	21	6		7	Tropospheric ozone is a more prominent contributor to anthropognic radiative forcing than N2O, but it isn't shown on the figure or listed here (see e.g. IPCC AR5 WGI Fig 8.15). [Nathan Gillett, Canada]	Noted. Due to space considerations not added, but the figures is moved to technical appendix.
34422	21	6		39	Changes in tropospheric ozone forcing should also be discussed here. [Nathan Gillett, Canada]	Agreed. Figure moved to technical summary and clarification included.
36366	21	6		9	It´s not possible. 63%+20%+6%+37% >100%. We can see that 63%+37% =100%, but this 37% then contains not only other LLDFs such as the halogenated gases but also methane and nitrous oxide. [Emilio Cerdá, Spain]	Agreed. Figure moved to technical summary and clarification included.
42734	21	6	21	14	This paragraph neglects to mention how other SLCPs (aside from the mention of black carbon) affect the overall forcing. Also, the paragraph should include an explanation up front about how some emissions contribute to negative forcing, which will make the maths of the percentages make more sense when reading through the paragraph. [Kristin Campbell, United States of America]	Agreed. Moved to technical appendix, and numbers clarified.
42948	21	6	21	14	Cooling aerosols are co-emitted with CO2 from fossil fuel use, and are reduced when energy production is decarbonized. Some black carbon also is co-emitted. This paragraph neglects to mention how other SLCPs (aside from the mention of black carbon) affect the overall forcing. Also, the paragraph should include an explanation up front about how some emissions contribute to negative forcing, which will make the percentages make more sense when reading through the paragraph. [Durwood Zaelke, United States of America]	Agreed. Text moved to technical summary and clarification included.
44804	21	6	21	9	The ratio of anthropogenic radiative forcing contribution is shown here, but sum of CO2, methan, nitrous oxide and other LLCFs is 63%+20%+6%+37% > 100%. [Hiroaki Kondo, Japan]	Agreed. Text moved to technical summary and clarification included.
45562	21	6	21	14	I find this paragraph very confusing. Are CO2, methane and N2O responsible for 89% (63+20+6) of anthropogenic radiative forcing in 2016 but others (such as CFCs and so on) are responsible for 37% of anthropogenic radiative forcing?? These values all together give a total value of 126!?. Perhaps the sense of the data is other but the current writing of the sentence leads to confusion. [Adela M Sánchez-Moreiras, Spain]	Agreed. Text moved to technical summary and clarification included.
45708	21	6	21	14	The sum of anthropogenic forcers listed gives 126%, makae more clear that this is counteracted by cooling effect of aerosol. Why is O3 missing in this list? Similarly for the aeroosl types, why are SOA and nitrate not mentioned here? [Astrid Kiendler-Scharr, Germany]	Agreed. Text moved to technical summary and clarification included.
51570	21	6	21	14	It's a little confusing to have 63%+20%+6% since it doesn't sum to 100%, could a parenthetical statement explain where the rest of the anthropogenic radiative forcing is coming from? With a negative forcing from aerosols, this gets further muddied. The 27% reduction is further confusing. Perhaps avoiding the percentages and using W/m2 would clarify this point? [Jason Donev, Canada]	Agreed. Moved to technical appendix, and numbers clarified.
31694	21	7	21	7	You should specify that «anthropogenic radiative forcing» is the net radiative forcing here. My understanding from Figure 1.4 is that the cooling from aerosols is included in this estimate. [Borgar Aamaas, Norway]	Agreed. Text moved to technical summary and clarification included.
38764	21	8	21	9	The PFCs are missing. [Jan Fuglestvedt, Norway]	Agreed. Text moved to technical summary and clarification included.
38766	21	8	21	9	CFCs have indirect colling effects; see ch8 in WGI AR5. [Jan Fuglestvedt, Norway]	Agreed. Text moved to technical summary and clarification included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
460	21	9	21	9	Other LLCFs' (such as CFCs) are here stated as being responsible for 37% of anthropgenic radiative forcing. I would ask the authors to check this figure as it seems very high (should be more like 12% I think) and fails to add up with the relative forcings of CO2, CH4 and N2O. It may be the this LLCF category is somehow encompassing negative forcings too? Either way, I suggest this is checked and clarified if necessary. [David Reay, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Text moved to technical summary and clarification included.
7138	21	9	21	9	This value of 37% seems uncorrect (or needs explanation ….) [Jean Jouzel, France]	Agreed. Text moved to technical summary and clarification included.
8578	21	9	21	9	responsible of should be "responsible for" [Pauline Midgley, Germany]	Agreed.
40048	21	9			Shouldn't this share be 11% (remaining from the other shares above)? [Aziz ELBEHRI, Italy]	Agreed. Moved to technical appendix, and numbers clarified.
53746	21	9	21	9	are responsible for [Patrik Winiger, Netherlands]	Agreed.
2614	21	1	21	12	Emissions such as black carbon and sulphur dioxide form different types of aerosol particles which interact with short – and long – wave radiation and alter clouds. The resulting net aerosol radiative forcing is spatially inhomogeneous and uncertain. It is estimated to have reduced [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
7348	21	1	21	11	Black carbon are primary particles whereas sulphur dioxide is the gaseous precursor of sulphates that are secondary particles. Hence, in my opinion the meaning of this sentence is mistaken due to the fact that emissions of black carbon do not form different types of aerosol particles. I suggest replacing the sentence by: "Different types of aerosol particles are also present in the atmosphere which interact with short – and long – wave radiation and alter clouds. These aerosols can be primary, such as black carbon particles which are directly emitted from the sources to the atmosphere, or secondary, such as sulphate aerosols that are formed from emissions of gaseous Sulphur dioxide.". [Pedro Salvador, Spain]	Agreed. Text moved to technical summary and clarification included.
53748	21	1	21	11	This sentence is incomplete and incorrect (Emissions such as black carbon and sulphur dioxide form different types of aerosol particles, which interact with short – and long – wave radiation and alter clouds.) and I do not know what the authors try to say. Some aerosols contribute to warming (black carbon), others to cooling (SO2). I suggest to rewrite to: Emissions of different types of aerosol particles, such as black carbon and sulphur dioxide, interact with short- and long-wave radiation and alter clouds, leading to simultaneous warming and cooling effects. [Patrik Winiger, Netherlands]	Agreed. Text moved to technical summary and clarification included.
55936	21	1	21	14	This language focused on particle formation is less complete and nuanced than the language in Chapter 2. Suggest more consistent language along the lines of Ch. 2-19, for example (beginning at line 10): “Emissions such as black carbon and sulphur dioxide form different types of aerosol particles, which may be primarily warming (black carbon) or primarily cooling (SO2) depending on their interactions with short – and long – wave radiation, alterations of clouds or deposition on reflective snow and ice surfaces. The resulting net aerosol radiative forcing is therefore spatially inhomogeneous, necessitating more complex analysis based on the source and location of such emissions. Globally averaged, it is estimated to have reduced the globally averaged anthropogenic forcing by about 27% based primarily on SO2 emitted from coal-fired power plants, an effect which will disappear with phase-out of such plants and necessitating additional compensatory measures (figures from Myhre et al. (2013), [Pamela Pearson, United States of America]	Agreed. Text moved to technical summary and clarification included.
45564	21	12	21	14	The last sentence of this paragraph is not clear. It looks redundant and with confusing information [Adela M Sánchez-Moreiras, Spain]	Agreed. Moved to technical appendix, and numbers clarified.
34420	21	13			The radiative forcing in which year? [Nathan Gillett, Canada]	Agreed. Text moved to technical summary and clarification included.
38768	21	13	21	13	Add "net" before "anthropogenic" ? [Jan Fuglestvedt, Norway]	Agreed. Text moved to technical summary and clarification included.
57516	21	13	21	14	(figures from Myhre et al. (2013), updated): Are these figures to be included in this chapter or just figures in the reference you are referring to? Please revise and clarify [Hans Poertner, Germany]	Agreed. Moved to technical appendix, and numbers clarified.
2616	21	15	21	22	Since 2013, the growth of CO2 emissions has slowed down because of changes in the energy mix, mostly moving from coal to natural gas, and because of increased renewable energy generation as shown in Figure 1.4b (Boden et al., 2015). This slowdown in CO2 emission growth has occurred de-spite an increase of the global GDP growth to 3%year–1 in 2015, and thus reflects a structural shift away from carbon intensive activities (Jackson et al., 2015; Le Quéré et al., 2017). In 2016, howev-er, anthropogenic CO2 emissions reached 36.18 CO2 y–1 and have begun to grow again by 0.4% with respect to 2015 (Le Quéré et al., 2017). The global average concentration reached 402.3 ppm in 2016, which represents an increase of about 38.4% from the 1850–1900 average (290.7 ppm). [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
13032	21	15	21	17	Delete the text "because of changes in the energy mix moving from coal to natural gas and increased renewable energy generation as shown in Figure 1.4b (Boden et al., 2015). This slowdown in CO2 emission growth has occurred". [Eleni Kaditi, Austria]	Agreed. Text moved to technical summary and clarification included.
53384	21	15	21	3	Only mention of energy and CO2. No mention of deforestation & forest degradation on CO2 which has been significant. If you are going to cite detailed examples like paddy rice, etc on methane and others for N2O then include deforestation data from Dan Zarin, Richard Houghton etc Otherwise comes across as weak and unbalanced [Elizabeth Penelope Davies, United States of America]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
57514	21	17	21	17	I suggest defining GDP at first mention and using the acronym afterwards [Hans Poertner, Germany]	Agreed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51572	21	18	21	18	I think it's problematic to laud a shift from coal to natural gas from a climate change perspective. Certainly natural gas burns more cleanly than coal does from the perspective of non-CO2 pollutants (PM, NOx, SOx, Hg, etc.) but the methane emissions from using natural gas are problematic and may not make for a 'reduction in carbon intensive activities' as the text claims. [Jason Donev, Canada]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
51574	21	18	21	18	I think it's problematic to make too much of such a short period of time. The claim is made that we've leveled off our carbon emissions. There are a number of countries, like Germany and the United States, who are retiring nuclear power plants and replacing them with fossil fuel generation. This limits the efficacy of the wind and solar power being brought on-line. Previous behaviour within the graph shows that this may not be much of a hiatus as there is noise within the graph. [Jason Donev, Canada]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
3184	21	19	21	22	this sentence should be in the past tense [Vassilis Daioglou, Netherlands]	Noted. Moved to technical appendix, but editorial change not agreed to.
42736	21	19	21	22	Likelihood of having 2017 numbers in time of publication to demonstrate a continued trend of the increase? [Kristin Campbell, United States of America]	Noted. Moved to technical appendix, but editorial change not agreed to.
51450	21	19	21	2	These are not all anthropogenic CO2 emissions, but CO2 emissions from fossil fuels and industry. [Astrid Schulz, Germany]	Noted. All anthropogenic emissions included.
53282	21	19	21	2	Need units of Gt here: “In 2016, however, anthropogenic CO2 emissions are 36.18 CO2 y-1” [Mary Booth, United States of America]	Agreed.
7148	21	2	21	2	Should be useful to include the 2017 data showing a further incresese (Last GCP report) even if data are still preliminary [Jean Jouzel, France]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
7854	21	2			Typo: Gt is missing [Petr Zavialov, Russian Federation]	Agreed.
36368	21	2			Please, write 36.18 Gt CO2y-1, instead of 36.18 CO2y-1 (the units don´t appear. [Emilio Cerdá, Spain]	Agreed.
40920	21	2	21	2	Missing unit for CO2 emissions - 36.18 Gt CO2 y–1 [Neelam Singh, United States of America]	Agreed.
46376	21	2	21	2	…..anthropogenic CO2 emissions are 36.18 CO2 y–1……. Emission unit is missing. It looks "Gt CO2 y-1" [Ijaz Ahmad, Pakistan]	Agreed.
50548	21	2	21	2	begun to grow again implies a prediction that they will grow in future - I think you mean simply "grew" [Peter Stott, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
51228	21	2	21	2	In the statement "…..anthropogenic CO2 emissions are 36.18 CO2 y–1……." the physical units of CO2 is missing and need to be mentioned. Figure 1.4 shows that it is "...Gt CO2 y-1…". [Muhammad Latif, Pakistan]	Agreed.
55278	21	2	21	2	Check units [ELISA BERDALET, Spain]	Agreed.
518	21	21	21	22	Update CO2 numbers to 2017. [Robert Koppu, United States of America]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
35470	21	21	21	22	It is not clear concentration of what has reached 402.3 ppm [Ashok Sreenivas, India]	Agreed: clarified in text.
53614	21	21	21	21	The rise of CO2 since 2016 was mentioned, however, influence of 2015/2016 Strong El-Nino was not discussed. [AKM SAIFUL ISLAM, Bangladesh]	Agreed.
2618	21	23	21	25	Unlike CO2, methane and nitrous oxide emissions have followed the most carbon–intensive pathways described in AR5 (Saunois et al., 2016b; Thompson et al., 2014). However, the current trends in methane and nitrous oxide emissions are not driven in the same way by human activities. About 60% of the [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix and carbon intensity removed.
17948	21	23	21	24	It is not clear from the figure that methane and nitrous oxide have followed a more carbon intensive path. Also the sentence needs to be rephrased. What does it mean for methane to be "carbon intensive"? please calrify. [Andrea TILCHE, Belgium]	Agreed. Moved to technical appendix and carbon intensity removed.
2620	21	25	21	25	What does "in the same way" mean here? [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
43998	21	25	21	3	I don't understand the difference between the two groupings. Both are linked to human activities. [Carl-Friedrich Schleussner, Germany]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
51576	21	25	21	28	It's a little confusing to have 60% of methane and then 40% of nitrous oxide emissions in the same paragraph, they coincidentally sum to 100%, even though they aren't exactly related. This could be addressed by explicitly saying where the other 40% and 60% respectively come from. [Jason Donev, Canada]	Agreed. Moved to technical appendix, and numbers clarified.
57668	21	25		29	Sentence reads as if industrial processes and agriculture are no human activities? [Hans Poertner, Germany]	Noted. Text moved to technical summary, and this point is clear.
13034	21	26	21	27	Delete the text "e.g. ruminants, rice agriculture, fossil fuel exploitation, landfills and biomass burning,". [Eleni Kaditi, Austria]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
2622	21	29	21	29	It is thus more complicated to link the rates [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
13036	21	29	21	3	Delete the text "It is thus more complicated to link rates of emissions to economic trends or energy demands than is the case with CO2 (Peters et al., 2011).". [Eleni Kaditi, Austria]	Agreed.
40046	21	31			See also the FAO publication on GHG estimates for agriculture in developing countries [Ref: FAO, 2015. Estimating Greenhouse Gas Emissions in Agriculture A Manual to Address Data Requirements for Developing Countries. Food and Agriculture Organization of the United Nations, Rome, 2015] [Aziz ELBEHRI, Italy]	Noted. Text moved to technical summary and due to space considerations is not added to figure or text.
45710	21	31	21	39	The statement that anthropogenic N2O emission projections are covered in US-EPA only is inconsistent with Figure 1.4 showing EDGARv4.2 time series as well. Also the effect of of economic crises on both CH4 and N2O seems to appear in EDGAR data only, please specify respective statement. [Astrid Kiendler-Scharr, Germany]	Noted. Projections are for beyond 2015, which are not included in Figure.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2624	21	32	21	32	Figure 1.4. The EDGARV4.2 [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
4144	21	33	21	33	It is normal to quote a range from the smaller number to the larger number, so "between 392.87 and 378.29" looks odd. Perhaps one of the numbers has been mistyped. Also, given the range, perhaps the numbers could be rounded to one decimal place. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Moved to technical appendix, and numbers clarified.
2626	21	34	21	35	compared to the 2015 emissions. However, the livestock emissions in these databases are likely underestimated [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
2628	21	38	21	38	i.e. an increase of about 1% compared to 2016. [Christophe Deissenberg, Luxembourg]	Agreed. Moved to technical appendix, and numbers clarified.
5498	21	38	21	39	The relation between three economic events and the different N2O and CH4 data sets appears inconsistent between data sets. Suggest clarifying proof for this point, or remove this sentence. [Haroon KHESHGI, United States of America]	Agreed.
55938	21	39	21	39	Add, "In addition, some "natural" emissions respond to anthropogenic forcing, for example release of CO2 and methane from permafrost thaw." [Pamela Pearson, United States of America]	Agreed
330	21	42	24	41	It should also emphasize that the various climate models gave the different years of 1.5?. [Zong-Ci Zhao, China]	Noted. We revised the text that mentions there are different pathways to achieve 1.5C target.
71	21	44	22	9	The text needs to frame also how 1.5C consistent pathways deal with relevant climatic uncertainties, most notably that of climat sensitivity. In my understanding, the framing used in the report is that a pathway is said to reach the defined targets with some probability, e.g. 50% or 66%. Also alternative approaches exist to this chance-constrained method, which should be noted here to broaden the discussion. Risk-cost analysis expands this by considering the trade-off between added certainty to meet the targets and additional costs (e.g. Neuberschet al., Climatic Change 126, 2013). Adaptive strategies with learning can, in principle, be used to meet targets with certainty (e.g. Webster et al., Climatic Change 89, 2008; Ekholm, Climatic Change 127, 2014). [Tommi Ekholm, Finland]	Noted. Text is revised. Uncertainty is also discussed here. Risk and cost analyses are assessed in the later sections and chapters.
2630	21	44	22	9	The Paris Agreement does not associate a specific temperature pathway to the 2100, 1.5°C temperature goal. Therefore, this report needs to classify temperature pathways potentially consistent with 1.5°C in 2011. Three broad categories of pathways, associated with very different emissions and impacts, are considered: (1) pathways remaining below 1.5°C (including pathways that reach 1.5°C but do not exceed it modulo the natural climate variability); (2) pathways exceeding 1.5°C temporarily (i.e., for at most a few decades before 2100); and (3) pathways permanently exceeding 1.5°C (i.e. with a very low probability of returning to 1.5°C under any policy within a relevant timescale). Although not exhaustive, these three categories can be used to broadly characterise the mitigation options and impacts associated with 1.5°C pathways over the 21st century. Note that they do not consider elements such as the rate of warming in 2100, although this rate is highly relevant for impacts after 2100. [Christophe Deissenberg, Luxembourg]	Noted. The paragraph is revised.
9662	21	44	21	46	1.5c can't be yet labeled as a temperature goal for the Paris Agreement. [Mustafa BABIKER, Sudan]	Accepted. The sentence is deleted.
24290	21	44	21	45	The first sentence is rather confusing than helpful in introducing this topic. I suggest to delete it as it is entirely unnecessary for introducing various pathway types. [Joeri ROGELJ, Austria]	Accepted. The sentence is deleted.
49364	21	45	22	5	I think it important to clarify how they are directly relevant to (or closely follow) the Agreement text and what are assumed for scientific analyses. First, it is certainly commonly interpreted in the scientific community (e.g. Geden und Löschel, 2017) that the Agreement text is open to the possibility of overshoot. But the Article 2.1 states: “Holding the increase in the global average temperature to well below 2°C above pre-industrial levels …”, which does not seem to allow overshoot if taken literally. Second, the timescale to 2100, which is assumed in overshoot pathways, is indeed consistent with the emission goal in the Agreement text, but the temperature targets are not accompanied by any provision of timescale. Geden O, Löschel A (2017) Define limits for temperature overshoot targets. Nature Geoscience 10 (12):881-882. doi:10.1038/s41561-017-0026-z [Katsumasa Tanaka, Japan]	Noted. The sentence is deleted.
55940	21	47	22	9	While it may not be possible given the stated constraint of timescale to 2100, this seems limiting of overshoot scenarios to "at most few decades" seems unrealistic for this category, especially given that all RCP scenarios but 2.6 have overshoot or rising temperatures through about 2300. Current NDCs commit to substantial overshoot of many decades even with an expressed desire to return to 2.0 degrees. Some language on longer overshoot periods above 1.5 or 2.0 degrees would be useful here, consistent with Ch, 2 that notes the possibility of "centuries." [Pamela Pearson, United States of America]	Noted. We revised the text including a phase "the trajectory of climate change after 2100 is also important."
30742	21	49	22	5	Could the three categories be given as bulletpoints? It is a rather long sentence with semicolumns, brackets for each category, etc… I find it difficult to keep track on the categories. [Érika Mata, Sweden]	Editorial. The paragraph is revised.
38770	21	49	22	5	I suggest you separate the three points made by i, ii and iii. And check for consistency in presnetation of these three across the report. [Jan Fuglestvedt, Norway]	Editorial. The paragraph is revised.
14178	22		24		This is a much improved description of how scenarios and pathways are used in the report as it doesn't lock in just one definition/interpretation of the terms. [Silvia Serrao-Neumann, Australia]	Noted.
598	22	3	22	4	it is not understandable to include pathways permanetly exceeding 1.5 C here. In addition, the following explanation in the parenthesis for this term does not make sense. [Ken'ichi Matsumoto, Japan]	Accepted. The sentence is revised.
57274	22	7	22	7	Impacts is not the correct term here [Hans Poertner, Germany]	Accepted. The sentence is revised.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
50260	22	9	22	9	… but exceptions are possible in principle: this is veyr vague and should be expressed through IPCC uncertainty language [Karina VON SCHUCKMANN, France]	Taken into account. The sentence is deleted.
7168	22	11	22	15	This paragraph is too narrow. This report also uses the terms development pathways and adaptation pathways. [Petra Tschakert, Australia]	Noted. The paragraph is deleted. Pathways such as "Development pathways" and "adaptation pathways" are explained in Cross-Chapter Box 1.1.
8940	22	11	22	17	I strongly appreciate the usage of clear terinology with respect to scenarios versus pathway. You should stick to it in the following paragraph and change "temperature scenarios" to "temperature pathways". [Heike Huebener, Germany]	Taken into account. The paragraph is revised.
50262	22	11	22	12	Proposition to cut don: change to: " In this report, pathways will be used to … [Karina VON SCHUCKMANN, France]	Noted. The paragraph is moved to Cross-Chapter Box 1.1. The phrase is revised.
55280	22	11	22	11	Highlight this. [ELISA BERDALET, Spain]	Noted. The paragraph is moved to Cross-Chapter Box 1.1, because there is similar explanation in CC Box 1.1.
38772	22	14	22	14	I suggest inserting "set of" before "underlying" [Jan Fuglestvedt, Norway]	Noted. The paragraph is deleted. Scenarios and pathways are explained in Cross-Chapter Box 1.1.
2632	22	17	22	24	Figure 1.5 illustrates the three categories of temperature pathways and the associated annual and cumulative emissions of CO2, assuming that the net impact of other climate forcers is 1) either negligible; or 2) can be expressed in terms of the equivalent amount of CO2 emissions that would have the same impact as the other forcers (non–CO2 forcing is discussed in Section 1.2.4.5). While many impacts respond to the GMST change shown in the large panel, some such as the sea level rise respond to the cumulative or integrated temperature, meaning the rate of change of the impacted variable scales with GMST. introduces different timescales of response, shown in the lower right panel. [Christophe Deissenberg, Luxembourg]	Noted. The paragraph is revised.
50264	22	17	22	17	categories of temperature scenarios: is better described as "temperature pathways" as introduced before? [Karina VON SCHUCKMANN, France]	Taken into account. The paragraph is revised.
3186	22	2	22	21	Text in brackets has a mistake, perhaps the "in" should be removed [Vassilis Daioglou, Netherlands]	Editorial. The phrase is deleted.
8580	22	2	22	21	forcing in discussed should be "forcing is discussed" [Pauline Midgley, Germany]	Editorial. The phrase is deleted.
36370	22	2		21	Please, write "forcing is discussed in", instead of "forcing in discussed in". [Emilio Cerdá, Spain]	Editorial. The sentence is deleted.
38774	22	2	22	2	in --> "is" [Jan Fuglestvedt, Norway]	Editorial. The phrase is deleted.
56190	22	2	22	2	Change "in" to "is". [Annika Herbert, Australia]	Editorial. The phrase is deleted.
57518	22	2	22	2	should say "IS discussed" [Hans Poertner, Germany]	Editorial. The phrase is deleted.
688	22	21	22	23	While many impacts respond to GMST change shown in the large panel, some such sea level rise respond to cumulative or integrated temperature, meaning the rate of change of the impacted variable scales with GMST. 'some such 'as' seal level rise 'as' inserted [Robert Shapiro, United States of America]	Editorial. "as" is inserted.
8582	22	22	22	22	some such sea level rise presumably should be "some such as sea level rise" [Pauline Midgley, Germany]	Editorial. "as" is inserted.
8942	22	22	22	22	some such sea level rise -> "some such as sea level rise" [Heike Huebener, Germany]	Editorial. "as" is inserted.
55942	22	22	22	23	Add, "Some responses, especially in polar regions also arise with peak and/or regional temperatures, for example accelerated loss of multi-year sea ice or permafrost thaw, associated with singualr extreme events but with long-term impacts." Slight editorial - note "such AS" needed line 22. [Pamela Pearson, United States of America]	Noted. This is a framing chapter, so the details are assess in the following chapters. Accepted. "such" is changed to "such as".
56192	22	22	22	22	Change to "such as sea level". [Annika Herbert, Australia]	Editorial. "as" is inserted.
5500	22	26	24	39	I generally find this box useful, but it could be improved and possibly shortened. After the first paragraph which says the focus is on this report not various uses in the literature, it would be clearer to start with the section on page 24 on this report. The term climate scenario is sometimes used in this box in place of the many types of scenarios considered (emissions, temperature, climate, ...); for example, a climate projection from an emission scenario would be different than a climate scenario used in impacts assessment. Perhaps most important, it seems that scenario and pathway are used interchangeably in this report whereas this box explains them as different. Suggest that this box be consistent with the use of scenario and pathway across the report. [Haroon KHESHGI, United States of America]	Taken into account. The box is restructured.
10480	22	26	24	39	The text in Box 1.1 is too long. Should be shortened by deleting the text not directly related to this special report. [Hong Yang, Switzerland]	Noted. We restructured the box by considering the readability.
17950	22	26			The Box 1.1 needs substantial simplification and shortening [Andrea TILCHE, Belgium]	Noted. The box is restructured.
38776	22	26	24	39	I suggest that it is explained why the time frame is usually until 2100. [Jan Fuglestvedt, Norway]	Noted. We explain it in the first paragraph of Sec. 1.2.3 of the final document which is also revised.
44806	22	26	24	39	The definition of the terms of 'senario' and 'pathway' are written in the cross-chapter box 1. And the term 'narratives' is used sometimes in this report, however, this term is unclear particularly for non-native speaker of English. It is helpful to add the definition of 'narratives' here or in the Glossary. [Hiroaki Kondo, Japan]	Accepted. "Narratives" is defined in Glossary.
50460	22	26	23	52	In comparison with the subsequent section on p. 24, the description of pathways and scenarios in box 1.1, pages 22-23, is very densely packed with numbers, abbreviations, jargon and references. Consider reformulating in a more reader-friendly manner, especially as this box is instrumental in clarifying a central concept of the report. [Ina Möller, Sweden]	Taken into account. The box is restructured.
57670	22	26	24	39	While being very informative one wonders whether the historical overview of scenarios might be better placed in the main AR6 report or the OSM, keeping the section from p. 24, l. 1 onward in the chapter. [Hans Poertner, Germany]	Noted. We restructured the Box. But we explained the historical overview of scenarios that, we think, is important.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
58274	22	26	24	39	This is an excellent box in an excellent chapter. I have two requests, one specific, one general. Speciic: can we not use "pathway" in the definition of "pathway" page 23, line 7; and general: can we state speciicially, the substantail aspects of the use of scenario and pathway in this report. That is in addition to the specific technical references on page 24, lines 1-39, it is possible to state that scanarios are, for example, used in the sense of "consistent, plausible and integrated descirptions of possible futures..." and the pathways are, for example, "solution oritned scenarios"? (if that is how they are being used, which is seems like to me). Otherwise, I. am left with a wide variety of definitions used (as per the literature review). [Peter Marcotullio, United States of America]	Noted. The box is restructured.
2634	22	31	22	33	The sole objective of this box is to frame how climate scenarios and pathways are used in this report. We do not to discuss all definitions of scenarios and pathways encountered in the climate research literature (Rosenbloom, 2017). [Christophe Deissenberg, Luxembourg]	Noted. The box is revised.
49366	22	31	22	33	This box can start with a statement like “scenario is practically interchangeably used with pathway (for example, emissions scenarios and emissions pathways)”. It is in fact stated on line 11 on the same page. Without this statement in the box, as the reader goes through the box, readers would continue to wonder what the differences between these two terms are. There is no difference that can be clearly defined. These two terms are used in different places and often interchangeably. [Katsumasa Tanaka, Japan]	Taken into account. We restructured the box. The definitions of scenario and pathways moved in the latter part of the box. However we inserted "interchangeably" as "scenarios and pathways are terms that are sometimes used interchangeably,..."
30744	22	33	22	33	I do not understand what to expect from reference Rosenbloom (2017), all definitions within the climate research literature? If so, could it be stated specifically? [Érika Mata, Sweden]	Noted. The sentence is revised.
30750	22	43	22	43	Does the sentence refer to this SR only? If not, one could argue that climate scenarios are used for any sort of climate-related assessment but not restricted to climate policy choices. [Érika Mata, Sweden]	Noted. Although climate scenarios can be used for any sort of climate-related assessment, the climate scenarios that are focused here such as SRES, RCP and SSP are originally developed for analysing and constructing climate policy choices.
30754	23	3	23	3	Unclear if "the new scenario framework" is this SR, the two references given or the literature in general. [Érika Mata, Sweden]	Taken into account. "new" is deleted.
4770	23	1	23	1	Need to capitalize "Earth" and no need for hyphen. Consistency across chapter is needed. [Michael MacCracken, United States of America]	Editorial. The phrase is deleted.
50266	23	1	23	1	Earth system [Karina VON SCHUCKMANN, France]	Editorial. The phrase is deleted.
50268	23	11	23	11	The IPCC 5th Assessment Report of Working group II presented… [Karina VON SCHUCKMANN, France]	Editorial. The phrase is deleted.
38782	23	13	23	15	This sentence seems unconnected, and may be deleted. [Jan Fuglestvedt, Norway]	Noted. The text is revised. "climate-resilient pathways" is important to understand "sustainable development pathways".
38778	23	15	23	15	I don't understand why "negotiated" is used here. [Jan Fuglestvedt, Norway]	Noted. The text is revised.
54472	23	17	23	18	Adaptation pathways are more than just choices involving trade–offs between short–term and long goals and values; they involve choices among human adaptation processes themselves. These processes are multiple and contingent and often full range of human adaptation strategies are not considered in policy because of worldviews and values (cf. Thornton and Manasfi 2010) [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Adaptation pathways involve choices among human adaptation processes themselves. This could be also included in the choices stated here.
13434	23	18	23	18	Omit: 'and values' [Sergio Aquino, Canada]	Rejected. This phrase comes from the reference.
30758	23	22	23	52	Could these detailed descriptions of "scenarios" be moved up, before the "pathways"? In the begining of the box, the definitions of both scenarios and pathways are presented - in that order - but then their corresponding details are given in the opposite order, i.e.for pathways first. [Érika Mata, Sweden]	Noted. The box is restructured.
39510	23	23	23	24	The sentence "The SRES scenarios (named after the IPCC Special Report on Emissions Scenarios; IPCC, 2000), published in 2000, consist of four scenarios..." seems to be redundant. Consider to modify its wording. [Hernan Edgardo Sala, Argentina]	Rejected. We think the phrase (named after the IPCC Special Report on Emissions Scenarios; IPCC, 2000) is important, as the naming of other scenarios comes from its meaning, but SRES is not.
53750	23	29	23	29	fix the superscript of the "-" sign in 2.6 Wm^-2 [Patrik Winiger, Netherlands]	Editorial. The format is corrected.
17952	23	36	23	52	Advise deleting this since SSP have been introduced in the previous para and therefore spending so much space on SSP is not needed. [Andrea TILCHE, Belgium]	Noted. The paragraphs is shorted. As the SSPs are used across chapters, we think it is important to introduce SSPs in the cross-chapter box.
57932	23	45	23	45	The word "levels" may be inserted at the end of the phrase "RCP2.6 to explore pathways limiting warming to 1.5°C above pre–industrial (Rogelj et al., 2017)" to read "RCP2.6 to explore pathways limiting warming to 1.5°C above pre–industrial levels (Rogelj et al., 2017)." [Siir KILKIS, Turkey]	Editorial. "levels" is inserted.
46378	23	49	23	5	In the statement "…….mitigation scenarios will be used to drive the next round of climate change projections….", drive looks to be replaced with derive. [Ijaz Ahmad, Pakistan]	Obsolete. The sentence is deleted.
38780	23	5	23	5	I suggest changing "to be assessed" to "available for assessment". [Jan Fuglestvedt, Norway]	Noted. The sentence is deleted.
17954	24	1			This is the para of great relevance for this report. However the description fails to clearly lay down i) if the scenario nomenclature is same across chapters ii) why there is not much description of 2 C scenarios since a comparision to 2 C was indicated in the approved outline [Andrea TILCHE, Belgium]	Noted. We also have descriptions of 2 degree Celsius, although they are not many, as we focused on 1.5 degrees C scenarios and pathways in this box.
30762	24	1	24	1	The title is appreciated! Could there be a corresponding title above, e.g. "Scenarios and Pathways in the Literature"? All the way long in the Box I was wondering if the text refeered to the literature only, but it is only clear now. [Érika Mata, Sweden]	Taken into account. The box is restructured.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30778	24	1	24	39	I was expecting more clarity - and possibly a list - in this part, with respect to how all the definitions of pathways and scenarios in the literature are interpreted/made homogeneous in this SR. Also, how do the Temperature and Emission pathways relate to the numerous scenarios of the literature? [Érika Mata, Sweden]	Noted. The main objective of the cross-chapter box 1.1 to introduce scenarios and pathways used across-chapters. The box is revised.
2636	24	2	24	15	This report focusses on scenarios that could limit the increase of global mean surface air temperature to 1.5°C above pre–industrial conditions and that align with the goals of sustainable development and poverty eradication". The pace and scale of mitigation and adaptation are confronted to historical evidence to determine where unprecedented change is required (see Chapter 4). Additional scenarios are also assessed, primarily as benchmark for comparing e.g., impacts, mitigation and/or adaptation requirements. They include baseline scenarios that assume no climate policy; scenarios that assume that the current climate policy trends and plans will continue in some form and are among others useful to assess the implications of the Nationally Determined Contributions (NDCs); and scenarios limiting the increase to 2°C above pre–industrial conditions.). Regional, national, and local scenarios as well as decision–making processes over values and difficult trade–offs are important for understanding the challenges of limiting global mean temperature increase to 1.5°C and are thus indispensable when assessing implementation. The report thus covers a wide range of issues from global mitigation scenarios to local adaptation choices – complemented by a bottom–up assessment of individual mitigation and adaptation options and their implementation (policies, finance, institutions, governance, see Chapter 4). [Christophe Deissenberg, Luxembourg]	Taken into account. The box is restructured.
57934	24	3	24	4	The word "for" should be "of" in the phrase "comparison for, for example, impacts, mitigation" to read "comparison of, for example, impacts, mitigation." [Siir KILKIS, Turkey]	Noted. The sentences in Line 6 is revised.
50270	24	6	24	6	… as benchmark of, for example… [Karina VON SCHUCKMANN, France]	Noted. The sentences is revised.
50272	24	14	24	14	check overall in this chapter: remain to introduced terms; here for example change "global mean temperature" to GMST [Karina VON SCHUCKMANN, France]	Taken into account. The phrase is revised.
24292	24	17	24	21	This wording suggest that "climate resilient development pathways" are introduced in this report. This would not be the task of the IPCC. The IPCC is supposed to assess the available literature. [Joeri ROGELJ, Austria]	Noted. "climate resilient development pathways" was used in IPCC AR5 of WGII. We rephrased the explanation of the pathways.
30764	24	17	24	17	There is only a word differing between this "Climate resilient DEVELOPMENT pathways" and the "Climate resilient pathways" from the literature above presented. May this easily generate confusion? Could one think of another name? [Érika Mata, Sweden]	Taken into account. The explanation of the two pathways are rephrased.
63134	24	17	24	2	Please define "climate resilience", and "climate resilient development pathways". This seems to imply that there are ways to resist climate impacts, which are as effective, equitable, ethical, and sustainable as avoiding climate change in the first place(?!). Evidence? [Greg Rau, United States of America]	Taken into account. The explanation of the two pathways are rephrased.
17216	24	18	24	18	I would argue for dropping "for all" from this sentence. It is practically impossible to attain equitability "for all" (there will ALWAYS be winners and losers), so perhaps avoid seeming impractical by simply promoting equity and welbeing (where equity implies "for all", but avoids making an impossible-looking claim). [David Schoeman, Australia]	Accepted. The sentence including "for all" is deleted. We rephrased the explanation of the pathway.
13436	24	2	24	21	Simplify: They entail priorities about the futures we want [Sergio Aquino, Canada]	Noted. The sentence is deleted.
36372	24	2			Please, write "UN General Assembly, 2015", instead of "United Nations, 2015", as it appears in the References on page 77. [Emilio Cerdá, Spain]	Obsolete. The sentence is deleted.
50458	24	2	24	2	Please clarify who is considered 'we' in the sentence: 'They entail priorities about the futures we want and the ethics and equity dimensions of the societal transformation needed to get there' [Ina Möller, Sweden]	Accepted. The word "we" is deleted. We rephrased the explanation of the pathway.
4772	24	23	24	24	It is not just "climate risks" that are different--it is actual climate impacts and their long-term implications and commitments. I think more needs to be said than just "risks" [Michael MacCracken, United States of America]	Accepted. The sentence is modified.
4774	24	23	24	27	Why is there no mention here of the potential for climate intervention to moderate the temperature change and of CDR generally to play a role for all of these types of pathways? What we need is an integrated and comprehensive approach to the formulation of a policy; none of the approaches that are being proposed (mitigation, adaptation, CDR, regional/global climate intervention) can completely address the situation that we face, so I don't hink it appropriate to then rule out one or more by saying it can't do everything or to decide that one will only do them in succession rather than in a coordinated way with all together, etc. It seems to me that the chapter needs to have gotten to this issue of the need for a coordinated response (including CDR and SRM) by this point. [Michael MacCracken, United States of America]	Noted. "net negative emissions" are included in this paragraph. We can't introduce all measures in this short box.
30770	24	23	24	23	Should "Temperature pathways" be highlighted in Bold? [Érika Mata, Sweden]	Rejected. We restructured the Box, and decided the names of pathways under the subtitle of "Scenarios and Pathways in this report" are not highlighted in bold.
38784	24	23	24	27	This is repetition. Needed here? [Jan Fuglestvedt, Norway]	Noted. We think this paragraph is necessary to introduce scenarios and pathways assessed in this report.
2638	24	26	24	27	In the case of a temperature overshoot, net negative CO2 emissions are required at some point to remove excess CO2 from the atmosphere [Christophe Deissenberg, Luxembourg]	Rejected. As "at some point" seems obvious, we keep the current phrase.
13438	24	26	24	26	not sure what overshoot means. [Sergio Aquino, Canada]	Taken into account. The sentence is rephrased. "overshoot" is in Glossary.
50534	24	27	24	27	Based on the criticism that has been expressed towards the use of net-negative emissions for modeling pathways, it might be useful to add a sentence here explaining what the term implies [Ina Möller, Sweden]	Noted. "net negative emissions" is explained in Glossary. Because of space constraint, we do not add additional explanation.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2640	24	29	24	34	Emission pathways can also be classified as 'prospective' or 'adaptive'. Prospective pathways assume that, based on our current knowledge of the climate system response, the emissions will be consistent with a global mean surface temperature remaining with a given probability below some temperature target, e.g. a 50:50 chance of staying below 1.5°C. [Christophe Deissenberg, Luxembourg]	Obsolete. The box is restructured.
2642	24	29	24	34	IF I UNDERSTAND PROPERLY ADAPTIVE AND PROSPECTIVE PATHWAYS SHARE THE SAME GOAL, KEEPING THE TEMPARATURE BELOW A GIVEN LIMIT WITH A GIVEN PROBABILITY. THE DIFFERENCE IS THAT PROSPECTIVE PATHWAYS ASSUME AN OPEN-LOOP IMPLEMENTATION, ADAPTIVE PATWAYS A CLOSED-LOOP ONE. THIS IS NOT CLEAR WITH THE PRESENT FORMULATION. [Christophe Deissenberg, Luxembourg]	Taken into account. We rephrased the paragraph.
30774	24	29	24	29	Should "Emission pathways (prospective and adaptive)" be highlighted in Bold? [Érika Mata, Sweden]	Rejected. We restructured the Box, and decided the names of pathways under the subtitle of "Scenarios and Pathways in this report" are not highlighted in bold.
42738	24	29	24	39	Xu and Ramanathan 2017 show that the median staying well below 2ºC can keep warming to less than 1.5ºC, but the fat tail—the extension of the curve to the right—continues into the dangerous and catastrophic range, highlighting that even the best solutions still face some risk of excessive warming though far less risk than baseline scenarios that fail to include faster and much more aggressive mitigation. Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci., doi: 10.1073/pnas.1618481114. [Kristin Campbell, United States of America]	Accepted. We rephrased the paragraph and cited (Xu and Ramanathan, 2017).
42950	24	29	24	39	This discussion and the interactive graphic in Figure 1.5 do not appear to account for the potential of non-CO2 forcers to affect the near-term rate of warming, which can avoid crossing crucial tipping points and starting off feedbacks. Furthermore, Xu and Ramanathan 2017 show that the median staying well below 2ºC can keep warming to less than 1.5ºC, but the fat tail—the extension of the curve to the right—continues into the dangerous and catastrophic range, highlighting that even the best solutions still face some risk of excessive warming though far less risk than baseline scenarios that fail to include faster and much more aggressive mitigation. See Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci., doi: 10.1073/pnas.1618481114; and Report of the Committee to Prevent Extreme Climate Change (Chairs: V. Ramanathan, M. L. Molina, and D. Zaelke) (2017) Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change. [Durwood Zaelke, United States of America]	Accepted. We rephrased the paragraph and cited (Xu and Ramanathan, 2017).
45466	24	29	24	29	There is no reference to any literature here and I don't believe this is a distinction comonly made in the pathways literature. The text says that there are no adaptive pathways in Chapter 2. It is not clear whteher the distinction is in the real world or is a modelling artefact. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. We rephrased the paragraph.
50274	24	3	24	3	use GMST [Karina VON SCHUCKMANN, France]	Editorial. GMST is used.
53616	24	31	24	31	It might be more appropriate to write "50:50 or above" instead of "50:50 or two-thirds" [AKM SAIFUL ISLAM, Bangladesh]	Obsolete. As the most pathways considered in Chapter 2 as 1.5 C-consistent are those of a 50:50 or two-thirds chance of staying below 1.5C, we use the current phrase.
2644	24	34	24	39	The 1.5°C pathways assessed in Chapter 2 are prospective. Thus, they include and may indeed be dominated by the risk of a warming exceeding 1.5°C. By contrast, the 'risks of warming of 1.5°C'assessed in Chapter 3 refer to risks in a world that limits warming to 1.5°C, without (unless otherwise qualified) taking into account the fact that this might be exceeded with some probability. Therefore, these later risks can rather be understood as associated with adaptive 1.5°C pathways. [Christophe Deissenberg, Luxembourg]	Editorial. The sentences are revised.
24296	24	42	25	4	Note that Chapter 2 also assesses scenarios that keep peak warming below 1.5°C, but still peak and decline temperatures. It would be good to also introduce or at least mention that option here, with appropriate cross-references to other chapters. [Joeri ROGELJ, Austria]	Accepted. We also introduced "peak and decline" pathways in the definition of 1.5C consistent pathways.
55766	24	42	27	8	Match the item from 1.2.4.1 to 1.2.4.3 with the number of Figure 1.5 for the clarification(For example, sequence a) and b) are the example of pathway remaining below 1.5C(1.2.4.1)) [Dong-Woon Noh, Republic of Korea]	Noted. The figure is changed. And the texts are changed accordingly.
4776	24	44	24	45	How is it that "limit to 1.5" has come to mean "stabilise at 1.5"? I just do not understand how this has come to pass. There will be many more impacts at 1.5 stabilized than having 1.5 be the peak and head back down to less than 0.5 C or something. So, for me, the simplest pathway is to not exceed 1.5 and then head lower. There has been no discussion of this, and this is, in my view a seriou omission of the report, at least to this point. [Michael MacCracken, United States of America]	Accepted. The sentence is rephrased.
2646	24	44	24	52	The simplest 1.5°C–consistent pathways are those where human–induced warming rises monotonically to stabilise at 1.5°C. Because of the inertia of the climate, carbon cycle, and energy systems, the rate of human–induced warming varies slowly over decades and such paths can be achieved through emission reductions alone (Huntingford et al., 2017). As Figure 1.5 illustrates, the rate of change of CO2–induced warming is proportional to the annual CO2 emissions. Hence, postponing the reductions until the temperatures are close to the proposed limit necessitates very rapid rates of net CO2 emission reductions in the later years if one wants to remain under 1.5°C, potentially requiring active CO2 removal combined with rapid reductions in other climate forcers. [Christophe Deissenberg, Luxembourg]	Noted. The paragraph is revised.
50276	24	44	24	44	why is the terminology "consitent pathways" not introduced? [Karina VON SCHUCKMANN, France]	Noted. We introduced 1.5C-consistent pathways in the second paragraph of this section.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4146	24	45	24	46	It is stated here that the rate of human-induced warming varies slowly over decades. This appears to be contrary to what is shown earlier in Figure 1.2, in which the human-induced temperature anomaly (the yellow curve) rises much faster after about 1975 than before then. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. This is the case of pathways remaining below 1.5 degrees C. Figure 1.2 shows the case emissions are growing fast.
7140	24	45	24	45	The term inertia is applied here to temperature change while the executive summary mention that there is practically no inertia with respect to temperature. Again this is confusing ; needs clarification. [Jean Jouzel, France]	Taken into account. The expression in the executive summary is revised.
38786	24	45	24	45	I think you should say that you refer to energy system infrastructures. [Jan Fuglestvedt, Norway]	Obsolete. The sentence is deleted.
50278	24	45	24	45	the intertia of the climate system is linked to these cycles… and what is meant by "energy systems"? Suggestion: … inertia of the climate system triggered by the Earth's system carbon, energy and water cycle .. [Karina VON SCHUCKMANN, France]	Obsolete. The sentence is deleted.
3188	24	47	24	49	The order of arguments in this sentence suggests that warming is the driver of CO2 emissions, while I believe it is the opposite. Thus the sentence should instead read "CO2 induced warming is proportional to co2 emissions" [Vassilis Daioglou, Netherlands]	Noted. The sentence is revised.
38788	24	48	24	48	I suggest you intead write that CO2-induced warming is proporional to annual emissions. [Jan Fuglestvedt, Norway]	Noted. The sentence is deleted.
4778	24	49	24	51	The Executive Summary asserts that if all emissions went to zero, there would essentially be no further warming. This has not yet been discussed. In any case, it is not at all clear that this "no further warming" (or no "legacy warming") assumption would apply to how emissions cuts might be made--perhaps some emission cutback strategies would do this, but quite likely not all. I'd thus think that the statement in the text here is over-simplified; fine conceptually, but I think that there are surely complications that need to be hinted at, at least. [Michael MacCracken, United States of America]	Noted. The sentence is rephrased.
53752	24	51	24	51	potentially should be replaced by "most likely" [Patrik Winiger, Netherlands]	Obsolete. The authors think that it is "potentially".
56194	24	51	24	51	Add your definition of "climate forcers to the glossary, as it appears as if you define "climate forcers" as greenhouse gases, which is not the climatological definition. [Annika Herbert, Australia]	Accepted. The definition of "climate forcers" is added to Glossary.
34432	25				Panels a) and b) of Figure 1.5 are indistinguishable, at least at the resolution at which I printed them out. [Nathan Gillett, Canada]	Taken into account. We revised the figure.
2648	25	1	25	5	To stabilize the GMST, the net annual CO2 emissions must decline (depending on the long–term adjustment of the carbon cycle). to almost zero or slightly below. However, this is not sufficient to stabilize the complete climate system. If the other forcings are constant and positive, the CO2 concentrations and hence the radiative forcing need to decline to stabilize the GMST [Christophe Deissenberg, Luxembourg]	Noted. The sentences are revised.
2654	25	1	25	16	THE PARAGRAPH MIXES DIFFERENT CAUSES AND DIFFERENT EFFECTS. POSSIBLY A MORE TABULAR PRESENTATION WOULD HELP, SUCH AS: 1. A STABLE CO2 CONCENTRATION WITHOUT SIDE MEASURES IMPLIES (a) … (b) … 2. A FALLING C02 CONCENTRATION IMPLIES … [Christophe Deissenberg, Luxembourg]	Noted. The sentences are revised, although not in a tabular representation.
24294	25	1	25	16	Would be good to crossref the respective sections in Chapter 3. [Joeri ROGELJ, Austria]	Obsolete. This is a definition section that relates all other chapters.
37142	25	1	25	16	This paragraph is not clear and could be written in simpler terms. What is unclear is the role of SLCFs (in particular their ongoing constant nature) in drawing the quantitative conclusions in line 13. Are the direct and/or indirect effects of SLCFs included in the CO2 statement or not? [John Sweeney, Ireland]	Noted. The paragraph is revised. Line 13 is deleted.
39096	25	1	25	4	Please remember that while policy makers need to understand different pathways, they also need information on the suffering their citizens will experience if the policies fail to be ambitious enough to hold temperatures to 1.5C. This inclusion in the Paris Agreement was a political struggle, won in part because the IPCC/UNFCCC reports thus far outlined with enough clarity how people would suffer if policies allowed for an above 2C rise. This 1.5C SR is critical for policy makers to appreciate why urgent, sufficient and rights-based climate action is necessary, because failing to do so could lead to greater suffering. This is what we hope your important SR will help outline, so that non-scientists can imagine what is at stake with insufficient action. [Lindsey Cook, Germany]	Noted. The paragraph is revised.
50462	25	1	25	3	Please consider clarifying what is meant by 'stabilizing other properties of the climate system' [Ina Möller, Sweden]	Noted. Such as sea level rise.
51578	25	1	25	16	As I've stated previously, there's too much of a 'story telling' nature to this report. This section withholds whether or not there are paths. This answer must be stated clearly, cleanly and with no ambiguity (although nuance and uncertainty are needed). This report is dramatically weakened by uncommitted language. [Jason Donev, Canada]	Noted. We revised the paragraph.
47040	25	4	25	4	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Accepted. The sentence is revised.
2650	25	5	25	6	I do not understand "as shown by the cumulative emissions remaining in the atmosphere, which is proportional 6 to atmospheric concentrations," [Christophe Deissenberg, Luxembourg]	Taken into account. The sentence is revised.
34424	25	6		7	A similar statement is made several times in the chapter. It can't be true that ocean pH levels everywhere begin to recover as soon as atmospheric CO2 starts to decline. I could imagine this might be true right at the surface, but in the deeper ocean I would expect that pH would continue to decline for some time after atmospheric CO2 concentration peaks. At the depths of corals or fisheries sensitive to pH, how long is the delay - is it 1 year or 100 years? This should be discussed somewhere in the chapter, otherwise readers will be left with the impression that declining CO2 will immediately start to increase ocean pH everywhere. [Nathan Gillett, Canada]	Noted. The sentence is removed. The sentence “ocean acidification may begin to reverse” is in in Cross-Chapter Box 2.
57522	25	6	25	6	place last part of this sentence ("green line…") in parentheses [Hans Poertner, Germany]	Editorial. The sentence is changed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2652	25	7	25	11	A falling atmospheric CO2 concentrations means that the ocean pH levels would begin to recover, while a mere stabilization of the atmospheric greenhouse gas concentrations would result in continued warming, see Section 1.2.6. The sea level would continue to rise after temperatures stabilize (Kopp et al., 2016), but at substantially lower rates than under a continued warming scenario. The requirement that the CO2 emissions must reach zero to stabilise the GMST provides a simple method of taking stock of progress towards a [Christophe Deissenberg, Luxembourg]	Noted. The paragraph is revised.
34426	25	7		8	The statement that stabilised GHGs would result in continued warming is a non-sequitur - it doesn't follow from the previous text. [Nathan Gillett, Canada]	Obsolete. Stabilization of GHG concentrations would result in continued warming, as excess GHGs stay in the atmosphere.
36374	25	8			Please, write (see Section 1.2.6), instead of see Section 1.2.6. (The open parenthesis is missing). [Emilio Cerdá, Spain]	Editorial. "(" is inserted.
42740	25	8	25	1	Even though the warming effect of SLCPs is not as long lived as CO2, they can still have a lasting influence on sea-level rise for centuries. Zickfeld et al 2017 ("We show that short-lived greenhouse gases contribute to sea- level rise through thermal expansion (TSLR) over much longer time scales than their atmospheric lifetimes. For example, at least half of the TSLR due to increases in methane is expected to remain present for more than 200 y, even if anthropogenic emissions cease altogether, despite the 10-y atmospheric lifetime of this gas. Chlorofluorocarbons and hydrochlorofluorocarbons have already been phased out under the Montreal Protocol due to concerns about ozone depletion and provide an illustration of how emission reductions avoid multiple centuries of future TSLR. We examine the "world avoided" by the Montreal Protocol by showing that if these gases had instead been eliminated in 2050, additional TSLR of up to about 14 cm would be expected in the 21st century, with continuing contributions lasting more than 500 y."). [Kristin Campbell, United States of America]	Obsolete. This is a framing chapter, so the details are assessed in the following chapters.
42952	25	8	25	1	Even though the warming effect of SLCPs is not as long lived as CO2, they still have a lasting influence on sea-level rise for centuries. The forcing from non-CO2/SLCPs also contributes to other impacts, including some that are irreversible. See Zickfeld et al 2017 ("We show that short-lived greenhouse gases contribute to sea- level rise through thermal expansion (TSLR) over much longer time scales than their atmospheric lifetimes. For example, at least half of the TSLR due to increases in methane is expected to remain present for more than 200 y, even if anthropogenic emissions cease altogether, despite the 10-y atmospheric lifetime of this gas. Chlorofluorocarbons and hydrochlorofluorocarbons have already been phased out under the Montreal Protocol due to concerns about ozone depletion and provide an illustration of how emission reductions avoid multiple centuries of future TSLR. We examine the "world avoided" by the Montreal Protocol by showing that if these gases had instead been eliminated in 2050, additional TSLR of up to about 14 cm would be expected in the 21st century, with continuing contributions lasting more than 500 y."); and Solomon et al (2009) "Irreversible climate change due to carbon dioxide emissions" ("The severity of damaging human-induced climate change depends not only on the magnitude of the change but also on the potential for irreversibility. This paper shows that the climate change that takes place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop. Following cessation of emissions, removal of atmospheric carbon dioxide decreases radiative forcing, but is largely compensated by slower loss of heat to the ocean, so that atmospheric temperatures do not drop significantly for at least 1,000 years. … Thermal expansion of the warming ocean provides a conservative lower limit to irreversible global average sea level rise of at least 0.4–1.0 m if 21st century CO2 concentra- tions exceed 600 ppmv and 0.6 –1.9 m for peak CO2 concentrations exceeding 1,000 ppmv. Additional contributions from glaciers and ice sheet contributions to future sea level rise are uncertain but may equal or exceed several meters over the next millennium or longer."). [Durwood Zaelke, United States of America]	Obsolete. This is a framing chapter, so the details are assessed in the following chapters.
5426	25	9			add ocean deoxygenation, e.g.: Changes in ocean stratification, circulation, and biogeochemical cycles foster ocean deoxygenation (Schmidtko et al., Nature 2017; Breitburg et al., Science 2018). [Andreas Oschlies, Germany]	Rejected. Because of the space constraint, we cannot include other examples of climate change in this short paragraph.
1540	25	1	25	11	Should this be: "The requirement that NET CO2 emissions must reach zero …" (ie add "Net" before "CO2")? [David Wratt, New Zealand]	Noted. The sentence is deleted.
47048	25	1	25	13	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Taken into account. The sentence is revised.
42954	25	1	25	16	The closing statement of this paragraph (about the required reductions being independent of scenario) may be true in a CO2-only forcing scenario over more than a century, but it does not seem to hold true when non-CO2 forcers are considered. This is inconsistent with findings relating to the reductions of SLCPs and the connected reduction in rate of warming. At 2100, reductions of SLCPs can avoid up to 1.2ºC of warming, and 0.6C by 2050. See Xu and Ramanathan (2017); Report of the Committee to Prevent Extreme Climate Change (Chairs: V. Ramanathan, M. L. Molina, and D. Zaelke) (2017) Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change; and Haines et al (2017) "Short-lived climate pollutant mitigation and the Sustainable Development Goals". [Durwood Zaelke, United States of America]	Noted. The sentence is deleted.
38790	25	12	25	12	You may add "additional" before "warming" [Jan Fuglestvedt, Norway]	Noted. The sentence is deleted.
39094	25	12	25	15	Could you write this more plainly, so policy makers better understand what this 20% on average for every tenth degree of warming means in practical terms to policy? [Lindsey Cook, Germany]	Noted. The sentence is deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
45712	25	12	25	15	The statement "a minimum requirement for limiting future warming to 0.5°Cwithout overshoot is that CO2 emissions must fall……about 8 GtCO2, for every theth of a degree warming from now on" is unclear and needs further explanation. [Astrid Kiendler-Scharr, Germany]	Noted. The sentence is deleted.
50464	25	12	25	16	This is an important statement; consider repeating/clarifying in less technical terms [Ina Möller, Sweden]	Noted. The sentence is deleted.
53284	25	12	25	14	Lack of clarity: " a minimum requirement for limiting future warming to 0.5°C without overshoot is that CO2 emissions must fall, on average, by 20% of their present value, or about 8 GtCO2, for every tenth of a degree of warming from now on." Not clear – does this mean to to *avoid* every tenth of a degree? [Mary Booth, United States of America]	Noted. The sentence is deleted.
36376	25	13			Please, put a space between Gt and CO2. [Emilio Cerdá, Spain]	Editorial.
34428	25	14		16	The statement about CO2 emissions needing to reach zero to stabilise temperatures is not independent of scenario. For example it is not true under a scenario with ongoing emissions of other long-lived greenhouse gases such as N2O - net CO2 emissions would have to be negative to stabilise temperatures in this case. [Nathan Gillett, Canada]	Noted. The sentence is deleted.
57936	25	14	25	14	The phrase "This statement is independent of scenario" may be improved. [Siir KILKIS, Turkey]	Noted. The sentence is deleted.
2656	25	21	25	22	WHAT DO YOU MEAN EXACTLY? LOWERING THE TEMPERATURES FROM WHICH MOMENT AND FROM WHICH TEMPERATURE LEVEL ON? [Christophe Deissenberg, Luxembourg]	Noted. The sentence is revised.
4780	25	21	25	23	he statement here completely leaves off the potential for climate intervention as an option. This seems an important omission. [Michael MacCracken, United States of America]	Obsolete. This is a definition section. The potential of climate intervention such as Carbon Dioxide Removal and Reliable Sequestration is assessed in the following chapters. SRM is not included in scenarios, as it would be effective but is too early to evaluate its feasibility.
42742	25	22	25	23	Relate this information to the considerations in the previous subsection (1.2.4.1) for remaining below 1.5C. [Kristin Campbell, United States of America]	Noted. We revised sections 1.2.4.1 and 1.2.4.2.
4782	25	23	25	25	There has been no real discussion to this point of what negative emissions means, the variety of approaches and their state of development, etc. This seems a serious emission, etc. [Michael MacCracken, United States of America]	Noted. "Negative emissions" is explained in Glossary.
53934	25	23			Delete "(net anthropogenic removal of CO2)" as it limits the options to only anthopogenic -aka technological- removals, instead of enhancing natural removals or other options, such as wide spread adoption of small farmers' agreocological practices and promotion of local food markets, etc. [Elenita Daño, Philippines]	Noted. We define "Anthropogenic removals" in Glossary. It is defined that it includes increasing biological sinks of CO2 and using chemical engineering to achieve long term removal and storage.
2658	25	25	3	25	most anthropogenic climate forcers are bounded from below. Hence, the feasibility and availability of large–scale CO2 removal limits the accessible rates and levels of temperature decline. In this report, overshoot pathways temporarily exceeding 1.5C are all referred to as 1.5°C–consistent. However, they are qualified by the amount, duration and timing of the temperature overshoot, as it can have a substantial impact on sea level rise and on many irreversible climate change impacts such as coral reef loss, ice–sheet loss and species extinction. [Christophe Deissenberg, Luxembourg]	Obsolete. The texts are revised.
34430	25	25			This is true if solar radiation management is ruled out. [Nathan Gillett, Canada]	Obsolete. SRM is in early stage of development and needs further assessment of its impacts.
31696	25	26	25	3	I would like to see a more thorough discussion on what can be seen as an acceptable or unacceptable overshoot. [Borgar Aamaas, Norway]	Noted. This is a framing chapter. Because of page constraint, the detailed is discussed in the following chapters.
19474	25	27	25	3	"In this report, overshoot pathways are referred to as 1.5°C–consistent, but qualified by the amount, duration and timing of the temperature overshoot, which can have a substantial impact on sea level rise and many irreversible climate change impacts such as coral reef loss, ice–sheet loss and species extinctions." This would be a very important point for the SPM including also other irreversible impacts of temporary overshoot. [Jennifer Morgan, Netherlands]	Obsolete.
2660	25	35	25	4	Along such pathways, the GMST continues to increase after 1.5C is reached. An important sub–category of these pathways are those associated with 'current policies' scenarios where existing climate mitigation policies and commitments are extrapolated into the future, or with 'no policies' scenarios without any no climate mitigation policy. The CO2 concentrations and the sea level when temperatures reach 1.5°C are very different on a continued warming pathway and on a stabilisation pathway. This has important implications. [Christophe Deissenberg, Luxembourg]	Noted. The sentence is deleted.
4148	25	35	25	35	Change "warm" to "increase". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Editorial. The sentence is deleted.
10482	25	35	25	36	An important sub-category of continued warming pathways are pathways associated with … ' Check the gramer of the sentence. [Hong Yang, Switzerland]	Obsolete. The sentence is deleted.
5364	25	42	25	43	The text is not too clear. It is like shadowing and a bit grey. Suggest switching it to black. [Sulistyawati Sulistyawati, Indonesia]	Noted. The figure is revised.
9362	25	42	26	4	The status bars on the top of the pictures shall be deleted. [Attila Buzási, Hungary]	Noted. The figure is revised.
50280	25	42	26	4	text in figure difficult to impossible to read; and this migth become even more challenging when the animation is running. [Karina VON SCHUCKMANN, France]	Noted. The figure is revised.
61724	25	42	26	24	This is a helpful figure, but I suggest to remove the lower right panel which is supposed to illustrate cumulative impacts, based on (from the caption) sea level rise computed using a semi-empirical model. Instead, I would suggest to report the indicative corresponding atmospheric concentration in CO2, or the indicative corresponding rate of sea level rise (so that they would be consistent with outcomes of the assessments in chapters 2 and 3). It is not a rigorous approach to a representation of "cumulative impact" (using methods at least coherent with those in the AR5, or traceable to an assessment in this report) and therefore cannot be used here. [Valérie Masson-Delmotte, France]	Noted. The figure is revised.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
690	25	43	25	43	charts a and b line 43 p 1.25 seem to be identical?? [Robert Shapiro, United States of America]	Taken into account. The figure is revised.
5642	26				Fig. 1. 5: the graphs have videoes capacities. How will this look for readers who do not have video etc capabilities? [Marion Grau, Norway]	Noted. We have static figures in the main text. Animation will be used for web-version.
5366	26	1	26	2	The text is not too clear. It is like shadowing and a bit grey. Suggest switching it to black. [Sulistyawati Sulistyawati, Indonesia]	Taken into account. The figure is revised.
38792	26	1	26	25	Very useful figure. [Jan Fuglestvedt, Norway]	Noted.
51580	26	1	26	8	I like the animation, but include static pictures as well for a printable pdf version. The reader needs to be able to provide the side-by-side comparison of the different scenarios. This means making the images bigger as these images contain text that is impossible to read. [Jason Donev, Canada]	Taken into account. The figure is revised.
53618	26	1	26	3	In Figure 1.5, Cumulative impact variable was represented by SLR. However, melting of glacier can be added. [AKM SAIFUL ISLAM, Bangladesh]	Obsolete. Because of the space constraints, a figure of melting of glacier is not added.
5842	26	5	26	8	Just to say, because these reviews tend, by the nature of the process, to be negative that I am extremely intrigued about and excited by the concept of this figure. I think it could be amazing. [Peter Thorne, Ireland]	Noted.
44000	26	5			Although I'm in principle sympathetic to the idea of illustrating time-lagged effects here, including one additional indicator in addition to GMT might be seen as selective. [Carl-Friedrich Schleussner, Germany]	Rejected. Because of the space constraint, it is difficult to add another figure.
30780	26	1	26	1	Trying to understand Fig 1.5, I looked at the Technical Annex 1A, and have some dificulties to understand how the content there will be related - purely in practice: just at the end of the report? The reader needs to be able to look at the Chapter and Annex at the same time - to Chapter 1. Will there be notes in the Chapter when further information is available in the Apendix? I had missed that for now, so maybe it could be clearer. [Érika Mata, Sweden]	Noted. The figure is revised.
39342	26	1	27	8	The caption of figure 1.5 has to explain the meaning of the green and blue curves. [Olga Alcaraz, Spain]	Editorial. The texts are revised according to a new figure.
1542	26	11	26	12	Should this be : "…require NET annual CO2 emissions …" (ie add "net" before "CO2") ? [David Wratt, New Zealand]	Noted. If this comment is the sentence in Page 25, Line 10, the sentence is deleted.
38794	26	15	26	15	cumulative impact variable may need some more explanation. And may not be the best heading in the figure. [Jan Fuglestvedt, Norway]	Noted. The figure is revised.
50466	26	17	26	18	After the discussions of massive implications that going net-negative would have, I would encourage using a different kind of language in describing this scenario. 'Pathways temporarily exceeding 1.5°C allow slower or delayed emission reductions but require net CO2 removal after 2050' sounds very benign. It does not at all express the considerable social and ecological impacts that such a scenario would entail and thereby falls into the same trap that the AR5 report was criticized for [Ina Möller, Sweden]	Noted. Figure 1.5 is revised. The texts are revised according to a new figure.
56196	26	22	26	22	Change "warm" to "warms". [Annika Herbert, Australia]	Editorial. The texts are revised according to a new figure.
49356	27	1	29	3	insufficient description of Justice, Poverty and Sustainable Development. These elements should be developed in regard to the elements of SDG poverty reduction. [Spyros Schismenos, China]	Noted: action unclear (misplaced comment?)
48360	27	3	26	3	Fig 1.5 Change "anchored to 0.87°C" to "anchored to 0.90°C" (AR5 avg replaced by "Oper5" avg) [David Clarke, Canada]	Rejected. In this figure, the temperatures are anchored to 0.87C.
48362	27	4	27	6	Fig 1.5 "Emissions–temperature relationship computed using a representative value (1.6°C) of the Transient Climate Response (TCR) with a simple climate model (Millar et al., 2017b; Myhre et al., 2013)" TCR of 1.8°C would be much more representative of observational datasets. This can easily be seen by running Otto et al (2015) model used in Millar et al 2017a with full range of available observational datasets. Millar et al found total forced warming of 0.92°C to 2015 using TCR of 1.6, when driven by the RCP2.6-2017 forcing scenario and appropriate emissions scenario. However total forced temperature response of the five datasets to using the same RCP2.6-2017 scenario ranged from 0.97°C (HadCRUT4) to 1.13°C (Berkeley Earth), with a mean of 1.05°C, implying that a higher TCR would be more appropriate. Note that Otto et al 2015 model was corrected by replacing RCP6 (the lowest of all forcing scenarios over 2005-2017) with RCP2.6-2017 (i.e. RCP8.5 over the same period), as well as using the full year of 2015 instead of only the first few months as originally published. These corrections increase the forced temperature response in HadCRUT4 by ~0.04°C. I note that Otto et al and Millar et al had validated their models only against HadCRUT4. [David Clarke, Canada]	Noted. The figure is revised and the texts are revised accordingly.
3752	27	13	27	15	Wang et al., (2017) provide direct justification to the statement here that 1.5ºC warming assessed in different scenarios is quite different. Wang, Z., L. Lin, X. Zhang, H. Zhang, L. Liu, and Y. Xu (2017), Scenario dependence of future changes in climate extremes under 1.5?°C and 2?°C global warming, Scientific Report, 7, 46432. [Yangyang Xu, United States of America]	Obsolete.
2662	27	13	27	21	The impacts under a continued warming or overshoot pathway may be very different from those under a 1.5°C temperature stabilization pathway. In particular, in the former cases, the CO2 concentrations and the sea level will be higher, as well as potentially, the mean precipitations (Pendergrass et al., 2015). These differences could lead to very different impacts on agriculture, on some forms of extreme weather (Baker et al., 2017), and on marine and terrestrial ecosystems (James et al., 2017; Mitchell et al., 2016, Box 3.1). The sea level would be substantially higher when temperatures return to 1.5°C following an overshoot than when temperatures reach 1.5°C without overshoot. Hence it is important to specify the pathway in discussing the impacts of 1.5°C warming. [Christophe Deissenberg, Luxembourg]	Rejected. We compare the difference of impacts at the point when GMST first rises past 1.5°C and those when GMST has stabilized at 1.5°C. According to your edition, this point cannot be made clear.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51582	27	13	27	22	This paragraph is another example where the overall conclusions must be clearly stated and committed to. If there are pathways that contain no overshoot, then say so, and briefly state that they may not be politically or economically feasible. The need to have overshoot for a politically feasible pathway is fine, but be more bold in your assertions. This report must remain scientifically unimpeachable, but we must break with the cultural habit of waffling with our words. The administrators must have that clarity. [Jason Donev, Canada]	Noted. The text is revised.
3750	27	15	27	17	In particular …… stablises at 1.5ºC is hard to understand. [Yangyang Xu, United States of America]	Taken into account. The text is revised.
5844	27	15	27	17	I found this passage confusing. Is there any way to redraft that may be clearer to the reader? [Peter Thorne, Ireland]	Taken into account. The text is revised.
13440	27	15	27	17	CO2 concentrations and sea level will be higher. The rest of the phrase is not clear. [Sergio Aquino, Canada]	Taken into account. The text is revised.
34434	27	15		17	Confusingly worded. Not clear which variables will be higher and which lower under which scenario. [Nathan Gillett, Canada]	Taken into account. The text is revised.
8584	27	16	27	16	Sentence would be clearer if "and" is used instead of "as well as" here [Pauline Midgley, Germany]	Taken into account. The text is revised.
57938	27	17	27	17	The phrase "than they will be as temperature stabilises at 1.5°C" may be improved. [Siir KILKIS, Turkey]	Taken into account. The text is revised.
57276	27	18	27	18	Extreme weather should be in the previous sentence where changes in physical climate are discussed [Hans Poertner, Germany]	Rejected. The previous sentence is related to the GMST under different pathways. Intension of this sentence is to indicate the some forms of extreme weather are different under when GMST first rises past 1.5 degrees C and when GMST has stabilized.
55290	27	19	27	19	Baker et al. 2017, is "submitted" in the references section, p. 61. See comment below [ELISA BERDALET, Spain]	Accepted. (Baker et al., 2017) is change to (Baker et al., 2018).
19478	27	2	27	22	“Sea level would be substantially higher when temperatures return to 1.5°C following an overshoot than when temperatures reach 1.5°C on a pathway that remains below 1.5°C before then. Hence it is important to specify the pathway in discussing impacts of 1.5°C of warming.” This is a rare and important instance when the difference in impacts between overshoot 1.5C scenarios and non-overshoot 1.5C scenarios are explicitly expressed. This chapter would benefit from other similar examples and chapter 3 could dedicate a whole section to such important differences. [Jennifer Morgan, Netherlands]	Noted.
42956	27	2	27	22	Explain why SLR is higher under an overshoot scenario; this highlights that while overshooting 1.5C achieves the final desired temperature goal, there are further consequences, including irreversibility, that would be avoided by limiting to 1.5C without going over. [Durwood Zaelke, United States of America]	Noted. Please see the revised figure. It is because of inertia of climate system.
4788	27	25	32	2	This all seems a quite complicated and involved (even though quite rigorous) way to get across a relatively simple message or two to the likely audience. Given how the desired length of the report is a good bit over the intention, I'd suggest pretty simply presenting the key messages relating to all of this and putting the details in an IPCC Technical Report or somewhere similar. For the reader of this report, it would seem the key message is that reducing short-lived species can be helpful, but is intertwined with achieving CO2 emission reductions and with achieving Sustainable Development Goals. How much more needs to be said? [Michael MacCracken, United States of America]	Accepted.
8586	27	25	27	25	in the subheading it would be more appropriate to use the name " Absolute Global Warming Potential " rather than the acronym "AGWP" [Pauline Midgley, Germany]	Obsolete. The text is revised.
17956	27	25			Write up for section 1.2.4.5. needs to be simplified. A lot of what is written under this section is actually covered again in cross chapter box 1.2 and therefore suggest deleting this section and merging any ideas within Box 1.2 itself [Andrea TILCHE, Belgium]	Noted. This section is deleted.
38796	27	25	27	25	I don't think you need to have "AGWP" in section title. Not all readers understand. [Jan Fuglestvedt, Norway]	Agreed: section has been deleted
44002	27	25			The assessments of mitigation requirements in the PA was done based on the underlying scientific information, the AR5. AR5 WG3 analysed pathways based on GWP100 potentials. Many other regimes under the UNFCCC also use this metric. While there might be scientific arguments for other metrics, re-interpretation of the Agreement using other metrics means rewriting the agreement and can only be seen as policy prescriptive. [Carl-Friedrich Schleussner, Germany]	Noted. The subsection is deleted.
50282	27	25	27	25	No abbreviations in title [Karina VON SCHUCKMANN, France]	Obsolete. The text is revised.
8528	27	27	27	27	If "The AR5 noted …" I would expect a reference to the relevant section of the AR5, IPCC 2013/2014, not just three older publications from 2009. Note same comment made on FOD so I assume you have your reasons [Pauline Midgley, Germany]	Noted: this section has been deleted
24298	27	27	28	19	This is more a text-book explanation than an assessment. I would recommend to either remove this section or merge it in Box 1.2. [Joeri ROGELJ, Austria]	Accepted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
36864	27	27	27	29	The AR5 note that "there is a simple near-linear relationship between cumulative CO2 emissions and CO2-induced warming" is also confirmed by theory. Goodwin et al. (2015) provide a single equation connecting surface warming with cumulative carbon emissions drawing upon theory for radiative response and carbon inventories. This equation is shown to provide insight into the surface warming response of intermediate complexity and full Earth system models integrated over the next century (Goodwin et al., 2015) and the continued surface warming after emissions ceases over the next 1000 years (Williams et al., 2017). References: Goodwin, P., R.G. Williams and A. Ridgwell, 2015. Sensitivity of climate to cumulative carbon emissions due to compensation of ocean heat and carbon uptake. Nature Geoscience, 8, 29-34, doi:10.1038/ngeo2304; Williams, R.G., V. Roussenov, T.L. Froelicher and P. Goodwin, 2017. Drivers of continued surface warming after cessation of carbon emissions. Geophysical Research Letters, 44, doi.org/10.1002/2017GL075080. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Noted.
53822	27	29	27	29	Could it be usefull if TCRE were briefly and explicitly explained? There is a nice popular-science type explanation in Tim Lenton's "Earth System Science: A Very Short Introduction" (ISBN: 9780198718871) [Patrik Winiger, Netherlands]	Rejected: unfortunately there is no space for text-book-style explanations
2664	27	3	27	34	30 “cumulative carbon budget” consistent with a given level of warming: the warming over a given time– period is equal to the cumulative CO2 emissions over that period multiplied by the TCRE plus any warming caused by non–CO2 climate forcing over that period. Under ambitious mitigation scenarios with small future cumulative CO2 emissions, the relative importance of the non–CO2 forcing increases, [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
36866	27	36	27	36	Goodwin et al. (2018) Nature Geoscience, doi:10.1038/s41561-017-0054-8 provides a complementary way of viewing the carbon budget to Millar et al. (2017), which makes similar assumptions about the non-CO2 radiative forcing [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Noted, and cited.
50468	27	36	28	18	Consider adding a sentence containing a list of (examples of) sources of non-CO2 forcing, and expressing the message without using mathematical terms in order to increase accessibility for people who are not versed in the natural sciences. This is, after all, the introductory chapter [Ina Möller, Sweden]	Accepted. text was revised
55420	27	38	27	39	This simple statement is nice and clear and deserves to end up both in the executive summary and the SPM. [Andy Reisinger, New Zealand]	Noted. But text was revised
2666	27	41	27	42	avoid strong non–linear or transient effects, the Absolute Global Warming Potential (AGWP; Shine et al., 2005) provides a simple scenario–independent way of quantifying this trade–off. [Christophe Deissenberg, Luxembourg]	Obsolete. Text was revised
49368	27	42	27	45	This definition of AGWP is not consistent with the definition used throughout the previous five IPCC Assessment Reports. GWP is usually defined with pulse emissions. Unlike what is stated here, GWP by definition refers to integrated radiative forcing, not the radiative forcing at the end point. It is referenced to Allen et al. (2017). It is possible that the Allen paper “redefines” the GWP, but I cannot confirm it because this paper is not available online at the time of writing (25 February 2018). Whichever the case, I think that the GWP definition should follow the traditional one, considering the wide readership of SR15. [Katsumasa Tanaka, Japan]	Noted, the equivalence of these two ways of defining AGWP is explained in Shine, 2005
31842	27	47	27	47	In several places in this chapter, it is assumed that non-CO2 and SLCF are synonymous, when of course they are not. I suggest the potential ambiguity in this section would be removed if SLCF was used instead. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted, and taken into account in X-chapter box 2
34436	27	47		52	No reference is given for this formula or approach, so it appears to be new science introduced in the report. In the formula it is not specified what the AGWP_H is of - presumably it is CO2. There are additional assumptions underlying this calculation that it is hard to appreciate without underlying literature to test them. For example, AGWP_H depends on the background state to some extent. [Nathan Gillett, Canada]	Noted. The subsection is deleted.
2668	27	48	27	48	same impact on the GMST as a total of [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
36868	27	52	28	2	Williams et al. (2017) J. Climate doi. 10.1175/JCLI-D-16-0468.1 provide an alternative way of including the surface warming dependence on fossil-fuel carbon emissions, DT=(DT/DR)(DR/DR_CO2)(DR_CO2/DI) in equation (2) where DT/DR is the sensitivity of surface temperature to radiative forcing and given in terms of heat uptake and radiative forcing in equation (5), DR/DR_CO2 details the effects of non-CO2 radiative forcing, and DR_CO2/DI is the sensitivity of radiative forcing from atmospheric CO2 to carbon emissions and is given in terms of carbon ocean undersaturation, terrestrial carbon changes and carbon emissions in equation (9) in their paper. This approach draws upon the single equation connecting surface warming and cumulative carbon emissions set out by Goodwin, P., R.G. Williams and A. Ridgwell, 2015. Sensitivity of climate to cumulative carbon emissions due to compensation of ocean heat and carbon uptake. Nature Geoscience, 8, 29-34, doi:10.1038/ngeo2304. This approach is also expanded upon in Williams, R.G., P. Goodwin, V.M. Roussenov and L. Bopp, 2016. A framework to understand the Transient Climate Response to Emissions. Environmental Research Letters, 11, Focus on Cumulative Emissions, Global Carbon Budgets and the Implications for Climate Mitigation Targets, doi:10.1088/1748-9326/11/1/015003. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Noted.
2670	28	1	28	1	where [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
13442	28	1	28	8	suggest to explain each cmponent of the equation in itsown line [Sergio Aquino, Canada]	Obsolete. Text was significantly revised
2672	28	2	28	2	The constant term represents the warming or cooling [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
2674	28	4	28	4	WHAT CONTRIBUTION? TO WHAT? [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised

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2676	28	4	28	6	to previous emissions and forcing in earlier periods. It may also contain a contribution if ? [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
42744	28	6	28	8	What is the connection between the two values given in this sentence and how do they relate to the overall discussion on carbon budgets? [Kristin Campbell, United States of America]	Obsolete. Text was significantly revised
42958	28	6	28	8	What is the connection between the two values given in this sentence and how do they relate to the overall discussion on carbon budgets? [Durwood Zaelke, United States of America]	Obsolete. Text was significantly revised
8530	28	7	28	7	if this is a quotation of calibrated language, please italicise "likely" [Pauline Midgley, Germany]	Obsolete. Text was significantly revised
36378	28	7			Please, put a space between Gt and CO2. [Emilio Cerdá, Spain]	Obsolete. Text was removed
46496	28	7	28	7	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Obsolete. Text was significantly revised
36380	28	8			Please, put a space between Gt and CO2. [Emilio Cerdá, Spain]	Obsolete. Text was removed
2678	28	1	28	12	The above formula provides a simple measure of the relative importance of cumulative CO2 emissions and non–CO2 forcing that can be used to frame the challenge of meeting ambitious temperature goals in terms of the two key policy variables: cumulative CO2 [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
55422	28	1	28	19	The authors have done a good job better explaining the concept of CO2-fe and how it can be used. However, the text is extremely dense. It would really help having a small box at the end of it with an example that uses the relationship developed here in a practical application. [Andy Reisinger, New Zealand]	Obsolete. Section on "balance" has been deleted. Concept of CO2-forcing equivalent emissions is no longer used in the chapter.
8588	28	13	28	13	it would be more readable here to spell out "the net change in non–CO2 radiative forcing" rather than use "? [Pauline Midgley, Germany]	Obsolete. Text was significantly revised
49370	28	13	28	16	If I understand correctly, the authors attempt to endorse a new GHG index similar to the forcing equivalent index. However, it has been shown that the forcing equivalent index behaves very differently from indices like GWP and GTP that have been studied more thoroughly. For example, Tanaka et al. (2013) presents that the forcing equivalent index follows a very different pathway from those of GWP and GTP on a 2°C stabilization scenario (also 3°C and 4°C stabilization scenarios). Manning and Reisinger (2011) shows a similar result. The Tanaka paper shows that the forcing equivalent index indicates an opposite trend from that of an “optimal” index for climate stabilization (i.e. CETP of Johansson (2012)). In my view, the new GHG index requires more scientific scrutiny before being recommended in SR15. Johansson D (2012) Economics- and physical-based metrics for comparing greenhouse gases. Clim Change 110 (1):123-141. doi:10.1007/s10584-011-0072-2 Manning M, Reisinger A (2011) Broader perspectives for comparing different greenhouse gases. Phil Trans R Soc A 369 (1943):1891-1905. doi:10.1098/rsta.2010.0349 Tanaka K, Johansson DJA, O'Neill BC, Fuglestvedt JS (2013) Emission metrics under the 2°C climate stabilization target. Clim Change 117:933-941. doi:10.1007/s10584-013-0693-8 [Katsumasa Tanaka, Japan]	Taken into account. Concept of CO2-forcing equivalent emissions is no longer used in the chapter.
34438	28	16		19	Has the relevance of this expression to lower emission pathways been assessed? If so, cite the reference. [Nathan Gillett, Canada]	Accepted.
2680	28	18	28	18	present–day conditions. The relevance [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
8640	28	22	29	11	Please include a paragraph that discusses the uptake of CO2 by the ocean. In IPCC_AR5_WG1 (2013) in Figure 6.1 there is a depiction of the Carbon cycle, indicating a net atmosphere-to-ocean flux of CO2 of 2.3 PgC/yr. My understanding (and that of many people I spoke to) had always been that: "This flux will continue in the future because the ocean is such a large reservoir; the rate of atmosphere-to-ocean flux will decrease somewhat because the ocean surface layer will increasingly get saturated with the surface-to-midocean flux becomming the limiting factor and because the warming ocean will increasingly degas CO2; but the ocean will always continue to be a sink for CO2 if atmospheric concentrations continue to increase or stay constant.". Now, you don't mention the ocean at all, and therefore I assume that my understanding (as outlined above) is indeed incorrect! However, you specifically mention only the "multi-century time scale". And maybe only on this time scale my understanding is incorrect. But since a lot of political action needs to happen between "right now" and the "mulit-century time scale" it is very important that this "intermediate time scale" is further elaborated on! I therefore suggest you include a paragraph that discusses the uptake of CO2 by the ocean and by other sinks in a world of constant atmospheric CO2-concentration. This could also include a Figure of the carbon cycle in such a world. Also a Figure would be very valuable showing for a world of constant atmospheric CO2-concentration the evolution over time of the different CO2-fluxes (atmosphere to land, atmosphere to ocean, remaining tolerable anthropogenic emissions etc.) with a net-zero change for the atmosphere, i.e. with x = time and y = CO2 flux by category, where the sum of all contributing fluxes might be zero, but the contributions are changing. [Urs Ruth, Germany]	Rejected. It is correct that the ocean continues to take up CO2 on a multi-century timescale, but at a smaller rate. A more in-depth discussion of the ocean carbon cycle is beyond the scope of this chapter.
24300	28	22	29	19	I think this section is out of scope of a report on 1.5°C. It speaks to all targets and can be removed in its entirety from this report. [Joeri ROGELJ, Austria]	Taken into account - Section has been deleted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
36396	28	22	29	19	The 'definition of balance' is policy prescriptive. The Paris Agreement does not relate to stabilising temperatures. Article 4 refers to global zero greenhouse gas emissions under GWP100. Suggestion that this whole section be deleted. [Snaliah Mahal, Saint Lucia]	Taken into account. Section has been deleted
44008	28	22	49	2	It is also not about interpreting 'emissions' and 'removals', but 'anthropogenic emissions by sources and removals by sinks of greenhouse gases'.. Sinks and sources are both defined in the convention (UNFCCC 1992). Anthropogenic, arguably links to both, 'emissions by sources' and 'removals by sinks'. In this context, it remains an open question, whether or not a reduction in atmospheric SLCFs would classify as an ' anthropogenic removal by sink'. I'd argue it doesn't. Thereby questioning the alignment of the given interpretation with the PA context. [Carl-Friedrich Schleussner, Germany]	Agreed. Text changed so this comment is resolved.
44004	28	22			The assessment of the balance article is politically highly sensitive and the section in its current form falls short to live up to those expectations. A thorough appraisal of the political (and scientific) context of the time is essential for the IPCC to inform this sensitive policy discourse and not being policy prescriptive by adopting new definitions that may have scientific merits but would distort policy processes and effectively lead to rewriting of the agreement. The section states that it adopts a single interpretation of balance based on a publication that is not yet publically available. This is problematic. Furthermore, I don't think the interpretation given should be the only and I'd argue is a dangerous, potentially policy prescriptive, re-interpretation of the PA. The 'balance' language in Article 4 has the scientific context of the time: The AR5 WG3 findings on timing for net zero GHG emissions (~2050 for 1.5, later the century for <2) based on GWP100. GWP100 is also used in all other relevant UNFCCC contextes (i.e. emissions trading). These will not be changed. [Carl-Friedrich Schleussner, Germany]	Obsolete. Section on "balance" has been deleted
44006	28	22			The interpretation operates under the implicit assumption that the Article 2 calls for GMT stabilisation at a certain temperature level. This is not the case. Much more, the 'holding well below' or 'limit' language indicates that these GMT levels should be seen as upper levels, not as stabilisation targets. Achieving net zero GHG emissions under GWP100 might lead to slowly declining GMT (depending on the evolution of the natural carbon sink). In the context of overshoot pathways on 1.5°C, this, given the scientific context and political history of the warming limits in the agreement, is the interpretation in the PA. In any case, it is a fully valid interpretation that needs to be reflected in the chapter. [Carl-Friedrich Schleussner, Germany]	Obsolete. Section on "balance" has been deleted
2682	28	24	28	31	Article 4 of the Paris Agreement acknowledges that, 'in order to achieve the long–term temperaturegoal (…) Parties aim to (…) achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'. This report examines the scientific meaning of this requirement in the context of 1.5°C and investigates how 'balance' relates to the temperature goals articulated in Article 2 of the Agreement. Diverse interpretations of 'balance', and hence of 'emissions' and 'removals' of greenhouse gases, are possible, but in this report 'balance' will generally be interpreted as a sustained combination of emissions and removals that results in a stable GMST (Fuglestvedt et al., 2017). [Christophe Deissenberg, Luxembourg]	Obsolete. Paragraph has been deleted
9664	28	24	28	31	The interpretation of balance in Article 4 of the Paris Agreement in terms of temperature stablization may not be consistent with Article language which specifically states " balacne between souorces and removall by singks of GHGs". The framing could better be dressed as whehter 1.5c warming is consistent with the Paris Article 4 language or else what is required or need to be revised in the Article language. [Mustafa BABIKER, Sudan]	Taken into account. Interpretation of Article 4 in terms of temperature stabilization has been deleted
34440	28	24	29	19	The discussion of balance seems contrived. Usually a source of CO2 means a source to the atmosphere and a sink means a sink from the atmosphere. To me the only ambiguity in the text of the Paris Agreement is whether the 'anthropogenic' modifier applies to the sources and sinks or just to the sources. If it applies to both, then a balance means net zero anthropogenic emissions. If it applies only to the sources, then a balance means constant concentrations. I'm sure that the parties to the agreement were not thinking of the complex CO2 forcing-equivalent framework described here when ratifying the agreement. The aim to stabilise temperatures seems to be primary, so if stabilised GHG concentrations are not consistent with the goal of a stabilised cliamte then it woudl seem to me to be better to explain this, rather than to interpret the statement in a way contrived to make it consistent with the temperature target. [Nathan Gillett, Canada]	Obsolete. Discussion of "balance" has been deleted from chapter, except for reference to Article 4 in the Cross-Chapter Box 2
45470	28	24	28	24	is the word "ackowledge" intended to refer to the "Parties aim" or the dubious scientific argument that a balance of sinks and sources will achive the long term tempreature goal. Just quote Article 4 This is spinning it a bit. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Section has been deleted
50440	28	27	28	29	Proposition to cut: why listing some examples? Sufficient to link to chapter 4 [Karina VON SCHUCKMANN, France]	Obsolete. Paragraph has been deleted
38798	28	28	28	31	You may consider mentioning the other interpretations since readers may be interested in discussions of how other interpretations may work. [Jan Fuglestvedt, Norway]	Obsolete. Section on "balance" has been deleted.

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49372	28	28	28	31	I think that these sentences can make it more explicit about what exactly are unclear in the Agreement text. For example, it is unclear (at least from the English version of the text) whether “removal” refers to anthropogenic removal or total removal (including natural sink). As far as I am aware, it is more common to adopt the first interpretation, but there is also an example using the latter interpretation (e.g. Walsh et al. 2017) Walsh, B. et al. Pathways for balancing CO2 emissions and sinks. Nature Communications 8, 14856, 387 doi:10.1038/ncomms14856 (2017). [Katsumasa Tanaka, Japan]	Obsolete. Section on "balance" has been deleted.
50284	28	28	28	29	Proposition to cut down: … in Article 2 of Agreement. In this report, balance will generally… [Karina VON SCHUCKMANN, France]	Obsolete. Paragraph has been deleted
45468	28	29	28	31	whatever the cited paper says, I doubt a lawyer would read the Paris Agreement and reach the same intepretation! [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Obsolete. Section on "balance" has been deleted.
2684	28	33	28	39	On multi–century timescales, the natural processes that remove CO2 permanently from the active carbon cycle are so slow that balance requires the net global anthropogenic CO2 emissions to be close to zero (Archer and Brovkin, 2008; Matthews and Caldeira, 2008; Solomon et al., 2009). Hence, on these timescales, almost all residual anthropogenic CO2 emissions will need to be compensated for by an equivalent anthropogenic carbon dioxide removal (CDR), using measures such as bioenergy with carbon capture and sequestration (BECCS), large–scale afforestation, biochar enhanced soil sequestration, direct air capture, or ocean alkalinisation, among others (Chapter 4 Section 4.3.8). [Christophe Deissenberg, Luxembourg]	Taken into account. Sentence has been reworded and moved to Cross-Chapter Box 2
17958	28	33	28	39	The Panel may wish to elaborate on the perceived benefits of bioenergy with carbon capture and sequestration (BECCS) which, next to afforestation and other biogenic sinks are seen as key avenue to 'zero net emissions' (just in line with findings in chapter 2) [Andrea TILCHE, Belgium]	Rejected. Negative emissions are discussed in detail in Chapter 4
49374	28	33	28	35	A recent paper of Wigley (2018) shows otherwise. The paper argues that zero CO2 emissions are not required to achieve 1.5°C and 2°C targets after overshoot on multi-century timescales. Wigley (2018) cites some reasons as to why the Wigley results are different from Matthews and Caldeira (2008). Wigley TML (2018) The Paris warming targets: emissions requirements and sea level consequences. Clim Change in press. doi:10.1007/s10584-017-2119-5 [Katsumasa Tanaka, Japan]	Noted. The sentence has been reworded and moved to Cross-Chapter Box 2. The need to reduce CO2 emissions to zero to reduce the rate of CO2-induced warming to zero is supported by several modeling studies, not just Matthews & Caldeira (2008), e.g. Gillett et al., Nature Geoscience, 2011.
53386	28	33	28	39	In addition to BECCs, and to afforestation,protecting tropical natural forests also play a role in removals. If you are going to mention the former surely should also mention the latter? See Houghton et al http://whrc.org/wp-content/uploads/2015/06/PB_Forests_and_Land_Use.pdf [Elizabeth Penelope Davies, United States of America]	Obsolete. Reference to specific removal technologies has been deleted.
55612	28	33	28	39	This paragraph is potentially misleading. "….natural processes … are so slow …." Yes, in the sense intended. But "natural" processes are "fast" in the sense that they can be immediately implemented (see the references later in the para. to afforstation and "other" CDR measures (which could include C sequestration through natural regeneration). I guess what is meant is that the net sequesdtration through natural processes is so slow? [David Cooper, Canada]	Noted. Yes
53936	28	33	28	39	This whole paragraph literally echoes the views of those promoting geoengineering and that´s not the goal of the quoted sentence in the Paris Agreement. Net zero emissions is not equivalent to CDR or geoengineering. The assertion in the paragraph are not objectiv, but mere opinions from the quoted authors which are debated by many others. Although the natural processes are slow, the statement that all anthropogenic emissions "will need to be compensanted for by (....) using BECCS, afforestation, biochar, DAC, ocean alkalinizsation" is extremely biased. We suggest deletion/reformulation of the whole text. Text could be reformulated as follows: "As natural processes that permanently remove CO2 are slow, rapid reductions must be a priority. Additionally, the removal of CO2 would need to enhanced by restoring natural ecosystems and other methods, including changes in production and consumption, that can lead to net zero emissions." [Elenita Daño, Philippines]	Rejected. Paragraph has been reworded and moved to Cross-Chapter Box 2. The statement that "Natural processes that remove CO2 permanently from the climate system are so slow that reducing the rate of CO2-induced warming to zero requires net zero global anthropogenic CO2 emissions" is supported by a large body of literature (e.g. Archer and Brovkin, 2008; Matthews and Caldeira, 2008; Solomon et al., 2009). The statement that "almost all remaining anthropogenic CO2 emissions must be compensated for by an equal rate of anthropogenic carbon dioxide removal (CDR)" is an implication of this finding.
55614	28	33	28	39	afforestation Here and elsewhere, may be better to use more general terms, eg AFOLU measures, ecosystem restoration; ecosystem-based CDR, etc. depending on context. [David Cooper, Canada]	Obsolete. Reference to specific removal technologies has been deleted
55616	28	33	28	39	Please be careful about the choice of examples for CDR given here. For example why exclude other examples of of soil sequestration beyond biochar? Why include afforestation but not reforestation or other ecosystem restoration? (especially when the chapter later states that "Some CDR techniques such as reforestation and ecosystem restoration are well understood" (p43 l5). Why include ocean alkanisation when its application at scale is so uncertain? These issues are especiually importnat in a chapter that is "framing" the disucssion! [David Cooper, Canada]	Taken into account. Reference to specific removal technologies has been deleted
33000	28	35	28	39	Anthropogenic CO2 removal should also be done by farming practices other than bioenergy crop production and biochar addition. E.g. Long-term addition of organic manures can potntially increase soil organic carbon status (For more information, see Sihi etal-2017-J of Plant Nutrition and Soil Science-Evaluation of soil health in organic vs. conventional farming of basmati rice in North India, , 180, 389–406, doi:10.1002/jpln.201700128). A lot of emphasis on soil health management is recognizable these days which has dual benefit of locking atmospheric CO2 in soil for long-term as well as increasing productivity/fertility. So, it could be beneficial to add this point here. [Debjani Sihi, United States of America]	Obsolete. Reference to specific removal technologies has been deleted
47042	28	36	28	36	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Taken into account. We have tried to avoid use of policy-prescriptive language

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50470	28	36	28	39	To enhance transparency on what these measures mean, it would be of value to add a note about the scale at which carbon dioxide would need to be removed from the atmosphere, and - in comparison - the degree to which we are currently engaging in this (or the degree to which 'natural' systems are doing it). Maybe also address the scale of natural resources (land, forest, water, energy, storage space) that would be needed to achieve net zero if assuming 'plausible' development scenarios. There are several recent articles by Lena Boysen et al. that make estimations about this. Considering that this is the introductory chapter (which will be widely read), it is of fundamental importance to address these issues directly, and in every instance, that CDR is being relied on to make a pathway reach 1.5° [Ina Möller, Sweden]	Rejected. Beyond scope of this chapter. Negative emission technologies are assessed in detail in Chapter 4
29748	28	37	28	39	The listing of CDRs, in particular the specification of "large-scale" afforestation, seems unnecessarily narrow. "Small-scale" afforestation may of course equally well be deployed, as may reforestation and ecosystem restoration. Dooley and Kartha (https://doi.org/10.1007/s10784-017-9382-9) suggest that, if constrained by considerations of trade-offs with relevant SDGs, ecosystem restoration may hold a higher potential for CDR over the 21st century than may afforestation. [Bård Lahn, Norway]	Taken into account. Reference to specific removal technologies has been deleted
17960	28	37	28	37	It is probably incorrect to frame BECCS and biochar as "CDR". These methods are aimed to sequester carbon already fixed (by vegetation). The fixation itself is done by the vegetation, which is part of land use, regardless how the produced biomass is used afterwards. The biomass could be sequestered (at least theoretically) through CCS or char in the soil, but it could also just as well buried in landfill, abandoned mines or by sinking it to the deep ocean, where it would be more securely stored, less risky and easier to monitor than storing it as a liquid in geological layers. Same for "biochar": from a mitigation perspective, "sequestering" char in the soil has no benefit: it could be more efficiently and securely sequestered in a hole in the ground (if not needed as a coal substitude, that is after coal has been phased out entirely). Sequestering in soil would be less secure (and more expensive) from a storage perspective. It would only make sense if (and to the extent which) the char could improve soil productivity and stability (without compromising other factors, like albedo) more than it reduces the stability of char. Most evidence to this is anecdotal, biochar does not seem attractive to farmers, although similarly costly methods are routinely used, and the risks to soil are substantial and not fully addressed. [Andrea TILCHE, Belgium]	Obsolete. Reference to specific removal technologies has been deleted
2686	28	4	28	45	For greenhouse gases other than CO2, the simplest interpretation of 'balance' for temperature stabilization is a situation with net zero total anthropogenic CO2 forcing–equivalent (CO2–fe) emissions. This follows from the fact that stabilizing CO2–induced warming requires net zero CO2 emissions and that CO2–fe emissions, by construction, give the same radiative forcing and hence temperature response as CO2. [Christophe Deissenberg, Luxembourg]	Obsolete. Paragraph has been deleted
692	28	41	29	11	The CO2-fe emissions discussion is difficult to follow!! [Robert Shapiro, United States of America]	Taken into account. Discussion of the CO2-fe concept has been deleted from the chapter
49376	28	41	29	2	Somewhere here, I think it policy-relevant to discuss what the more commonly used metrics like GWP and GTP mean for net zero GHG emissions and resulting temperature pathways. Tanaka and O'Neill (2018) shows that, compared to the use of default GWP100, the use of GTP100 leads to higher peak temperatures and slower declining temperature when net GHG emissions fall zero. The Tanaka paper also shows that with metrics like GWP20 emphasizing CH4 strongly, it can be impossible to achieve net zero GHG emissions because residual CH4 emissions are valued so high that negative CO2 emissions cannot compensate it enough to make zero GHG emissions. Tanaka K, O'Neill BC (2018) Paris Agreement zero emissions goal is not always consistent with 2°C and 1.5°C temperature targets. Nature Climate Change (in press). [Katsumasa Tanaka, Japan]	Taken into account. Reference to Tanaka and O'Neill has been included in Cross-Chapter Box 2.
57940	28	44	28	44	The word "give" should be "given" to read "given the same." [Siir KILKIS, Turkey]	Obsolete. Sentence has been deleted
2688	28	45	29	2	THESE LINES ARE VERY DIFFICULT TO UNDERSTAND AND MAY BE CONTRADICTORY. I AM UNABLE TO SUGGEST WITH CONFIDENCE AN ALTERNATIVE FORMULATION [Christophe Deissenberg, Luxembourg]	Taken into account. Paragraph has been deleted
3754	28	48	28	51	The analog of methance with CO2 is misleading here, because even a small positive CO2 emission can lead to CO2 concentration decrease, and yet that is NOT CO2 net emission. [Yangyang Xu, United States of America]	Obsolete. Paragraph has been deleted
31844	28	48	28	51	I may be missing something, but I have re-read this sentence many times and cant quite make sense of it. Declining methane concentrations always imply a (relative) cooling. I want also to flag that it seems to me that "sustained" in this section seems to be being used as short-hand for "sustained but constant" and that needs to be made clearer. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Paragraph has been rewritten and moved to Cross-Chapter Box 2.
55424	28	48	28	51	It is not clear to me how sustained SLCF emissions could result in declining SLCF concentrations, unless "sustained" does not mean "constant" but simply "greater than zero". Please clarify the wording here. [Andy Reisinger, New Zealand]	Taken into account. Paragraph has been rewritten and moved to Cross-Chapter Box 2.
57524	28	48	28	48	Use acronym only here, SLCF has already been defined on p20 line 4 [Hans Poertner, Germany]	Obsolete. Sentence has been deleted
8590	29	1	29	2	an equivalent impact on future forcing and temperature as active removal of some quantity of CO2. would read more easily if changed to "an impact on future forcing and temperature equivalent to active removal of some quantity of CO2." [Pauline Midgley, Germany]	Obsolete. The sentence is deleted.

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2690	29	4	29	11	While the simplest interpretation of balance, from a physical perspective, is in terms of net zero CO2– fe emissions, these emissions must be calculated from the full forcing history with a carbon cycle model. Thus, other interpretations are also helpful. The expression given in Section 1.2.4.5 allows to convert non–CO2 forcing changes ? [Christophe Deissenberg, Luxembourg]	Obsolete. Text was revised
13444	29	4	29	1	CO2-Fe ? [Sergio Aquino, Canada]	Obsolete. The sentence is deleted.
2692	29	13	29	19	Should the temperatures overshoot 1.5°C, returning to 1.5°C will require either an active anthropogenic cooling of the climate system or net negative CO2–fe emissions through some combination of anthropogenic removals of long–lived greenhouse gases and reductions in anthropogenic emissions of SLCFs. Hence achieving 'balance' in the sense of net zero CO2–fe emissions represents a necessary, but potentially not sufficient, condition for reaching the 1.5°C temperature goal. [Christophe Deissenberg, Luxembourg]	Obsolete. text was revised
50472	29	13	29	14	If the IPCC wants to bring geoengineering in the form of SRM to the table, it should do so by explicitly stating what 'active anthropogenic cooling of the climate system' means and implies [Ina Möller, Sweden]	Obsolete. Paragraph has been deleted
61726	29	13	29	14	What does ""would require active anthropogenic cooling of the climate system" mean? Is this related with solar radiation management? I suggest to improve the coherency of this statement with the terms and tone of the assessment in other parts of the report (including in this chapter). I note that the whole section here (1.2.5) is based on very few cited publications, and thus suggest to strongly shorten it. [Valérie Masson-Delmotte, France]	Obsolete. Paragraph has been deleted
4784	29	14	29	14	Is this a reference to the possibility of climate intervention? If so, it is pretty obscure, and merits discussion providing context. [Michael MacCracken, United States of America]	Obsolete. Paragraph has been deleted
53938	29	15			add after combination "of restoring ecosystems and enhancing human activities that can restore soil fertility and capacity to remove and store carbon, such as agroecology. Delete the rest of the paragraph. [Elenita Daño, Philippines]	Obsolete. Paragraph has been deleted
9666	29	16	29	19	The statement that "balance" in the sense of net zero emissions in Article 4 language is necessary but not sufficient for 1.5c is important for scrutnizing Article 4 of the Paris Agreement and would be useful to include it in the executive summary and the SPM. [Mustafa BABIKER, Sudan]	Obsolete. Section on "balance" has been deleted.
40648	29	16	29	19	The message of this sentence is made less clear by its length. It should be split into two sentences to make its meaning clearer. In its current state it is not clear. [Jonny Williams, New Zealand]	Obsolete. Text was removed
36398	29	21	32	2	This box is extremely problematic. All references to GWP in the context of the interpretation of the Paris Agreement are misleading and should be deleted. The extremely problematic nature of the box is illustrated in Box 1.2 Figure 1 where a 2°C (RCP2.6) pathway is 'retrofit' to be 'zero' shortly after 2050. [Snaliah Mahal, Saint Lucia]	Noted: there is no 'retrofitting' involved in the figure. This is simply an expression of the implications for aggregate WMGHGs under different published usages of the GWP metric. GWP* was proposed in 2016 based on a physical justification, not because of its implications for a specific scenario.
44010	29	21			This box is problematic for a variety of reasons outlined above for 1.2.5 See detailed comments there. The assessments of mitigation requirements in the PA was done based on the underlying scientific information, the AR5. AR5 WG3 analysed pathways based on GWP100 potentials. Many other regimes under the UNFCCC also use this metric. While there might be scientific arguments for other metrics, re-interpretation of the Agreement using other metrics means rewriting the agreement and can only be seen as policy prescriptive. The Paris Agreement is not about temperature stabilisation. The Convention calls for temperature stabilisation, but at levels that avoid dangerous interference. The PA gives upper bounds in order to achieve that without saying that stabilisation at these levels would be in line with the Convention (and, there is plenty of evidence why present levels of warming may represent dangerous anthropogenic interference). An interpretation of balance in Article 4 as aiming for temperature stabilisation only is therefore not appropriate. Much more, it might have been deliberate that achieving balance in GWP100 leads to declining temperatures, i.e. in the context of overshoot pathways. [Carl-Friedrich Schleussner, Germany]	Taken into account. Cross-Chapter Box 2 has been rewritten. Interpretation of "balance" in Article 4 as meaning temperature stabilization has been deleted.
52744	29	21	32	2	Box 1.2 presents a very interesting analysis of metrics in the context of the SR. In lines 50 to 53 of page 29, it is stated that policy makers choose a metric that works across a range of policy goals or choose a specific metric that is matched to the intended use and the admissible level of uncertainty. In lines 30 to 31 of page 31, it is stated that metrics do not dictate policy decisions, but can provide useful guidance to clarify the implications of such decisions for future GMST (in this case a 1.5°C scenarios). Therefore, policy makers have to choose metrics based on value judgements, or on pragmatic considerations of simplicity and/or continuity. However, the box itself and the SR in a more general manner, are not providing a more explicit sense of direction or guidance (for policy purposes) on the implications from using different metrics and a clear link of these implications on the likely levels of CO2–equivalent emission reductions compatible with holding temperatures to 1.5°C above preindustrial levels (as requested in para. 17 of decision 1/CP.21)(see Table 2.7). There is no clear reference why only GWPs (100-year time horizon) were considered through the report, and what differences in quantitaive terms may arise with the use of other metrics. It would be good that all these aspects are treated in a more comprehensive way and expanded in this chapter and that a particular section on the implications of choice of metrics and related matters is included in the Summary for Policy Makers of the SR. [Iulain Florin VLADU, Germany]	Accepted: the revised box attempts to provide this context.

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53368	29	21	32	2	It would be desirable to include a short table comparing coal to fossil gas, using GWP100 and GWP20 to debunk the myth that fossil gas is better for the climate. For gas leakage rates see: Howarth, R. W. (2015). Methane emissions and climatic warming risk from hydraulic fracturing and shale gas development: implications for policy. Energy and Emission Control Technologies, 3, 45-54. [Kjell Kühne, Mexico]	Rejected: this would be too policy prescriptive.
53754	29	21	32	2	The current version uses GWP, GWP*, and AGWP. Could the differences be more explicitly explained here in this cross-chapter box? [Patrik Winiger, Netherlands]	Accepted: (partially) the revised box provides detail on the new usage, GWP*, but GWP and AGWP are well-established and we do not have space for text-book material that has appeared in earlier IPCC reports.
57678	29	21	32	2	while interesting, lengthy disciplinary excursions in the box might go into OSM and key messages thereby brought to the front [Hans Poertner, Germany]	Accepted. Box has been significantly shortened and focussed.
2694	29	25	29	29	The goals are seen as an 'indivisible' package that need to be pursued in an integrated way (Coopman et al., 2016); yet, the policy challenges with such an integrated approach are enormous and countries are addressing subsets of SDGs in relation to their priorities and national capacities. Based on voluntary country report, the Commitments to the SDGs are reviewed and reaffirmed at annual high-level forums at the United Nations. They will also be reviewed at the UN General Assembly in [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
38800	29	34	29	34	you may add "…and transfer their effect to a common scale" after "gases" [Jan Fuglestvedt, Norway]	Noted: good suggestion, but we are short of words.
38802	29	35	29	35	it seems odd to reference such an old paper (2006). Newer studies are available. [Jan Fuglestvedt, Norway]	Accepted.
38804	29	4	29	4	I suggest you add "from the Second Assesment report" after "GWP100". [Jan Fuglestvedt, Norway]	Noted: good suggestion, but we are short of words.
694	29	43	3	21	excellent discussion of GMP and GTP [Robert Shapiro, United States of America]	Noted.
2706	29	43	29	43	Numerous other metrics have been proposed: for illustration, we consider the Global [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
5740	29	43	29	5	It may be mentioned that the definition of GWP and GTP does not take the efficacy of the forcing agents such as CH4 into account. A recent study (Modak and others, 2018: Does shortwave absorption by methane influence its effectiveness? Climate Dynamics, https://doi.org/10.1007/s00382-018-4102-x) shows that the efficacy of CH4 is about 80% which suggests that the currently defined GTP may be overestimating the effectiveness of CH4. The implications of lower efficacy of SLCF may be discussed here. [Govindasamy Bala, India]	Noted: the implications of revised methane efficacy is assessed elsewhere
30784	29	43	29	44	Could the authors explain what is the logic for choosing GTP among the "numerous other metrics"? Do not these all need to be briefly presented or categorized before being disregarded, and the reason for disregard given? [Érika Mata, Sweden]	Noted: these are simply (widely-used) examples.
52746	29	43	29	44	It is unclear if it is the IPCC (in which AR?) that proposed numerous other metrics, and for what purpose or objective they were proposed. Also it is unclear who is referred here with "we consider". It is the Special Report? The authors of the box? and what is purpose for this consideration?. [Iulain Florin VLADU, Germany]	Noted: we believe the sentence is clear that these metrics have been proposed in the literature, such as in the references cited.
38806	29	45	29	45	I suggest changing "over the GWP time-horizon" to "over a chosen time-horizon" - to make it clearer that this is a choice. [Jan Fuglestvedt, Norway]	Accepted: revised text makes clear H is a choice
38808	29	46	29	47	I suggest changing "after a give amount of time" to "at a chose point in time". Will make it clear that there is a choice. [Jan Fuglestvedt, Norway]	Accepted: revised text makes clear H is a choice
45472	3	5	3	9	I've read the Paris paragraph and don't see how this highly specific conclusion follows - good box though [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Noted: revised text makes clear that the implications of the metric used must be considered in any calculation of aggregate greenhouse gas emissions.
5502	3	11	3	21	The stock Vs flow description is only approximate which should be clearly stated. For example, even a long-lived gas like N2O has some sink which would offset some emissions. Also, the stock/flow description has a history of use associated with land carbon stock accounting that is not the same useage as here; to avoid confusion suggest using a different term. [Haroon KHESHGI, United States of America]	Accepted: the revised wording makes clear the impact of stock pollutants depends on cumulative emissions over either the entire industrial period, or over the past century.
57526	3	11	3	21	On page 20 these long lived gases such as CO2 are introduced as "long–lived climate forcers (LLCFs)"; please be consistent [Hans Poertner, Germany]	Obsolete. reference to LLCF was removed

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49378	3	11	3	12	This is a general problem that any emission metric attempts to address. The Box discusses only the idea of GWP* to tackle this problem, but there are other ideas worth being discussed in my view. The recent idea of using multiple metrics to circumvent this problem (e.g. complementary use of GWP100 and GTP100) gains a fair amount of attentions. Below are examples of relevant literature. Please consider incorporating other ideas like this to the discussion somewhere in the Box. Levasseur A, Cavalett O, Fuglestvedt JS, Gasser T, Johansson DJA, Jørgensen SV, Raugei M, Reisinger A, Schivley G, Strømman A, Tanaka K, Cherubini F (2016) Enhancing life cycle impact assessment from climate science: Review of recent findings and recommendations for application to LCA. Ecol Indicators 71:163-174. doi:10.1016/j.ecolind.2016.06.049 Cherubini F, Fuglestvedt J, Gasser T, Reisinger A, Cavalett O, Huijbregts MAJ, Johansson DJA, Jørgensen SV, Raugei M, Schivley G, Strømman AH, Tanaka K, Levasseur A (2016) Bridging the gap between impact assessment methods and climate science. Environmental Science & Policy 64:129-140. doi:10.1016/j.envsci.2016.06.019 Cherubini F, Tanaka K (2016) Amending the Inadequacy of a Single Indicator for Climate Impact Analyses. Environ Sci Technol 50 (23):12530-12531. doi:10.1021/acs.est.6b05343 Ocko IB, Hamburg SP, Jacob DJ, Keith DW, Keohane NO, Oppenheimer M, Roy-Mayhew JD, Schrag DP, Pacala SW (2017) Unmask temporal trade-offs in climate policy debates. Science 356 (6337):492-493. doi:10.1126/science.aaj2350 CCAC (2017) Metrics for accounting for SLCPs mitigation benefits: discussion Paper for the CCAC SAP Expert Workshop on Metrics, Ottawa, Canada. [Katsumasa Tanaka, Japan]	Noted: this material was included, but then deleted for reasons of space. The difficulty with multiple metrics is that they don't address the central point of this box, which is the implications of metrics for aggregation methods.
3696	3	12	3	12	Insert and spece between dioxide and (Smith [Castor Muñoz Sobrino, Spain]	Obsolete. Text was removed
36382	3	12			Please, put a space between (and Smith. [Emilio Cerdá, Spain]	Obsolete. Text was removed
38810	3	12	3	12	I think you could add more than one ref here. Pierrehumbert, for instance. Or Bowman et al. [Jan Fuglestvedt, Norway]	Accepted.
39512	3	12	3	12	Insert space before the opening parenthesis in "dioxide(Smith..." [Hernan Edgardo Sala, Argentina]	Obsolete. Text was removed
57942	3	12	3	12	There is a spacing issue prior to the reference in "carbon dioxide(Smith et al., 2012)." [Siir KILKIS, Turkey]	Obsolete. Text was removed
2708	3	15	3	16	SLCFs is determined by their annual emission rates (or "flow"). Hence reducing the emission of a long–lived gas like CO2 by a single tonne has a similar impact on the future global mean surface temperature [Christophe Deissenberg, Luxembourg]	Obsolete. text was revised
38812	3	17	3	17	I sugest adding "step" after "permanent" [Jan Fuglestvedt, Norway]	Accepted.
5742	3	18	3	21	The statement "GWP and GTP, conventionally applied, equate a single tonne of CO2 with a single tonne of emissions of an SLCF, not a change in SLCF emission rate, and hence typically understate the impact of SLCF emissions on GMST on short timescales, and overstate their impact on long timescales" is not consistent with panel b) of Cross–Chapter Box 1.2, Figure 1, which show that GWT is smaller than GWP* on longer timescales. Consistency is seen only for GWP in this panel. [Govindasamy Bala, India]	Accepted: "and hence…" has been deleted.
2710	3	23	3	24	Ambitious mitigation scenarios addressing 1.5°C must simultaneously address both long timescales (temperature stabilisation) and short timescales (rapid emission reductions over decades), posing a [Christophe Deissenberg, Luxembourg]	Obsolete. Text was revised
47050	3	23	3	23	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Obsolete. Text was revised
38814	3	25	3	25	I suggest adding "use of" after "conventional. [Jan Fuglestvedt, Norway]	Accepted: phrase has been deleted.
55426	3	3	3	31	Clarify that the key issue for a revised policy framework is that it would need a way of comparing/trading pulse and sustained emissions - it's not the fact that the lifetimes of the gases are different that creates the challenge for policy, but that a pulse emission (or an avoided pulse emission) in one year needs to be related through policy with an obligation (or right to emit) in perpetuity for another group of gases. Countries already treat methane (at least from agriculture) very differently to CO2 - no country currently has a price on agricultural methane. Policy deals just fine with treating different gases and sectors differently (for whatever reason), the problem arises from any attempt to merge stock and flow gases into a single policy framework. [Andy Reisinger, New Zealand]	Accepted: references to policy frameworks have been deleted.
4786	3	32	3	39	Two uses of the word "may" that it would be good practice to change, drawing from the likilihood lexicon. There are several more uses of "may" on the next page. A real scrubbing of the chapter is needed. [Michael MacCracken, United States of America]	Obsolete. Text was revised
51584	3	36	3	4	The stock vs. flow problem is a conceptually deep difficulty that many people struggle with. The technically proficient people reading this report won't struggle with it, but I would advise creating some sort of 'filling a bathtub' analogy or graphic to make it easier to help the technical people communicate this issue to the people whom they work for (who often don't have strong technical knowledge but do make the decisions with profound consequences). [Jason Donev, Canada]	Noted: we accept this is a relatively technical box, but it addresses an important issue and is constrained by space limitations.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
55428	3	36	3	53	The text here has lots of statements that some people will love to take out of context. I feel it would help to start this para with the concluding sentence ("Whatever metric is used…") and then use the rest of the para to get into the nuances of this statement and quantify and explain what it means. As it stands, the concluding sentence hangs somewhat in free air and is not set up well by the preceding discussion. [Andy Reisinger, New Zealand]	Obsolete. Text was revised
53940	3	39	3	41	The paragraph starting "this may require (….) remain speculative" should be deleted, as CO2 removal technologies are ALSO speculative and none of them has been proved to be effective, feasible and viable at any significant scale to counteract excess of emissions. [Elenita Daño, Philippines]	Accepted: references to policy frameworks have been deleted.
31846	3	41	3	41	A rather minor point but the assumption here that all ODS's are long-lived is not correct. I would simply call them "long-lived ozone depleting substances" [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Accepted: phrase has been deleted.
40650	3	44	3	44	The opening bracket on this line does not have a corresponding closing bracket. [Jonny Williams, New Zealand]	Obsolete. Text was removed
31848	3	49	4	49	This is a bit picky but the conclsion regarding GTPs depends on what time horizon is chosen. [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	Noted.
34442	3	5		53	What about the effects of cooling SLCFs? Obiously keeping cooling SLCF emissions high to meet Paris targets carries other disadvantages, but they do effect the climate and need to be discussed. [Nathan Gillett, Canada]	Accepted: revised text makes clear the need for mitigation to offset the impact of reduced cooling SLCFs.
38816	3	5	3	5	You may add a ref to Rogelj et al.: Rogelj J, Schaeffer M, Meinshausen M, Knutti R, Alcamo J, Riahi K, Hare W. 2015 Zero emission targets as long-term global goals for climate protection. Environ. Res. Lett. 10, 105007. (doi:10.1088/1748-9326/10/10/105007) [Jan Fuglestvedt, Norway]	Noted: this paper is assessed in chapter 2
7420	31	1	31	3	It's important to define what do you mean with the term "more than longer term GMST" in the definition of metrics [Manuel MORALES, France]	Obsolete. Text was removed
2712	31	2	31	2	It may be desirable to consider other dimensions than longer–term GMST in the metrics [Christophe Deissenberg, Luxembourg]	Obsolete. Text was revised
2714	31	5	31	5	be considered in the metric (Shine et al., 2015). [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
2716	31	8	31	1	well if the adaptation options are limited (Chapter 3). All this could be included in the definition of the climate metric. From an economic perspective, climate metrics should capture the ratio of marginal economic damages from different GHGs, i.e., their economically optimal exchange ratio under a [Christophe Deissenberg, Luxembourg]	Obsolete. Text was significantly revised
2718	31	15	31	17	found that the metric choice tends to have a modest effect on the median costs of maintaining temperatures below 2°C because all feasible mitigation options are needed (Harmsen et al., 2016; Strefler et [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
13038	31	15	31	2	Delete the text "Studies have found that the effect of metric choice on the median costs of maintaining temperatures below 2°C tends to be modest because all feasible mitigation options are needed (Harmsen et al., 2016; Strefler et al., 2014), implying that a range of metrics might be suitable from a global economic perspective. Metric choice can nevertheless substantially affect carbon prices and consequent mitigation decisions on a regional or sectoral level (see Chapter 2)." [Eleni Kaditi, Austria]	Accepted.
2720	31	19	31	19	The metric [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
2722	31	2	31	2	at the regional [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
48244	31	22	31	25	may have considerable societal co–benefits such as... makes it sound like the reductions of SLCF emissions would be driven by climate change policy, with fortunate side benefits for health etc. Most of the real world works differently: reductions of air pollution are typically driven directly by local tolerance levels being exceeded and reductions being socio-politically acheivable and pushed by pollutant emissions control regulations. This should thus be rephrased as "may occur in various polluted regions, driven particularly by their societal (co–)benefits such as..." [Mark Lawrence, Germany]	Obsolete. Text was removed
2724	31	26	31	26	The valuation of [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
39100	31	26	31	31	Can you write this so that laypeople/policy makers can understand? [Lindsey Cook, Germany]	Accepted. Text revised slightly for clarity
2726	31	29	31	3	economically viable or socially acceptable to favour mitigation of other forcers rather than CO2 mitigation or vice versa. While they do not dictate policy decisions, emission metrics can [Christophe Deissenberg, Luxembourg]	Obsolete. Text was removed
39514	31	32	31	32	The right panel (b) of the figure has the legend: "b) Cumulative WMGHG emissions and & temperature response (black)" To not be redundant, I suggest to delete either "and" or "&". [Hernan Edgardo Sala, Argentina]	Obsolete. Figure revised
40652	31	32	31	32	These figures should be enlarged to take up the full width of the box, thus facilitating interpretation. [Jonny Williams, New Zealand]	Accepted. Figures were revised
53628	31	32	31	32	Figure 1(b) Legends can be added and black line should be defined in the Figure caption [AKM SAIFUL ISLAM, Bangladesh]	Accepted.
46522	31	35	31	44	Colourblind check failed for this figure. The greens and reds used are hard to distinguish between. [Sarah Connors, France]	Accepted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2728	31	36	31	36	mitigation scenario, expressed as [Christophe Deissenberg, Luxembourg]	Obsolete. Txt removed
19110	31	37	31	37	missions => emissions [Olivier Boucher, France]	Accepted.
46380	31	37	31	37	CO2–equivalent missions are "CO2-equivalent emissions". [Ijaz Ahmad, Pakistan]	Accepted. text revised
51230	31	37	31	37	In "Aggregate CO2–equivalent missions fall …." The word missions may be replaced with emissions. [Muhammad Latif, Pakistan]	A text revised
53756	31	37	31	37	emissions [Patrik Winiger, Netherlands]	A text revised
5744	31	38	31	38	It would be more precise if “falling methane emissions are… ” is changed to “falling methane emission rates are…. “ [Govindasamy Bala, India]	Accepted. Revision noted in text
40654	31	42	31	44	It is true that the correlation is stronger in the case of GWP* however to say that the temperature response is 'correlated with neither' of the other two metrics and that they are 'unrepresentative' is overly simplistic especially since this analysis is performed with a 'simple climate-carbon-cyle model'. The temperature reponse tracks all three metrics closely for approximately 100 years from 1900 onwards. The lack of uncertainty analysis in these figures further obfuscates the author's point. This is a very interesting point but is blurred by a less-than-clear explanation. [Jonny Williams, New Zealand]	Noted. The text makes clear that the failure of GWP and GTP metrics only emerges when emissions are falling.
19106	31	44	31	44	I think we need a bit more clarity on how this is computed. I assume that the SLCF emissions are decomposed as a series of sustained emission changes, so that GWP* emissions in year y are dependent on emissions in previous years. It would help the reader who is not versed into these new climate metrics. [Olivier Boucher, France]	Noted: some detail is now provided on how GWP* emissions are calculated in the text, within space constraints.
2730	32	1	32	1	the impact [Christophe Deissenberg, Luxembourg]	Sentence in question was deleted.
8592	32	1	32	2	In placing Cross–Chapter Box 1.2, pay attention so that the caption of Figure 1 does not split over two pages as in this draft [Pauline Midgley, Germany]	Noted
40922	32	5	33	46	The discussion on technological, economic, institutional, and behavioural lock-in seems misplaced here along with inertia in the geophysical climate system. The two inertia are very different - you could argue that there is little control (or the idea of poor control over trajectory of planetary processes mentioned eariler on p13) in case of latter while the former is ideally in our control - and that's why the need for long term goal for net zero, long term strategies for low carbon development so that we can avoid new lock-in. The former - tech, econ, instt, behavioural lock-in - seems to belong to Section 1.4.5 where transformation and transformation pathways are discussed. Consider consolidating the two in one place. [Neelam Singh, United States of America]	Discussion of technological, economic institutional etc. inertia was deleted.
2732	32	8	32	1	The feasibility of this temperature goal depends on the warming ‘commitment’ that arises due to inertia in the geophysical climate system, but also to technologica [Christophe Deissenberg, Luxembourg]	Sentence was reworded
13446	32	9	32	9	warming commitment from whom? [Sergio Aquino, Canada]	Added "from past emissions of greenhouse gases and aerosol precursors"
40656	32	1	32	1	Lock-in' is a vague term and should, at the least, be defined or a different term used. [Jonny Williams, New Zealand]	Lock-in was deleted
2734	32	12	32	12	from the [Christophe Deissenberg, Luxembourg]	Comment unclear
7142	32	12	32	37	I agree on this analysis (but again keeping only one part of it in the executive summary is confusing) [Jean Jouzel, France]	There is no room to repeat the whole analysis in the Executive Summary.
2736	32	14	32	15	if the atmospheric composition and hence the radiative forcing were stabilised at the current level; [Christophe Deissenberg, Luxembourg]	Sentence was reworded.
7350	32	15	32	26	In line with the first comment, the term "zero emissions commitment" is first mentioned in Page 32-Lines 15-16 and after that in Page 32-Line 26, the term and the acronym is showed. I think that the acronym should be used since the first time the term is used. [Pedro Salvador, Spain]	Done
36886	32	17	32	2	The text could be more explicit or clear about the "constant composition commitment". Is that text refering to air-borne fraction of emissions assumed to be constant? There is an alternative way of evaluating surface warming after emissions cease in terms of a single equation in Williams et al. (2017). There is continued surface warming after emissions cease due to the decline of ocean heat uptake leading to a greater fraction of the remaining readiative forcing from atmospheric CO2 driving surface warming. See Williams, R.G., V. Roussenov, T.L. Froelicher and P. Goodwin, 2017. Drivers of continued surface warming after cessation of carbon emissions. Geophysical Research Letters, 44, doi.org/10.1002/2017GL075080. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Constant composition commitment refers to the commitment from constant atmospheric concentrations, consistently with the literature.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51586	32	17	32	37	I'm embarrassed to admit that I am someone who has been suffering under the exact misconception that Hansen's 2005 paper implied. I am willing to take on faith that the asserted statement is true. However, in an effort to make it easier for the reader (many of whom will be operating under this same misconception that I've been operating under) more explanation is needed here. Some graphics would greatly improve my ability to understand why I'm wrong about the current CO2 levels committing us to future warming, despite having been told this a number of times in a number of contexts. Please understand, I'm not disagreeing with the assertion, but unseating my preconception is difficult without a more detailed explanation. It's possible that figure 1.6 several pages further down in the document is that graphic, but if so, the assertion and the graphic are separated too much to be useful (although making it clear that it's figure 1.6 in this document rather than the cited document my be an improvement). My understanding is also based on David Archer from the University of Chicago making the statement that we have perturbed the carbon cycle and that perturbation will last for ~100,000 years. It would seem that would imply (although I don't recall that Prof. Archer made this claim), further warming even in a ZEC. [Jason Donev, Canada]	Figure 1.6. was moved up (closer to the discussion in the text), and referencing of the lines in Figure 1.6 was improved.
50286	32	19	32	19	this statement is wrong: it is not the slow heat uptake, it is the huge heat capacity; moreover, several new publications can be cited here, including AR5. [Karina VON SCHUCKMANN, France]	Sentence was reworded.
50288	32	19	32	24	This part of the paragraph is not nutrally written, and words as "misconception" and "ill-suited" should be avoided. Moreover, strong statements are given here, which are either referenced to pre-AR5 publications, or no citations. [Karina VON SCHUCKMANN, France]	Ill-suited was replaced with "not relevant".
61728	32	26	32	26	Authors introduce a new acronym (ZEC, zero emissions commitment), used only once. Please avoid introducing one more acronym. [Valérie Masson-Delmotte, France]	ZEC is now used more than once.
7352	32	28	32	28	The magnitude and sign of the ZEC depend on the mix of gases and aerosols…. Aerosols are mentioned short afterwards in this page in relation with the ZEC topic. [Pedro Salvador, Spain]	Text was changed as suggested.
36888	32	33	32	35	This argument is quite heuristic that the warming effect is approximated balanced by declining radiative forcing due to CO2 uptake by the ocean. This response is set out in the single equation connecting surface warming and carbon emissions by Goodwin et al. (2015). However, on centennial timescales, the thermal response of declining ocean heat heat uptake can dominate over the carbon response of declining radiative forcing from ocean carbon uptake. See GFDL model illustration by Froelicher et al. (2014), Froelicher and Paynter (2015) and the mechanistic analysis by Williams et al. (2017). References: Frölicher, T. L., & Paynter, D. J. (2015). Extending the relationship between global warming and cumulative carbon emissions to multimillennial timescales. Environmental Research Letters, 10(7), 75002. https://doi.org/10.1088/1748-9326/10/7/075002. Frölicher, T. L., Winton, M., & Sarmiento, J. L. (2014). Continued global warming after CO2 emissions stoppage. Nature Climate Change, 4, 40–44. Williams, R.G., V. Roussenov, T.L. Froelicher and P. Goodwin, 2017. Drivers of continued surface warming after cessation of carbon emissions. Geophysical Research Letters, 44, doi.org/10.1002/2017GL075080. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Reference to Willimas et al., GRL, 2017 was added.
2738	32	34	32	34	warming effect of the ocean thermal inertia is approximately balanced by a decline in radiative [Christophe Deissenberg, Luxembourg]	Rejected
53758	32	35	32	35	Missing bracket "…((Solomon et al., …." or "..2009) (Figure 1.6, …". Or separate the literature reference from the figure reference by semicolon. [Patrik Winiger, Netherlands]	Corrected.
55946	32	35	32	37	As a policy maker, I am confused by this assertion as it appears to be inconsistent with RCPs and indeed conventional knowledge that additional warming of around 0.5 degrees is "baked in" for 1-2 centuries before GMST begins to fall; it also appears inconsistent with the assertion for example on 1-24 line 26 that carbon removal will be necessary in any cases of overshoot to bring temperatures down within a few decades. [Pamela Pearson, United States of America]	The notion that 0.5 degrees of warming are "baked in" is based on constant atmospheric composition, not zero emissions of these gases (see constant composition commitment discussion in text). There is no inconsistency with the need for CDR to bring down temperature after overshoot.
63136	32	35	32	37	should read: "Thus, although the present–day CO2–induced warming is not reversible for millennia (without human intervention such as with CDR or SRM), past CO2 emissions do not commit to substantial further warming." [Greg Rau, United States of America]	Sentence was reworded following suggestion
63140	32	35	32	37	Suggested rewrite: "Thus, although the present–day CO2–induced warming is irreversible for millennia without negative-emissions intervention, past CO2 emissions do not commit to substantial further warming. [Greg Rau, United States of America]	Sentence was reworded
2740	32	38	32	39	time (in the [Christophe Deissenberg, Luxembourg]	Sentence was reworded
34444	32	4			The ZEC for SLCFs must be scenario-dependent. For example it would be different for a case where emissions were constant for a long time, versus following a pulse emission. [Nathan Gillett, Canada]	Noted
49380	32	46	32	48	This is a relatively minor point. The uncertainty in warming commitment from eliminating aerosol emissions stems from not only aerosol forcing uncertainty but also climate sensitivity uncertainty (and their interdependency). Armour KC, Roe GH (2011) Climate commitment in an uncertain world. Geophys Res Lett 38 (1):L01707. doi:10.1029/2010gl045850 Tanaka K, Raddatz T (2011) Correlation between climate sensitivity and aerosol forcing and its implication for the “climate trap”. Clim Change 109 (3):815-825. doi:10.1007/s10584-011-0323-2 [Katsumasa Tanaka, Japan]	We did not discuss this point due to lack of space, but considered climate sensitivity uncertainty in the expert assessment at the end of the section.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3758	32	48	32	48	If GHGs here mean short-lived GHGs, then you can dismiss the previous comments on Page 33. [Yangyang Xu, United States of America]	Here we refer to all GHGs - short and long-lived
2742	32	5	32	5	following the elimination [Christophe Deissenberg, Luxembourg]	Rejected
9486	32	5	32	5	Recent citation, Samset, in N. Clim. Change seems relevant here too; they estimate a larger temperature increase from cessation of aerosols. (Indeed, one that would make 1.5C an impossible target, as an immediate cessation of aerosols would lead to more warming than the 0.4C we have left, so this should be discussed. I assume that paper was submitted before the cutoff deadline.) [Douglas MacMartin, United States of America]	Citation to Samset et al., GRL, 2017 is included (the Nature Scientific Reports paper was not accepted before the literature cutoff deadline).
40658	32	5	32	5	THIS RELATES TO THE FOOTNOTE: Is this adjustment the so-called 'e-folding' time related to assumed exponential decay? Either way it should be more quantitatively defined. [Jonny Williams, New Zealand]	Footnote was deleted.
2744	33	1	33	1	1FOOTNOTE We refer here to the adjustment time, rather than the turnover time of a gas in the atmosphere. The adjustment [Christophe Deissenberg, Luxembourg]	Footnote was deleted
3756	33	2	33	2	The graduate cooling is mainly driven by GHG decline, not SLCP cut. [Yangyang Xu, United States of America]	The sentence states "driven by the decline in radiative forcing of short–lived greenhouse gases".
31850	33	2	33	2	Presumably it is the decline in methane forcing that is dominating on these longer timescales? [Keith Shine, United Kingdom (of Great Britain and Northern Ireland)]	That is correct. We do not have enough space to discuss the contribution of individual forcers.
2746	33	6	33	6	commitment, assuming no [Christophe Deissenberg, Luxembourg]	Sentence was deleted
24302	33	6	33	6	Maybe keep to one term for the ZEC? [Joeri ROGELJ, Austria]	Sentence was deleted
40660	33	6	33	7	This sentence does not make grammatical sense and should be reworded. [Jonny Williams, New Zealand]	Sentence was deleted
2748	33	11	33	11	economic inertia. This is referred to as the 'feasible scenario commitment' [Christophe Deissenberg, Luxembourg]	Sentence was deleted
51588	33	13	33	15	A graphic showing the three main types of inertia would help illustrate this important point better. [Jason Donev, Canada]	Discussion of types of inertia other than geophysical was deleted.
38818	33	17	33	17	I am not sure why you refer to Fuglestvedt et al here. Misplaced? [Jan Fuglestvedt, Norway]	Reference and related paragraph were deleted.
40662	33	17	33	2	This sentence does not make grammatical sense and should be reworded. [Jonny Williams, New Zealand]	Sentence was deleted
53942	33	18	33	2	Delete paragraph starting with "For instance, unless power plants are …. (until) many decades. The example does not exist as it is not proven and largely speculative that CCS would function and deliver as expected, thus it is wishful thinking instead of acknowledging that "Existing Power plants infrastructure is expected to contribute CO2 emissions and warming for many decades" [Elenita Daño, Philippines]	Paragraph was deleted.
2750	33	2	33	2	Davis et al. (2010) estimate a 0.2–0.5°C [Christophe Deissenberg, Luxembourg]	Sentence was deleted
51446	33	2	33	2	0.2-0.5°C warming in 2060 : as compared to when? [Astrid Schulz, Germany]	Sentence in question was deleted.
53760	33	2	33	24	Warming in 2060 ist compared to warming in 2100. Could instead a value for 2060 from Smith et al. 2018 be used? [Patrik Winiger, Netherlands]	Sentence in question was deleted.
53762	33	23	33	24	The last sentence makes it sound to me as if Smith et al. 2018 did not consider physical climate system ucertainties. [Patrik Winiger, Netherlands]	Sentence was deleted
2752	33	24	33	24	arises from their [Christophe Deissenberg, Luxembourg]	Sentence was deleted
24304	33	24	33	24	ADD: … and associated non-CO2 emissions. [Joeri ROGELJ, Austria]	Sentence in question was deleted.
37354	33	26	33	33	I think there is one key aspect missing in this paragraph, which is that physical structures built up by humans, e.g. infrastructures, settlement patterns, production capacities etc. also create institutional inertia. Consider the many ways in which daily routines of humans are centered around such structures (e.g. operational procedures and the structuration of work are strongly influenced by them). Or think of the role of communication infrastructure for how societies are organised (e.g. Stokols, 2017, Social Ecology in the digital age, Krausmann et al., 2017. PNAS, vol 114, 1880ff; Haberl et al., 2017, sustainability 9, 1049). Note that this is different from the behavioural inertia discussed in the following para, which is of course also strongly related to these physical structures, but the point here is that social organization and institutions are also shaped by these structures, not only individual human behavior [Helmut Haberl, Austria]	Paragraph was deleted.
38820	33	26	33	33	But what about unintended inertia? [Jan Fuglestvedt, Norway]	Sentence in question was deleted.
39102	33	29	33	31	This is a profound point but needs to be worded more clearly for the layreader, or its message is lost. [Lindsey Cook, Germany]	Sentence was deleted
39104	33	35	33	47	Will you give similar time to behavioural change, rather than only behavioural inertia? Policy makers need to understand what is possible, or the root causes of anthropogenic climate change are not being addressed. [Lindsey Cook, Germany]	Sentence in question was deleted.
2754	33	4	33	4	). HERE YOU COULD ALSO MENTION MYOPIC BEHAVIOR. I CAN PROVIDE REFERENCES [Christophe Deissenberg, Luxembourg]	Sentence was deleted
17962	33	48	34	16	This whole discussion on timescales should be taken to Chapter 2 [Andrea TILCHE, Belgium]	Rejected. it would be impossible to introduce the concept of pathways without discussion of timescales.
38822	33	51	34	4	This concept (the time it would take to reach the target at the current rate of warming) and the results should be discussed vs the results in chapter 2. In order to avoid confusion about how many years calculated by different approaches. I.e. explain differece to scenarios and modelling. [Jan Fuglestvedt, Norway]	Noted. the discussion of the number of years left before we reach 1.5C has been clarified in the FGD, with additional support in the published literature.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2756	33	52	33	52	THIS IS UNCLEAR TO ME – HOW IS THE TRAJECTORY COMMITMENT RELATED TO THE EARLIER “PROFOUND DIFFERENCE” AND WHY IS IT A COMMUNICATION DEVICE? [Christophe Deissenberg, Luxembourg]	Sentence was reworded
32784	34	1	34	2	(...) warming rate: if temperatures are now at 1°C and (...) ... please replace "if" by "as": "as temperatures are now" [Manfred Treber, Germany]	Sentence in question was deleted.
2758	34	3	34	4	timescale for 1.5°C is 25 years, as the GMST would reach 1.5°C in the early 2040s at the current rate of warming. [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
24306	34	6	34	16	This paragraph is unnecessarily confusing by mixing forcing and emissions. It is also very text-book like, without providing a real assesment. Can be removed in my opinion. [Joeri ROGELJ, Austria]	Paragraph was rewritten.
42960	34	6	34	16	Specify the “timescale” considered here, including when it will start and how quickly emissions must decline. [Durwood Zaelke, United States of America]	Obsolete. Text revised
50474	34	6	34	17	The 'trajectory commitment' argument seems important - please consider rewriting in a more accessible way, spelling out very clearly what Figure 1.6 means and how the individual lines must be interpreted. Maybe more importantly, link the results back to the misconception about warming inertia mentioned earlier [Ina Möller, Sweden]	Paragraph was rewritten
55944	34	8	34	16	See comment for 1-21-10 to 14, above -- confusing language (does non-CO2 include methane and N2O, implying these substances are cooling??) so need similar differentiation here regarding what is meant by "non-CO2," including nuance on different SLCFs or aerosols, as current language aggregates "aerosols" without sufficient nuance as to differing kinds'sources and therefore impacts. [Pamela Pearson, United States of America]	Noted. we believe non-CO2 climate forcing agents is unambiguous, and covers all (warming and cooling) agents.
31698	34	17	34	18	I have some trouble accepting the lower figure on temperature. I would expect that the blue curve would behave something similar to the yellow curve, but with slower change. As CO2 emissions are shut down in 2020, the expected outcome would be to see warming continue for about a decade due to historic emissions, and followed by a slow gradual cooling after that. That is the result I found when replicating this figure by assuming constant CO2 emissions until 2020 and then zero emissions from 2020 and combining that emission profile with the metric Absolute Global Temperature change Potential, which is a very simple climate model. [Borgar Aamaas, Norway]	The temperature response to zero CO2 emissions shown in the figure (blue line) is consistent with the body of literature on zero emissions commitment.
61730	34	17	34	21	Do I understand correctly that all these calculations assume constant land use and related emissions, as it is not explicit? Do I also understand correctly that many of this calculations are purely for illustration purposes, given the co-emissions of GHG and aerosols in various processes? It may be valid to add precisions in the caption of the figure. [Valérie Masson-Delmotte, France]	Land-use emissions are zeroed with fossil fuel emissions. In the text it is specified that ZEC simulations are based on idealized assumptions.
8594	34	19	34	19	I suggest moving this Figure one or two pages back in the text so that it is placed nearer to where it is extensively discussed [Pauline Midgley, Germany]	Done
9668	34	19	35	6	Figure 1.6, lines 19-21, indicates emissions should fall to zero by 2020 whereas on page 35, lines 4-6, says the dotted line emissions are reduced to zero over 56 years. Is there a conflict between the two statements? [Mustafa BABIKER, Sudan]	The dotted blue line assumes a linear, rather than abrupt reduction of emissions, as explained in the figure caption.
38824	34	19	34	19	Very useful figure. You may add "linear" for the 2nd case in the legends. [Jan Fuglestvedt, Norway]	This is specified in the figure caption.
57672	34	19	35	8	It would be useful to explain the initial sudden rise in radiative forces in the top figure, in the caption. [Hans Poertner, Germany]	We agree that it would have been useful to include more detailed explanations for some features of the response shown in Figure 1.6, but refrained from doing so due to lack of space.
40664	34	21	34	21	The authors use results from one model here. Are there other similar studies using models of a comparable (or enhanced) complexity. If there are none then this should be stated also. [Jonny Williams, New Zealand]	Figure is for illustrative purposes only and shows results consistent with those obtained with more complex models. Assessment is done base on results from models of varying complexity.
39516	35	11	35	11	I suggest to delete the space inside "1.5° C", in order to keep consistency with the rest of the chapter. (Probably, this title is internally linked in the document with the Table of Contents, see page 2, line 33). [Hernan Edgardo Sala, Argentina]	Implemented
4790	35	13	35	18	The jumping from mention of a change in global average temperature straight to specific consequences around the world (i.e., impacts) omits giving an explanation of how the global climate is changing--so greater change over land than ocean, at mid- and high latitudes compared to low latitudes, the intensification of precipitation, the poleward expansion of the subtropics, the lengthening and intensification of the warm season (and the opposite for the cold season), the intensification of drying/moisture stress and shift toward drought, the melting of the glaciers and ice sheets and consequent rise in sea level that adds to thermal expansion of the oceans, the activation of the natural carbon cycle (permafrost thawing, vegetation change), and more--and providing context for the changes in terms of the paleo-record (which confirms the roughly 3 C temperature sensitivity for CO2 doubling, gives a roughly 15-20 m sea level/degree sensitivity, and provides an indication of the range of pH over Earth history, etc.). I just don't see (at this point) how one can jump from the discussion above about the potential for changes in the global average temperature to impacts without a good discussion of what is associated with a change in the global average temperature. [Michael MacCracken, United States of America]	Accepted, the section has been reviewed extensively; consistent effort was made to increase the discussion of past climates within page constraints. Where appropriate reference was made back to the AR5
2760	35	14	35	14	possible to use a single number to compare the [Christophe Deissenberg, Luxembourg]	Accepted - Text was revised
38826	35	14	35	14	Re "single global number": I don't think all readers will understand that you are talking about a highly aggregated global impact estimate, and that this could be in monetary terms. I suggest you explain a littel more. [Jan Fuglestvedt, Norway]	Accepted. More elaboration was provided

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2762	35	17	35	17	introduced. However, for a detailed assessment [Christophe Deissenberg, Luxembourg]	Accepted - Text was revised
40666	35	21	35	21	The term 'very localised' needs clarification. [Jonny Williams, New Zealand]	Accepted - Text was revised
196	35	23	35	24	There are wide range of indirect impacts due to either one of the direct impacts and 'tourism' is not a good example (more people can come to see a bleached reef and tourism can be indirectly impacted by other drivers in a more severe way). As examples for indirect impacts on corals and coral reefs due to direct impact of 'bleaching' I would count: coral growth, coral reproduction, etc. [Baruch RINKEVICH, Israel]	Noted. Discussion of impacts was heavily revised in the chapter and framing was sharpened
13448	35	23	36	24	Impacts can be direct like in coral bleaching due to ocean warming or indirect such as redured tourism dueto coral bleaching at a particular site. [Sergio Aquino, Canada]	Rejected, sentence is fine
2764	35	24	35	24	coral bleaching. Impacts [Christophe Deissenberg, Luxembourg]	Accepted - Text was revised
4792	35	24	35	24	Change to "due to coral" [Michael MacCracken, United States of America]	Accepted - Text was revised
51590	35	24	35	24	Missing the word 'to' between 'due' and 'coral' [Jason Donev, Canada]	Accepted - Text was revised
56198	35	24	35	24	Change to "due to coral bleaching". [Annika Herbert, Australia]	Accepted - Text was revised
4794	35	25	35	26	Using SRM here as an example seems terribly out of place here, given it has not really even been discussed, and given that virtually all SRM studies make clear that the consequences of mitigation/adaptation/CDR/SRM are FAR LESS than the consequences of what would happen were SRM not part of the set of responses. This is really a gratuitous inclusion of SRM and makes no sense at all to include here. How about instead mentioning adaptation--so putting houses on pilings isolates them during storms whereas retreat would still allow emergency responders to reach them--or the land cover and use changes associated with biofuels or retreat from the coastline. In that SRM is a way to reduce impacts, putting it here indicating it is a cause of impacts really makes no sense at all--the discussion is just not nearly nuanced enough to justify SRM as an example here. [Michael MacCracken, United States of America]	Accepted, the section has been reviewed extensively
53944	35	25			Delete the word "remedial" as SRM is not proved to remedy anything. [Elenita Daño, Philippines]	Noted.
4796	35	29	35	29	Several seems a very significant understatement, given that you have previously talked about impacts being local and related to consequences. Were this talking about major features of the climate such as shortening of the cold season, etc., perhaps, but this sentence is about impacts--saying "several" here is just not consistent with the preceding sentence. [Michael MacCracken, United States of America]	Noted. Discussion of impacts was heavily revised in the chapter and framing was sharpened
7354	35	29	35	32	In relation with the impact of climate change, extreme events and atmospheric pollution, I suggest to mention aside from tropospheric ozone, particulate matter from wildfires and dust storms (Fernández A.J., Molero F., Salvador P., Revuelta A., Becerril-Valle M., Gómez-Moreno F. J., Artíñano B., Pujadas M. 2017. "Aerosol optical, microphysical and radiative forcing properties during variable intensity African dust events in the Iberian Peninsula". Atmospheric Research, 196, 129-141.). [Pedro Salvador, Spain]	Noted.
38828	35	29	35	32	you may add a referece to a recent paper discussing these issues: A recent commentary (peer reveiwed) by Otto et al in Nature Climate Chaneg is potentially relevant for this section: Assigning historic responsibility for extreme weather events. Nature Climate Change 7, 757–759 (2017)DOIdoi:10.1038/nclimate3419. [Jan Fuglestvedt, Norway]	Noted.
56200	35	31	35	31	Not clear what your definition of "forcings" is. According to the climatological definition, none of the listed processes are forcings. The definition used needs to be added to the glossary. [Annika Herbert, Australia]	Noted and revised; attempts were made to clarify the definition
55948	35	32	35	32	Add, "Observed impacts are especially extreme in the Arctic, including not only mean temperatures well above GMST but loss of sea ice thickness and extent, decreased snow cover, increased mass loss from Greenland and permafrost thaw (AMAP, 2017)." Citation: AMAP, 2017. Snow, Water, Ice and Permafrost in the Arctic, 2017. Arctic Monitoring and Assessment Program (AMAP), Oslo, Norway. [Pamela Pearson, United States of America]	Noted.
4798	35	37	35	39	Actually, "risk" seems to be used also for the actual consequences of the change (e.g., see page 8, line 8 and comment on that). That is, when one talks about people today being at greater risk, that is not theoretical--people have been more often and more intensely having to endure the consequences of climate change, not just of the increasing possiblity of change. I think the definition on these lines needs expansion, or the use of the word elsewhere needs to be limited. [Michael MacCracken, United States of America]	Noted and revised; attempts were made to clarify the definition of risk make it consistent with AR5
57278	35	37	35	38	Projected risks to human and natural systems? The AR5 definition of risk is 'The potential for consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain.' This is in contrast with the definition of risk in the next sentance, where risk can apply to the climate system projections whether or not there are consequences for ecosystems and humans [Hans Poertner, Germany]	Noted and revised; attempts were made to clarify the definition of risk make it consistent with AR5
2766	35	38	35	38	management context as expected value, i.e. [Christophe Deissenberg, Luxembourg]	Accepted - Text was revised
2768	35	41	35	41	this report uses the following definitions: [Christophe Deissenberg, Luxembourg]	Noted
57682	35	41		54	This definition of impacts and risk should be developed further so to combine projected impacts with the risk framework. It seems arbitrary to distinguish risk and projected impact according to likelihood levels and thereby intuitively suggest that risk is not about impact. [Hans Poertner, Germany]	Accepted, the section has been reviewed extensively
2770	35	42	35	42	impact refers to the observed [Christophe Deissenberg, Luxembourg]	Noted - definition of impact was revised
4800	35	42	35	53	It might also be useful to define "effects of climate change" as being the change in parameters describing the climate, so changes in rainfall intensity, temperature, sea level rise--to the changes that cause the impacts. [Michael MacCracken, United States of America]	Noted.

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57280	35	44	35	47	This is confusing given observed impact refers to consequences for human and natural systems, yet projected impacts refer to climate projections [Hans Poertner, Germany]	Noted. Discussion of impacts was heavily revised in the chapter and framing was sharpened
2772	35	46	35	46	there is high confidence that the change will occur and that other drivers will not alter the [Christophe Deissenberg, Luxembourg]	Accepted - text revised
46514	35	46	35	46	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	accepted. Use IPCC uncertainty language
2774	35	47	35	47	(e.g. the projected [Christophe Deissenberg, Luxembourg]	Accepted - text revised
7170	35	48	35	48	I understand the distinction between 'projected impacts' and 'projected risks'. But the use of both 'risk' and 'projected risk' is confusing. Risk is always about something that has not yet occurred. [Petra Tschakert, Australia]	Noted. Discussion of impacts and risk was heavily revised in the chapter and framing was sharpened
55430	35	48	35	53	Despite the assertion by the authors, the definition of risk used here is not consistent with the glossary definition. The concept of risk (as per glossary) crucially combines outcome (something at stake that people value) with uncertainty (and hence probability, either of the event occurring or about the magnitude of the event - even if not quantified). Risk is not simply a case of "something that may happen and that is affected by vulnerability and exposure", even though these factors are crucial to generate events that put something at risk that people value. Please rephrase to ensure consistency with the glossary definition (noting that there is a difference between the glossary definition in the AR5 SYR and AR5 WGII; personally I feel the AR5 WGII definition is tighter and less prone to abuse). [Andy Reisinger, New Zealand]	Noted. Discussion of impacts and risk was heavily revised in the chapter and framing was sharpened
38830	36	1	36	15	I think this text may be reduced; these examples of impacts may not be needed here. [Jan Fuglestvedt, Norway]	Text has been considerably reduced
2776	36	2	36	2	Agreement, and thus defined in the context of the UNFCCC. But what do we mean with 'impacts [Christophe Deissenberg, Luxembourg]	Sentence deleted
40924	36	3	36	4	Important statement which should be reflected in the Summary for Policymakers as well. [Neelam Singh, United States of America]	Noted
51448	36	3	36	4	Differentiating ...does not imply a scientific statement of safe vs. Unsafe conditions ... - I am not sure what this statement means. Reformulate? [Astrid Schulz, Germany]	Text deleted
2778	36	4	36	5	change. For heat–related extremes in the tropics, an additional 0.5°C (i.e., a 2°C versus 1.5°C warming) marks the [Christophe Deissenberg, Luxembourg]	Sentence deleted
34446	36	4		7	It cannot be the case that a particular warming threshold marks the difference between events at the upper limit of natural variability versus a new climate regime. This depends entirely on the definition of an event. Decadal mean temperature will move into a new climate regime sooner than daily mean temperature, for example. [Nathan Gillett, Canada]	This text has been removed
2780	36	7	36	8	result in changes unmatched during the last 10,000 year [Christophe Deissenberg, Luxembourg]	Sentence deleted
4802	36	8	36	15	I think a phrase or sentence needs to be added her to indicate that if a pathway goes up over 1.5 C and then comes back to it that themany components of the consequences are likely to be associated with the peak temperature reached rather than the temperature the pathway eventually comes back to, and the longer this return takes the more likely it is that the peak (overshoot) temperature will determine both the near- and long-term impacts/consequences. [Michael MacCracken, United States of America]	We agree, but this is covered in 1.3.3
13450	36	8	36	9	definitions like 'for this report, 'impacts at 1.5…' should be close to the beginning of the section: page 35:11 [Sergio Aquino, Canada]	This has been moved up
17620	36	9	36	11	Suggest revising "global average of near-surface air temperature" to "global mean surface temperature" to avoid inconsistency with lines 34-36 on P.15. [Sai Ming Lee, China]	Text deleted
2782	36	1	36	12	By comparing the impacts at 1.5°C with those at 2°C, this report highlights the impactthat could be avoided by maintaining global temperature increase at or below 1.5°C rather than 2°C, noting that these impacts also [Christophe Deissenberg, Luxembourg]	Partially implemented
39098	36	1	36	15	This is really well written (to help readers imagine) and also addresses concerns above. ThisSR report is critical for these understandings. [Lindsey Cook, Germany]	Noted
17964	36	11	36	15	When discussing impacts on natural and human systems of a 1.5°C world the focus is too much on how impacts differ between 1.5°C and 2°C, rather than on depicting how impacts in a 1.5°C world compare to present conditions. Also, if a comparison is made of impacts under other warming levels, why not considering warming levels that are more in line with the current NDCs ? [Andrea TILCHE, Belgium]	We do not discuss actual impacts on Ch1, we just provide the necessary framing in assessing impacts at different levels of warming
62956	36	15		18	This result must be specific to some locations in the tropics, and I would suspect it is scenario and model dependent. Either add more qualifiers, or add additional literature citations if it's a general result. [Nathan Gillett, Canada]	This text has been removed
2784	36	17	36	19	While numerical models and formal detection and attribution techniques are commonly used to attribute the impacts to different levels of warming (e.g., [Christophe Deissenberg, Luxembourg]	Rejected, sentence revised and the suggested edit no longer applies

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9552	36	17		25	See comments above for p. 7 that also apply here. Excellent to see here mention of the importance of Indigenous and local knowledge (although the two should be differentiated). However, the last sentence implies that this knowledge is based on lived experiences rather than 'tangible or empirical'. While this may be true in referring to some community observations, this is not true of Indigenous knowledge which, as mentioned above, has undergone a long process of validation. Nor is it true of community knowledge in many Arctic communities where there is long-term and ongoing community-based monitoring of climate drivers and/or impacts that ARE tangible and empirical (e.g. water monitoring, ice monitoring, permafrost monitoring). The wording here must be changed so that it doesn't imply that community knowledge is only perceived through 'felt' experience, which diminishes its importance, whether intentionally or not. [Joanna Petrasek MacDonald, Canada]	Wording changed accordingly, the phrase "felt rather than tangible or empirical" has been removed.
2786	36	21	35	24	perspective due to [Christophe Deissenberg, Luxembourg]	Rejected, sentence shortened and comma is necessary
56202	36	22	36	22	Remove "equally", as it makes it seems as if local knowledge is equal to no observations. [Annika Herbert, Australia]	Implemented, and text moved to section 1.5
4804	36	23	36	23	Delete the first comma [Michael MacCracken, United States of America]	Implemented, and text moved to section 1.5
54474	36	23	36	25	To say things are embodied, felt and experienced yet not tangible and empirical does not make sense ....at least without more nuance or engagement with the epsitemological and ontological issues that underlie the nature of local/Indigenous knowlege verus scientific knowledge. Perhaps stating the idea more positively works better, viz. local and indigenous knowledge may perceive impacts and causal connections between phenomena which may yet to be empirically validated or measured by science.... [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	The phrase "not tangible and empirical" has been deleted.
2788	36	24	36	25	embodied and place–based experiences, that is by feelings rather by than tangible or empirical evidence, and is therefore exceedingly hard to capture adequately (Tschakert et al., 2017). [Christophe Deissenberg, Luxembourg]	This part of the sentence has been deleted
4806	36	25	36	25	I don't think "predict" is the right word here (especially as in the scientific sense it implies determination in a statistically rigorous sense--high statistical confidence). What I think might be said is that these sensed reactions are noting a change in a combined set of climate variables, many of which are not recorded in observational data sets (e.g., the type of snow rather than just its areal extent and depth; the timing and well being of a combined set of responses of the flora; the mix and interactions of the fauna; and so on) but represent the overall functioning of the environment, and so are difficult to capture in the official scientifically observed records. The next paragraph actually explains a good bit of this--so it might be said at the end of the next paragraph that, as a result, the overall set of impacts for a region is difficult both to define and to project. [Michael MacCracken, United States of America]	We now use the word "assess" rather than "predict"
35472	36	27	36	32	Impacts could also be beyond human society - e.g. biodiversity loss, species extinction etc. Would be good to mention that too. [Ashok Sreenivas, India]	Text deleted
2790	36	29	36	29	but all are relevant to society [Christophe Deissenberg, Luxembourg]	Sentence deleted
2792	36	3	36	3	about both the amount [Christophe Deissenberg, Luxembourg]	Sentence deleted
2794	36	32	36	32	impacted systems. These differ widely from one system to another and may be non–linear. [Christophe Deissenberg, Luxembourg]	Sentence deleted
57674	36	35			The term "A physical dimension of impact" should be abandoned. In the risk framework adopted by all working groups this would be called "hazard". The wording "physical dimension of impact" is misleading. [Hans Poertner, Germany]	Change implemented, we no longer use this term.
2796	36	39	36	41	The spatial and temporal distributions of impacts are key in understanding how 1.5°C impacts affect people. This report thus assesses the local consequences of global warming at 1.5°C and 2°C (Chapter 3). Many [Christophe Deissenberg, Luxembourg]	Sentence deleted
34448	36	39			According to the definitions given, this should be a 'projected impact'. [Nathan Gillett, Canada]	Definition has been revised
42746	36	39	36	49	Arctic warming at twice the rate as the global average. Arctic Monitoring and Assessment Programme (AMAP) (2017) SNOW, WATER, ICE, AND PERMAFROST IN THE ARCTIC: SUMMARY FOR POLICYMAKERS, 8 (“The Arctic is still a cold place, but it is warming faster than any other region on Earth. Over the past 50 years, the Arctic’s temperature has risen by more than twice the global average. Increasing concentrations of greenhouse gases in the atmosphere are the primary underlying cause: the heat trapped by greenhouse gases triggers a cascade of feedbacks that collectively amplify Arctic warming.”). [Kristin Campbell, United States of America]	Beyond the scope of a framing Chapter, Please refer to Ch3
42962	36	39	36	49	Arctic warming at twice the rate as the global average. See Arctic Monitoring and Assessment Programme (AMAP) (2017) SNOW, WATER, ICE, AND PERMAFROST IN THE ARCTIC: SUMMARY FOR POLICYMAKERS, 8 (“The Arctic is still a cold place, but it is warming faster than any other region on Earth. Over the past 50 years, the Arctic’s temperature has risen by more than twice the global average. Increasing concentrations of greenhouse gases in the atmosphere are the primary underlying cause: the heat trapped by greenhouse gases triggers a cascade of feedbacks that collectively amplify Arctic warming.”). [Durwood Zaelke, United States of America]	Beyond the scope of a framing Chapter, Please refer to Ch3
3698	36	4	36	4	I suggest to replace local by regional/local in view that in most cases the document describes at best some regional synthesis of evidence, projections, scenarios, etc. [Castor Muñoz Sobrino, Spain]	Implemented
4808	36	41	36	41	I think saying "assessed" here is really not very helpful to the reader--they are "assessed" their taxes, etc. I would urge instead saying "summarized and evaluated" or something similar instead of using jargon words like "assessed." [Michael MacCracken, United States of America]	The IPCC carries out an assessment of the literature and hence we need to use the word assess.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
48220	36	41	36	43	The following statement maybe misleading and may require some clarification "Many regions experience higher than average rates of warming and some are already now 1.5°C warmer with respect to the pre–industrial period (Figure 42 1.3).". It is my understanding that global warming level of 1.5°C is a global average over a 30-year period, relative to the 51-year period 1850-1900. But, the regional warming depicted in Figure 1.3 is the regional scale warming over the 10-year period 2006-2015, relative to 1850-1900. If this is the case, can we compare and infer the expression of regional rates of warming against the 1.5°C global warming level? [Sarah Connors, France]	It is now specified in the text that this is over the decade 2006-2015
2798	36	42	36	42	some are already now 1.5°C warmer than in the [Christophe Deissenberg, Luxembourg]	Rejected. Warming is relative to the pre-industrial period as per definition
2800	36	44	36	44	differ substantially depending on the season. [Christophe Deissenberg, Luxembourg]	Sentence deleted
4810	36	44	36	45	It would really be good to get rid of the word "may" and provide some indicaiton of likelihood. Explaining that the cold seasons are shortening and warm seasons getting longer would help in setting the stage that the nature and intensity of temperature and precipitation changes are indeed likely to be different by season. Indeed, this might be a good place to indicate that what is really happening is a change in the frequency, types, and intesity of the weather systems that together make up the climate--that the climate changes is a result of the weather changing, not the reverse--the climate is a statistical artifact that is only experienced by experiencing the weather. [Michael MacCracken, United States of America]	may has been replaced with "will"
2802	36	46	36	49	pre–industrial (Seneviratne et al., 2016). In this report, the “warming experience at 1.5°C” in this report is understood as the collection of local climate changes (temperature, rainfall and other changes) when global average temperatures, as defined in Section 1.2.1, reach 1.5°C above pre–industrial. [Christophe Deissenberg, Luxembourg]	Rejected, sentence is fine
38832	36	48	36	49	I think this could be highlighted more in the ES [Jan Fuglestvedt, Norway]	Noted
61732	37	1	37	53	See my first overall comment for the chapter. I suggest to strongly reduce this section, as examples are given without a full assessment which is achieved only in chapter 3. What is most important here is to reflect the key aspects of the assessment done in the other chapters of the report. I would rather suggest to introduce key knowledge gaps (for information, the chapter 1 of the SROCC FOD report has the intention to have a box on deep uncertainty). [Valérie Masson-Delmotte, France]	The text has been considerably reduced
2804	37	5	37	5	King et al., 2017), and thus, different [Christophe Deissenberg, Luxembourg]	Rejected, sentence is fine
2806	37	6	37	7	some extremes. However, this could still imply increased risks, due to warm anomalies affecting cold–adapted systems (Seneviratne [Christophe Deissenberg, Luxembourg]	Sentence deleted
4812	37	1	37	13	This is a rather strangely worded sentence--if high-precipitation events in mid-latitudes are common, then this is apparently not really variable and these events are not really extremes, unless judging against some earlier standard for extreme events when overall precipitation was less. I just think that the logic of the sentence is not very clear. [Michael MacCracken, United States of America]	Text deleted
40668	37	1	37	21	This paragraph only has one reference associated with it. Further references should be given to this very important aspect of the chapter to answer questions such as: 'Is this a robust result?' Or 'Do other studies agree or disagree?' [Jonny Williams, New Zealand]	Text deleted
46498	37	1	37	1	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Sentence deleted
2808	37	11	37	13	IS “, where high–precipitation events are common, versus tropical regions, where precipitation is less variable, with higher total precipitation but fewer extremes” NECESSARY? IT IMPAIRS THE READING … [Christophe Deissenberg, Luxembourg]	Sentence deleted
4150	37	11	37	12	It would perhaps be better to avoid contrasting the variability of tropical and extratropical precipitation. Parts of the tropics can experience enormous extremes of rainfall from the occasional passage of tropical cyclones, for example. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Text deleted
1544	37	13	37	18	I still have some concerns about this material (raised initially in my review of the FOD). It reads as if at ALL mid-latitude locations in South America there is a relatively modest increase in the probability of heavy precipitation at 1.5°C increase compared to 2°C increase. And it reads as if at ALL TROPICAL LOCATIONS IOVER THE GLOBE there is a decrease in the intensity of heavy precipitation under 1.5°C of warming compared to historical values. I've not read the original paper, but from the discussion in the FOD I get the impression this study is for just two locations in South America - one at temperatue latitudes, one in the tropics. If I am right, I suggest you change the language in this paragraph to make it clear you are referring to just two sample locations in South America to illustrate that there can be a non-monotonic relationship between temperature increase and heavy precipitation - and that the relationships these authors have found at two South American locations do not necessarily reflect relationships between precipitation intensity and temperature increwase over broader geographical scales.(I'm worried about these sentences being taken out of context to argue that changes in temperature will have little effect on intense precipitation everywhere). [David Wratt, New Zealand]	Text deleted
3762	37	15	37	16	I am quite skeptical about the reported "non-monotonic" response here. Is this for whole tropics or just tropical Amazon? If it is latter, the extreme rainfall is heavily influenced by internal variablity, thus the robustness of aforementioned statement might be low. [Yangyang Xu, United States of America]	Text deleted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
50476	37	15	37	18	Convoluted sentence - consider reformulating [Ina Möller, Sweden]	Sentence deleted
2810	37	2	37	2	from 1.5°C to 2°C warming worlds. The magnitude [Christophe Deissenberg, Luxembourg]	Sentence deleted
13452	37	22	37	22	a table with the impact of global warming in the different continents would be great [Sergio Aquino, Canada]	Rejected, outside the scope of Ch1, please refer to Ch3
9364	37	24	37	39	Is there any data regarding magnitude of socio-economic consequences of non-temperature related impacts? If there are some information about them, it may be useful to be included in the sub-section no. 1.3.1.3 [Attila Buzási, Hungary]	Not possible due to word limit
53388	37	24	37	39	Vegetation cover, in particular tropical forests, has a huge impact on temperature and rainfall, beyond the carbon cycle. See Lawrence D et al 2015. Nature and Climate change. Effects of deforestation on climate and agriculture https://www.scopus.com/record/display.uri?eid=2-s2.0-84924558385&origin=inward&txGid=becf5c99bd43bc851789baaa82f266c6 . Also See Llopart et al 2018. Water.Land Use Change in the Amazon Forest and its Impact on the Local climate http://www.mdpi.com/2073-4441/10/2/149 Also Findell et al. 2017. Nature. Land Use change and extreme temperatures https://www.nature.com/articles/s41467-017-01038-w And not to ignore the coupling of other types of canopy or vegetation surface with climate affecting rainfall - eg corn http://www.sciencemag.org/news/2018/02/america-s-corn-belt-making-its-own-weather The impact of tropical deforestation or keeping forest cover on non CO2 temp pathways should not be underestimated in the text just because the expertise in water-vegetation models are not so prominent in the authors selected to write the report [Elizabeth Penelope Davies, United States of America]	This section refers to non-temperature related impacts due to GHG emissions.
39518	37	26	37	26	I suggest to use "Special Report" instead of "special report" in order to keep consistency along the chapter. [Hernan Edgardo Sala, Argentina]	Sentence deleted
2812	37	27	37	29	impacts do not depend on warming alone. Changes in rainfall affect the hydrological cycle and water availability (Schewe et al., 2014). The atmospheric composition is important. For example, increasing atmospheric carbon dioxide levels lead to ocean acidification [Christophe Deissenberg, Luxembourg]	Rejected, sentence is fine
7356	37	27	37	28	Changes in rainfall also affect dust emissions and long-range transport from arid zones, aside from the hydrological cycle and water availability (Prospero J.M. and Lamb P.J., 2003. "African droughts and dust transport to the caribbean: climate change implications". Science, 302, 1024-1027.). It has implications on human health and the role of dust-borne iron (Fe) on the ocean carbon cycle (Prospero J.M., 2006. "Saharan dust impacts and climate change". Oceanography, 19(2), 60-61.). [Pedro Salvador, Spain]	We agree, but cannot provide all examples.
40670	37	27	37	28	Rainfall is clearly part of the hydrological cycle and so to state that 'changes in rainfall affect the hydrological cycle' is a somewhat tautological and circular point. The author(s) should reword this. [Jonny Williams, New Zealand]	We disagree that this is a circular point
7856	37	3	37	33	Among the impacts associated with ocean heat content growth, the increase of thermal stratification leading to reduction of mixing and ventilation and increase of hypoxia should also be mentioned. [Petr Zavialov, Russian Federation]	This is a good example, but we are constrained by very tight word limits
39520	37	32	37	32	I suggest to use "heat-waves" instead of "heatwaves" to keep consistency along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Implemented
2814	37	34	37	34	including 'impact cascades' through secondary [Christophe Deissenberg, Luxembourg]	Implemented
45986	37	34	37	34	The term "impact cascade" may need some reference on the previous use as "cascading" was used ofrten in AR5. [Hiroyuki ENOMOTO, Japan]	We now make reference to Chapter 18 of the AR5 WGII which discusses cascading impacts.
7358	37	36	37	39	In the same line that comment n°7, I think that some other compound events should be mentioned beside "droughts and heat waves". I suggest including "droughts and dust transport from desert areas" and the reference: Prospero J.M. and Lamb P.J., 2003. "African droughts and dust transport to the caribbean: climate change implications". Science, 302, 1024-1027. [Pedro Salvador, Spain]	This is a good example, but we are constrained by very tight word limits
2816	37	37	37	37	arise when [Christophe Deissenberg, Luxembourg]	Rejected, meaning of sentence will be wrong if implemented
38834	37	38	37	38	The ref to Le Quere et al seems misplaced. [Jan Fuglestvedt, Norway]	This was indeed a mistake, Le Quere reference removed
8046	37	42	37	48	Climate sensitivity is a major factor that determine the uncertainties of climate models' responses to identical radiative forcing. For exmaple, Chen and Zhou (2016) found that the timing of 2C warming projected by CMIP5 models is sensitivity to climate sensitivity [Chen Xiaolong, Tianjun Zhou, 2016: Uncertainty in crossing time of 2C warming threshold over China, Sci. Bull., 61(18), 1451–1459, DOI 10.1007/s11434-016-1166-z]. Uncertainties in the projection of Asian monsoon changes are also related with climate sensitivity: [Chen, X., and T. Zhou*, 2015: Distinct effects of global mean warming and regional sea surface warming pattern on projected uncertainty in the South Asian summer monsoon. Geophysical Research Letters, 42, 9433-9439, doi:10.1002/ 2015GL066384] [Tianjun Zhou, China]	Rejected, timing of 1.5 and 2.0 is discussed earlier. The second suggested reference is not relevant to this section
53370	37	42	38	8	The risk of global run-away climate change which is under-researched should be mentioned here. Reference can be made to Hansen et al. 2008, who deduced a threshold for a global climate system tipping point from observations of the geological past. [Kjell Kühne, Mexico]	Chapter 1 frames these issues but does not provide the assessment as such.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4814	37	44	37	48	Given this perspective (often taken by skeptics), the accumulation of the error terms can suggest that one cannot say anything meaningful at all about the future, so why even conduct this assessment. This perspective leads to an approach to do research in a linear way, first reducing the error in emissions for the future, then in models, etc. I think stating the situation this way is quite counter-productive when considering the validty of impact studies. The alternate approach is to note that there are many emission pathways and climate model simulations of the changes in the climate that these pathways imply which lead to there being a warming of 1.5 C (or so), and what we do know from the impact models is that a change of 1.5 C would lead to this or that. So, the uncertainty that matters with respect to impacts relates to the impact modeling and this uncertaintly is not accumulated on top of the uncertainties arising from the emissions pathways and climate models. Basically, reductions in precipitation will have impacts no matter what combination of situations leads this to happening. What I would urge here is this a more nuanced explanation about uncertainties so as not to give the (mis-)impression that all of the uncertainties build up and there is no understanding or knowledge to emerge as a result. [Michael MacCracken, United States of America]	This is an important discussion, but for this Special Report there was a clear decision not to revise anything in the established IPCC guidance on this matter.
36890	37	44	37	48	A major uncertainty is the mismatch between Earth system model simulations and the historical records of surface temperature and ocean heat content. This mismatch is addressed by a new study by Goodwin et al. (2018) providing narrower climate projections by ensuring that an efficient Earth system model is consistent with these historical redcords. Reference: Goodwin. P., A. Katavouta, V.M. Roussenov, G.L. Foster, E.J. Rohling and R.G. Williams, (2018) Pathways to 1.5 and 2 °C warming based on observational and geological constraints, Nature Geoscience, doi:10.1038/s41561-017-0054-8. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	This is not a topic for chapter 1.
38836	37	44	37	44	I suggest adding "and impacts" after "climate change" [Jan Fuglestvedt, Norway]	Implemented
62958	37	46			The text refers to 'limitations and assumptions of the climate models', but not to model uncertainty, for example reflected in the large range of climate sensitivity across models. I would focus first on climate model uncertainty (i.e. uncertain parameters in models etc) - this is a major source of uncertainy in projected impacts. While 'limitations and assumptions' of models may give systematic errors across models, I would describe this as a secondary factor in terms of contributions to uncertainites in impacts. Things like downscaling model uncertainty will also have a smaller effect than climate model uncertainty. [Nathan Gillett, Canada]	Model "parameters" and associated uncertainly of these parameters falls within model assumptions. We don't want to get too technical about models here, and explain what a model parameter is.
53626	37	48	37	48	Bias corrections at local scale for impact modeling should be included [AKM SAIFUL ISLAM, Bangladesh]	has been added, thanks.
19482	37	49	37	52	“The trajectory of climate change also affects uncertainty with respect to impacts. For example, the impacts of overshooting 1.5°C and stabilization at a later stage, compared to stabilization at 1.5°C without 1 overshoot may differ in magnitude (Schleussner et al., 2017). Additionally, the capacity of some ecosystems to recover after an overshoot may not be well known (assessed in detail in Chapter 3).” This chapter/chapter 3 could have much more detail on risks & impacts of overshooting if these can be so significant. [Jennifer Morgan, Netherlands]	This comment should be considered by Chapter 3
57684	37	52			The formulation ecosystem recovery "may not be well known" is overly vague, also the term recovery seems misleading as ecosystems under climate change are changing into different systems as also seen during evolutionary crises in earth history, and if an ecosystem has died off there will be no recovery, but only a replacement by another one, at lower levels of biodiversity. [Hans Poertner, Germany]	Sentence deleted
2818	38	5	38	8	THESE LINES ARE VERY DIFFICULT TO UNDERSTAND AND MAY BE ERRONEOUS. E.G: WHY DO NON-LINEARITY OF EFFECTS FOLLOW FROM THE CHOICE OF AN INDEX? I AM UNABLE TO SUGGEST WITH CONFIDENCE AN ALTERNATIVE FORMULATION [Christophe Deissenberg, Luxembourg]	We agree that this was poorly explained. To save space, this text had to be removed.
4816	38	5	38	5	The indication of likelihood here, that is, "may ensue", needs to be changed--indeed, the whole sentence seems wrongly stated. In that most distributions of occurrence of events are bell-shaped curves and climate change is generally shifting the centroid of the distribution (and perhaps its spread), there will be a non-linear response to the exceedances of, say, two-sigma events (extremes). Hansen's shifting bell-shaped curves from observations of land surface summer temperature anomaly in the NH very clearly make the case--warm extremes that were occurring 0,1% of the time in the mid-20th century are now occurring 10% of the time--so very non-linear. This will be the case for virtually all situations where the distribution if a bell-shaped curve--shift the centroid and the occurrence of rare events of one type (warm, wet, whatever) will go up and of the other extreme will go down. So, saying "may ensue" here shows no understanding of the situation--there will be changes in what happens to extremes, some becoming much more often and some much less often, so some will matter to society and other may not, but there will be changes. [Michael MacCracken, United States of America]	Phrase "may ensue" has been deleted
39344	38	5	38	5	It's not an important thing, but it seems that between the word "ensue" and "when" there are two spaces, not only one. And the same is happening between "indices" and "such". [Olga Alcaraz, Spain]	Indeed it is not an important thing and would have been fixed by the copy editing. Anyway, this wording has been changed.
57676	38	11		45	Suggest including ocean system chapters from AR5 in this section as well, not only the terrestrial chapter. [Hans Poertner, Germany]	Please re-read: our text deals as much with land as with ocean ecosystems.
2820	38	15	38	18	The impacts of climate change on natural and managed ecosystems can include a loss or increase in growth, biomass, or diversity at the level of species populations, landscapes, or entire biomes. They overlap with the natural variation in growth, the ecosystem dynamics, the disturbance, succession, and other processes. At lower levels of warming, this sometimes impairs the attribution of impacts. [Christophe Deissenberg, Luxembourg]	Indeed, anyway the text has been shortened drastically.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
45568	38	15	38	31	I suggest including changes in life cycles of interdependent organisms as plants and pollinators or seed dispersals, which will difficult to complete the lyfe cycle of both organisms. [Adela M Sánchez-Moreiras, Spain]	Thanks, we have added "interspecific relationships (e.g. pollination)" to account for this suggestion.
56398	38	15	38	31	As commented on the FOD, should talk about uncertainty of changes in the scale and frequency of extreme ecosystem responses (e.g. Palmer G et al. 2017 Climate change, climatic variation and extreme biological responses. Phil. Trans. R. Soc. B 372: 20160144. http://dx.doi.org/10.1098/rstb.2016.0144) associated with 1.5 degrees. In the same way as for uncertainty of changes in the scale and frequency of extreme weather events associated with 1.5 degrees, as well as uncertainty associated with extremes of human responses, it is these extremes rather than the general trends that should be the focus of this entire report and that will be defining of impacts on ecosystems and people, their responses and ability to adapt. [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	This is addressed by chapter 3 and requires, in our opinion, no additional framing in chapter 1.
197	38	16	38	16	at the level of species' add comma after species [Baruch RINKEVICH, Israel]	The sentence has been deleted.
29288	38	16	38	16	species, populations, add comma in between [Yuanyuan Huang, France]	Correct. Unfortunately, this was missed during final editing and should be picked up at the proof correction stage.
198	38	2	38	2	Many ecosystems (notably forests) undergo long- term successional processes…..' Add 'and coral reefs' to the forests [Baruch RINKEVICH, Israel]	Thanks, we have made exactly that addition.
8944	38	2	38	23	Some authors already indicate reduced forest resilience due to increasing temperatures (as more favourable pest breeding conditions), not only to drought conditions (even though they play an important role here, too). See e.g. Dobbertin, M., Wermelinger, B., Bigler, C., Bürgi, M., Carron, M., Forster, B., ... & Rigling, A. (2007). Linking increasing drought stress to Scots pine mortality and bark beetle infestations. The Scientific World Journal, 7, 231-239. DOI 10.1100/tsw.2007.58. [Heike Huebener, Germany]	Which is why we address this issue. The specifics are in chapter 3.
57116	38	2	38	23	reference for (Möllmann et al 2015): Möllmann C, C. Folke, M. Edwards, and A. Conversi, 2015. Marine regime shifts around the globe: theory, drivers, and impacts. Philosophical Transactions of the Royal Society B, 370: 20130260. [alessandra conversi, Italy]	Our references here are not exhaustive, they just provide examples. Hopefully your input is considered by chapter 3.
57114	38	2	38	23	1.3.2.1. Abrupt shifts could be explained a little more. Also the marine realm is missing. Consider modifying this sentence as follows: Many ecosystems (notably forests) undergo long–term successional processes characterised by varying levels of resilience to environmental change over time, including the possibility of abrupt changes, for example as a consequence of unusual drought events (Settele et al., 2014). Ecosystems are at risk of abrupt shifts especially if its keystone species are distressed by the area warming. This has been seen in multiple ecosystems in the marine realm (Möllmann et al 2015). [alessandra conversi, Italy]	Why is it that marine experts always complain that the "marine realm is missing" when this is clearly not the case? In any case, for lack of space, we have further condensed this framing, leaving the specifics to chapter 3, which deals appropriately with both terrestrial and marine ecosystems.
2822	38	21	38	22	environmental change, with a possibility of abrupt changes, e.g. following unusual [Christophe Deissenberg, Luxembourg]	This part of the sentence has been deleted
199	38	23	38	23	Add: 'and as a consequence of major bleaching event (Baker et al., 2008)'. Baker, A. C., Glynn, P. W., Riegl, B. (2008). Climate change and coral reef bleaching: An ecological assessment of long-term impacts, recovery trends and future outlook. Estuarine, coastal and shelf science, 80(4), 435-471.? [Baruch RINKEVICH, Israel]	Our references here are not exhaustive, they just provide examples. Hopefully your input is considered by chapter 3.
200	38	25	38	31	The 1st sentence in this paragraph does not fit to the rest of the paragraph. Please revise the parag. [Baruch RINKEVICH, Israel]	Indeed. The entire flow of the section has been revised and is hopefully more logical now.
2824	38	25	38	25	degree, among others [Christophe Deissenberg, Luxembourg]	We prefer, and have kept, the earlier wording
4818	38	25	38	31	Too little mention of the fauna---the birds, other migrating species, all sorts of wildlife. At least some mention is needed other than the first word. [Michael MacCracken, United States of America]	There is ample mentioning of animals in chapter 3. Ecosystems mentioned here obviously include animals as well as plants.
39522	38	25	38	25	Delete point in "for example.," [Hernan Edgardo Sala, Argentina]	Done.
53764	38	25	38	25	remove . [Patrik Winiger, Netherlands]	Done.
201	38	26	38	26	Add to the line:' through changes in physiology, ecosystem structure, species composition or evolution' the topc of 'epigenetics' after 'species composition'. [Baruch RINKEVICH, Israel]	We do not see the need to add this.
2826	38	28	38	29	carbon fluxes through the impacted ecosystems – these can amplify or dampen atmospheric change at the regional to continental scale. Of particular concern is the response of most of the world's [Christophe Deissenberg, Luxembourg]	We prefer, and have kept, the earlier wording
4152	38	36	38	36	It should be clarified what is meant by the word "Mean" at the beginning of this line. Mean over what? A season, a year, a decade, or an area? Perhaps the word can simply be omitted. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Sentence deleted
4820	38	36	38	36	Putting the emphasis on "mean temperature" seems a bit overdone--sometimes it is the change in the maximum, otherwise in the change in nthe minimum--lack of hard winter freezes is proving particularly important. And then there are all sorts of aspects of precipitation, etc. It seems to me this would better say "Changes in the statistics of temperature and precipitation are the main drivers ..." [Michael MacCracken, United States of America]	Sentence deleted
2828	38	37	38	37	processes, any modification of these variables will at some point change the ecosystem. Other [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
2830	38	38	38	38	events like storms, [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
2832	38	39	38	39	ecosystems are [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
57868	38	39	38	41	and by reduced dissolved oxygen [alessandra conversi, Italy]	see chapter 3

Comment No	From Page	From Line	To Page	To Line	Comment	Response
56400	38	41	38	44	Despite comments on the FOD, this paragraph still fails to explain indirect impacts of climate change. See: Smithers, R.J. and Blicharska, M. (2016) Indirect impacts of climate change. Science 354: 6318, 1386. The following quote may be useful: "Climate change will bring indirect impacts to biodiversity through changes in socio-economic drivers,working practices, cultural values, policies and use of land and other resources. Due to their scale,scope and speed, many could be more damaging than the direct impacts, especially those that affectour highly modified landscapes, coasts and seas" (Smithers et al. 2008). Smithers, R.J.; Cowan C.; Harley, M.; Hopkins, J.J.; Pontier, H. and Watts, O. (2008) England Biodiversity Strategy: Climate Change Adaptation Principles. Conserving biodiversity in a changing climate. Defra, London. 16pp. https://www.gov.uk/government/publications/england-biodiversity-strategy-climate-change-adaptation-principles [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	This is a complex matter that, given current space, could not be addressed in greater detail.
50634	38	42	38	42	Include abstraction of water in human use [Jagdish KRISHNASWAMY, India]	Correct. Unfortunately, this text has been removed in response to space constraints.
57870	38	42	38	42	other direct human impacts: add: overfishing [alessandra conversi, Italy]	Correct. Unfortunately, this text has been removed in response to space constraints.
2834	38	43	38	43	which can even dominate the impact of climate change (e.g., [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
2836	38	44	38	44	2012). The quantification of [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
2838	38	45	38	45	particularly important and challenging [Christophe Deissenberg, Luxembourg]	The sentence has been deleted.
2840	38	5	38	5	resist to change or to [Christophe Deissenberg, Luxembourg]	Correct. Unfortunately, this was missed during final editing and should be picked up at the proof correction stage.
2844	38	5	39	2	THE LOGIC OF THE ARGUMENTATION IS NOT CLEAR TO ME. YOU SPEAK OF NON-LINEARITIES, THEN REFER TO STUDIES THAT SEEM TO INDICATE A SMOOTH BEHAVIOR, THEN MAKE A CONCLUSION THAT IS NOT DIRECTLY SUPPORTED BY THE PREVIOUS. WHAT WAS REALLY YOUR ARGUMENT? [Christophe Deissenberg, Luxembourg]	The reef ecosystems are mentioned as systems that show both linear and non-linear behaviour. There is unfortunately not enough space to elaborate this sufficiently.
4822	38	5	38	51	Aside from the wording problem (presumably this means "ability to resist change", I don't think this is a very helpful definition. The question is "their ability to survive and thrive across a range of conditions" and then their ability to recover after experiencing conditions outside their tolerance. And to apply the concept of resilience to ecosystems rather than species would mean the issue is their ongoing capability for providing ecosystem services, etc. I'd suggest a bit more nuanced discussion. [Michael MacCracken, United States of America]	We see the point and have removed the "to", but we feel unable to provide more nuances within the text limits we have here.
7360	38	5	38	51	The meaning of "resilience" is showed at this point of the report for the first time. However, this term has been used before in Pages 23, 24, 36 and 38. I suggest including the meaning of "resilience" the first time it is used in the report. [Pedro Salvador, Spain]	The use of the term prior to section 3 is about other systems than ecosystems. In these cases a definition of resilience seems not to be necessary. Here, the terms is defined in its specific meaning for ecosystems only.
8946	38	5	38	53	possibly a tipping point (irreversible change) has already been crossed for Hungarian beech forests due to the climate change up to now. However, I find no international literature on this. (Information taken from a project proposal by Prof. Eichhorn, North-western Germany Forestry research Institute, NW-FVA, proposing collaboration with the university Sopron, forestry faculty, on tipping point research. Perhaps there is a Hungarian partner in IPCC, who could help with literature here?) [Heike Huebener, Germany]	There clearly is no space to discuss Hungarian forests in the framing chapter of this report.
56402	38	5	39	2	Despite comments on the FOD, neither of the following two papers are cited here: Oliver TH, Isaac NJ, August TA, Woodcock BA, Roy DB, Bullock JM. Declining resilience of ecosystem functions under biodiversity loss. Nature Communications. 6: 10122. PMID 26646209 DOI: 10.1038/ncomms10122 ; Oliver TH, Heard MS, Isaac NJ, Roy DB, Procter D, Eigenbrod F, Freckleton R, Hector A, Orme CD, Petchey OL, Proença V, Raffaelli D, Suttle KB, Mace GM, Martín-López B, ... Bullock JM, et al. Biodiversity and Resilience of Ecosystem Functions. Trends in Ecology & Evolution. 30: 673-84. PMID 26437633 DOI: 10.1016/j.tree.2015.08.009 [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	These issues are addressed in chapter 3 (at the time of this writing we do not know whether the actual references are cited there).
17218	38	51	38	51	The start of the sentence needs to be rewritten to avoid this grammatical minefiled: "An example are…" [David Schoeman, Australia]	Correct. Unfortunately, this was missed during final editing and should be picked up at the proof correction stage.
57282	38	51	38	51	Coral reef ecosystems [Hans Poertner, Germany]	Correct. Unfortunately, this was missed during final editing and should be picked up at the proof correction stage.
2842	38	52	38	53	entirely, and that particular species show greater tolerance [Christophe Deissenberg, Luxembourg]	Correct. Unfortunately, this was missed during final editing and should be picked up at the proof correction stage.
195	38	53	39	2	The status is more complicated than descibed. There are clear genotype, species and regional differences for resilience and any overshoot in one of the global change drivers may result in different sometimed contrasting outcomes. Just an example: Even lagoon and forereef areas of the same reef site may differ significantly in reef tesilience to global change impacts like water temperatures and bleaching (Tkachenko and Soong, 2017).[Tkachenko, K. S., & Soong, K. (2017). Dongsha Atoll: A potential thermal refuge for reef-building corals in the South China Sea. Marine Environmental Research, 127, 112-125.?] This adds another dimention to the 'recovery' issue. [Baruch RINKEVICH, Israel]	Certainly, but the point here is to just introduce the existence of a number of key mechanisms - we have no space to address these in any detail.
17220	39	1	39	1	…they would… rather than "...would they..." in order to keep the sentence structure paralllel. [David Schoeman, Australia]	The sentence has been deleted.
4824	39	2	39	2	To sustain society and sea level, there is a real need to come back down to well less than 1.5 C, so it seems to me this could be written generally--what extent can ecosystems return to what they were when there is an overshoot excursion of some length and intensity. [Michael MacCracken, United States of America]	For the assessment see chapter 3.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
56404	39	3	39	3	As commented on the FOD, at this juncture, it is important that there should be mention of need for adaptation actions in relation to ecosystems. See: Oliver, T.H.; Smithers, R.J.; Beale, C.M. and Watts, K. (2016) Are existing biodiversity conservation strategies appropriate in a changing climate? Biological Conservation 193, 17-26. Oliver, T.; Smithers, R.J.; Bailey, S.; Walmsley, C. and Watts, K. (2012) A decision framework for considering climate change adaptation in biodiversity conservation planning. Journal of Applied Ecology 49:6, 1247–1255. CORRIGENDUM: (2015) 52, 538–538. [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	For the assessment see chapter 3.
56406	39	3	39	3	As commented on the FOD, at this juncture, it would be beneficial if there was explicit mention of SDG 14 and SDG 15. [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	We do not see this as a need for chapter 1
9670	39	5			Section 1.3.2 has a paragraph on the impacts of climate change mitigation of ecosystems. Similar statement on the impacts of cliamte change mitigation on human dimenion in section 1.3.3 would be needed. [Mustafa BABIKER, Sudan]	We do not see the need to add this. Later chapters of the report will provide the actual assessment.
2846	39	7	39	7	gas concentrations may [Christophe Deissenberg, Luxembourg]	We do not understand this comment.
50636	39	7	39	13	Need to include a few other large scale impacts: impacts of proliferation of small and medium hydro-power on fresh-water and estuarine aquatic ecosystems and impact of large solar farms and windmills on biodiversity [Jagdish KRISHNASWAMY, India]	For the assessment see later chapters in the report.
42748	39	7	39	13	Using BECCS to draw down the between 2 and 10 Gt CO2 annually that is mentioned in IAM reports would require the dedication of land equivalent to the size of India. See Anderson K. & Peters G. (2016) The trouble with negative emissions, Science 354:182–183, 183. Land requirements for BECCS could accelerate loss of forest and grassland, leading to more species loss than scenarios without BECCS. See Williamson, P., Emissions reduction: Scrutinize CO2 removal methods (Nature Comment, 10 February 2016. Large-scale BECCS could put significant strains on global freshwater use, land-system change, biosphere integrity, and biogeochemical flows. Vera Heck et al., Biomass-based negative emissions difficult to reconcile with planetary boundaries, Nature Climate Change (2018). [Kristin Campbell, United States of America]	For the assessment see later chapters in the report.
42964	39	7	39	13	Bioenergy is not carbon neutral in the relevant near-term period. See Booth M. S. (2018) “Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy”, Envtl. Research Letters; and Sterman et al (2018) “Does replacing coal with wood lower CO2 emissions? Dynamic lifecycle analysis of wood bioenergy”, Envtl. Research Letters. Moreover, even if BECCS were carbon neutral, it would be impractical because of the land needed to be dedicated to growing the biomass. Using BECCS to draw down the between 2 and 10 Gt CO2 annually that is mentioned in IAM reports would require the dedication of land equivalent to the size of India. See Anderson K. & Peters G. (2016) The trouble with negative emissions, Science 354:182–183, 183. Land requirements for BECCS could accelerate loss of forest and grassland, leading to more species loss than scenarios without BECCS. See Williamson, P., Emissions reduction: Scrutinize CO2 removal methods (Nature Comment, 10 February 2016. Large-scale BECCS could put significant strains on global freshwater use, land-system change, biosphere integrity, and biogeochemical flows. Vera Heck et al., Biomass-based negative emissions difficult to reconcile with planetary boundaries, Nature Climate Change (2018). [Durwood Zaelke, United States of America]	Certainly not, but we also do not claim anything about carbon neutrality.
55618	39	7	39	13	Could also add something on AFOLU pathways having potentially positive impacts on ecosystems. [David Cooper, Canada]	For the assessment see later chapters in the report.
2848	39	8	39	8	in land use, potentially required for the massively [Christophe Deissenberg, Luxembourg]	We prefer, and have kept, the earlier wording
32664	39	8	39	11	Afforestation/reforestation needs to mentioned as well. For the same GtC removal from the atmosphere, A/R needs more land than BECCS. This is discussed in the other chapters, so it should be mentioned here as well. [Jasmin Kemper, United Kingdom (of Great Britain and Northern Ireland)]	For the assessment see later chapters in the report.
13040	39	9	39	1	Delete the text "(either as simple replacement of fossil fuels, or as part of Bioenergy with Carbon Capture and Storage (BECCS))". [Eleni Kaditi, Austria]	We do not see why this should be removed - the statement refers to an issue that will likely affect ecosystems and requires assessment.
40050	39	9		1	BECCS option to the extend that it will require lots of land for bioenery production looks less realistic option in light of alternative demands for land (for food production and biodiversity conservation). [Aziz ELBEHRI, Italy]	Chapter 1 is not expected to provide any assessment of this.
2850	39	11	39	11	Depending on earlier use, the transformation [Christophe Deissenberg, Luxembourg]	We prefer, and have kept, the earlier wording
33002	39	11	39	13	Planting biofuel crops could also offset it's benefit of sequestering more C as it can increase the emission of more potent GHG, N2O (see Saha etal-GCB Bioenergy-2017-Landscape control of nitrous oxide emissions during the transition from conservation reserve program to perennial grasses for bioenergy, 9, 783-795). [Debjani Sihi, United States of America]	For the assessment see later chapters in the report.
54476	39	11	39	13	There is a need to recognised that there is widespread evidence that at the landscape scale humans socieiies can contribute or detract to ecosystem services values (Comberti et al 2015). Local and Indigenous economies have been showed to have contributed to ecosystem services by modifying landscapes to promote biodiversity, carbon sequestration and other values, over long-time scales. These techniques may be highly place specific but such diverse biocultural solutions should be considered as an alternative to industrial scale land use changes in BECCS. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	For the assessment see later chapters in the report.
46500	39	12	39	12	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	The sentence now no longer has the character of such an assessment

Comment No	From Page	From Line	To Page	To Line	Comment	Response
38838	39	16	39	47	In my view, this para contains too much general material and could be shortened. It could be useful to focus more on issues like 1.3.2 does. [Jan Fuglestvedt, Norway]	Taken into account.
56408	39	16	39	16	As commented on the FOD, this section should mention that the most vulnerable segments of society are vulnerable due to their greater immediate reliance on benefits from ecosystem services delivered by biophysical resources that are degraded, climate sensitive, and/or inaccessible due to lack of land rights (e.g. http://www.fao.org/docrep/017/i1688e/i1688e.pdf). The paragraph should also make explicit the fact that developed countries are not immune from extreme events and are tall 'houses of cards' that have furthest to fall (e.g. Hurricanes Katrina, José and Irma). [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. I think this is implicit in lines 7 to 9 of 1.3.3. This has been moved to sub-section 1.3.2 Details are provided by Chapter 3.
56692	39	16	39	47	Text well covers the issues related to adaptive capacity. Succint overview of vulnerabilities. [Cheryl Anderson, New Zealand]	Noted. Thanks.
24308	39	18	39	47	This section reads very much as AR5 knowledge with 1.5°C added to a few sentences. I don't think it provides new insights and could be significantly shortened. [Joeri ROGELJ, Austria]	Noted.
4826	39	19	39	19	Very strange to use the word "people" when the whole paragraph is about "human systems" and collective effeccts on societies, etc. I think the word needs to be changed tosomething like 'cities, coastal communities, and other human systems' [Michael MacCracken, United States of America]	Rejected. However, the sentence has been improved to make the message clearer.
2852	39	23	39	23	communities and their exposure to climate threats. [Christophe Deissenberg, Luxembourg]	Editorial
62938	39	27			Mycoo (2017) can be cited. Mycoo, M.A. (2017). The 1.5°C tipping point: Vulnerabilities and Adaptation Strategies for Caribbean Small Island Developing States. Regional Environmental Change. Doi:org/10.1007/s10113-017-1248-8 [Michelle Mycoo, Trinidad and Tobago]	We leave the specific literature to chapter 3.
40672	39	31	39	31	What is meant by 'density and risk exposure'? [Jonny Williams, New Zealand]	Noted. This refers to human settlements, as an example.
7172	39	35	39	37	Better to cite the relevant AR5 chapter that has dealt with gender and other dimensions of inequality (Olsson et al. 2014) and the x-chapter box on gender (Vincent et al. 2014) that is part of the TS WGII. The two refs here are not wrong but the literature was distinctly broader in 2014 than these two. [Petra Tschakert, Australia]	Accepted. References added. This is now in sub-section 1.3.2
40674	39	35	39	37	Only gender is referenced here, all other aspects mentioned should be referenced also. [Jonny Williams, New Zealand]	Done.
57530	39	35	39	37	Why are there only references for gender issues given and not for age, education, etc issues? [Hans Poertner, Germany]	Noted. Additional reference added. This is now in sub-section 1.3.2
33026	39	36	39	37	add a reference to the impacts of climate change on human rights and the role of human rights in strengthening adaptive capacity. [Tara Shine, Ireland]	Noted. Human rights framing is referred to in the Ch1 (SOD original version) Section1.1.2 (Ethics and equity)
9366	39	39	39	47	Impacts of climate change can exacerbate existing environmental problems as a knock-on effect. This aspect may be added to 1.3.3 sub-section. [Attila Buzási, Hungary]	Noted. The sentence on “Impacts may also be triggered by combinations of these factors, including ‘impact cascades’, that is through secondary consequences of changed systems.” imply this aspect.. This is now in sub-section 1.3.2.
4828	39	42	39	44	I think it would be helpful to not just say "climate change"--that being a quite vague term--and to mention this applies to vulnerable countries at the start of the sentence. How about saying something like "In most of the poorer nations, increases in occurrences of extreme heat and water resource deficits are projected to slow down economic growth and make poverty reduction more difficult." That is, be more specific. [Michael MacCracken, United States of America]	Noted. Text has been improved.
2854	39	43	39	43	Arent et al., 2014), causing a substantial [Christophe Deissenberg, Luxembourg]	Accepted - text revised
40676	39	44	39	44	As true as it may be, use of imprecise terms such as 'most of' are not suitable in a report of this gravity. [Jonny Williams, New Zealand]	Accepted - text revised
32722	4		43		It seems that this section on human rights should include a discussion of the crucial importance of environmental defenders in the pursuit of a 1.5-degree pathway / CRDP. The UN Special Rapporteur on the situation of human rights defenders, Michel Forst, affirmed “It is the responsibility of States and international community to empower and protect these defenders. We should listen to those who raise the alarm against environmental disasters, climate change and irresponsible resource exploitation, not repress them" (http://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=20730&LangID=E). See also: Situation of human rights defenders, Report of the Special Rapporteur on the situation of human rights defenders, 3 August 2016, A/71/281, para. 94. According to Katharina Rall, HRW researcher: "Unless governments stop the criminalization of defenders, protect those who defend the environment, and respect due process show a larger commitment to human rights, any efforts to protect the climate will easily be blocked. But so far, governments have been reluctant to integrate rights protections in key sections of the “Paris Rulebook”, the technical document governing implementation of the Paris Agreement." (https://www.hrw.org/print/310923). See also: Declaration on the Right and Responsibility of Individuals, Groups and Organs of Society to Promote and Protect Universally Recognized Human Rights and Fundamental Freedoms, United Nations, 9 December 1998, U.N. Doc. A/RES/53/144. [Christopher Campbell-Duruflé, Canada]	Obsolete.
54770	4				I see no mention of the residual impacts of climate change in the context of how they will be addressed. Adaptation and mitigation are not the only policies/strategies that will need to be implemented in a 1.5 degree world. This summary is very out of touch with the on the ground realities. What will countries need to do to respond to a 1.5 degree world? [Erin Roberts, United Kingdom (of Great Britain and Northern Ireland)]	Note- we have attempted to strengthen the discussion.
33028	4	1	4	2	add references to hmman rights in addition to ethics and equity. [Tara Shine, Ireland]	Noted and done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40678	4	1	4	3	This section heading is much too long. [Jonny Williams, New Zealand]	Taken into account - heading altered
2856	4	5	4	5	and the ambitions [Christophe Deissenberg, Luxembourg]	Editorial
63142	4	6	4	8	Suggested rewrite: "Climate mitigation–adaptation linkages, synergies and trade–offs should not in net impede sustainable development, and visa versa." [Greg Rau, United States of America]	Noted
61734	4	16	4	16	I do not understand the value of the footnotes given here. If terms have to be introduced, the right place is the glossary, or the main text. The notion of "nested uncertainty" may be refered to in the earlier sections and boxes (feasibility, uncertainty). [Valérie Masson-Delmotte, France]	all of the footnotes were deleted, except for one
56410	4	19	4	2	As commented on the FOD, more fundamentally there is a need to appropriately acknowledge that "A healthy, properly functioning natural environment is the foundation of sustained economic growth, prospering communities and personal wellbeing." (UK Natural Environment White Paper 2011) [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	agreed - this issue is developed elsewhere in the report
57944	4	19	4	19	Capitalization should be addressed for "agreements such as the Sendai framework for disaster risk reduction" to read "agreements such as the Sendai Framework for Disaster Risk Reduction." [Siir KILKIS, Turkey]	Editorial
16	4	23	42	5	I would suggest to extend this part, especially out of the current special issue in Current Opinion in Enviromental Sustainability 31 (especially see: https://www.sciencedirect.com/science/article/pii/S1877343517300660 and https://www.sciencedirect.com/science/article/pii/S1877343517301148) [Thaler Thomas, Austria]	Noted
53874	4	23	42	5	Inequalities may also be a barrier to effective mitigation and and the unintended social impact of policies may undermine their mitigation potential. See Grandin, J., Haarstad, H., Kjærås, K., & Bouzarovski, S. (2018). The politics of rapid urban transformation. Current Opinion in Environmental Sustainability, 31, 16–22. http://doi.org/10.1016/j.cosust.2017.12.002 and Patterson, J. J., Thaler, T., Hoffmann, M., Hughes, S., Oels, A., Chu, E., et al. (2018). Political feasibility of 1.5°C societal transformations: the role of social justice. Current Opinion in Environmental Sustainability, 31, 1–9. http://doi.org/10.1016/j.cosust.2017.11.002 and [Grandin Jakob, Norway]	Taken into account
56412	4	23	4	23	As commented on the FOD, land rights (or lack of them) is perhaps the most fundamental issue in many developing countries, so should be mentioned in this section (e.g. https://www.landesa.org/blog-secure-land-rights-climate-change-resilience-go-hand-in-hand/ ; http://www.landcoalition.org/en/regions/global-including-europe/event/cop22-side-event-secured-indigenous-and-community-land-rights-key-climate-change-adaptation ; https://www.weforum.org/agenda/2016/11/indigenous-peoples-are-the-real-climate-experts/). [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	Rejected - no space in this chapter
57812	4	23	42	5	There are several problems with the way equity is framed in this section. This could be solved through restructuring the section, to change the emphasis and untangle related but distinct concepts (such as equity and human rights). Line 36-37 should refer to the Paris Agreement includes (rather than mentions) the principle of equity as understood in the UNFCCC. Given the PA is under the UNFCCC, it is important to bring the Convention into the overall understanding of the treatment of equity in this context. In the same paragraph, it is important to separate out the inclusion of the principle of equity in the PA, from 'matters that fall within the broad ambit of ethics and equity", such as those included in the preamble to the PA. These should be treated in a separate paragraph, along with the discussion of Human Rights (which starts on line 27, page 41). Hence, lines 38 on page 40 to line 2 on page 41 should be moved down and included in the paragraph on human rights which starts on line 27 on page 41. The information on page 41, lines 4-12, can then be merged with the page 40, line 36 where the principle of equity is introduced, as included in the PA and understood under the UNFCCC. It is important that there is a discussion of the understanding of equity in international environmental law which is rooted in the recognition that countries have differing contributions to environmental problems and therefore differing responsibilities to act (See Phillipe Sands, Principles of International Environmental Law (Second edition, Cambridge University Press, page 286.). A related notion to equity under the UNFCCC, Common but Differentiated Responsibilities and Respective capacities (CBDR-RC) is obviously central to this discussion, and should be included here on page 41, lines 10-12 where equity is discussed as a useful organising framework. Phillipe sands, page 285-286 is a useful staring point here, but there is a wealth of literature on CBDR in the UNFCCC which has been neglected here (see in particular Rajamani and Winkler). [Kate Dooley, Australia]	Taken into account - Equity text revised
4154	4	25	45	22	Much of the discussion in the sections included in these pages appears to apply to the global response to the threat of climate change in general, not to the specific issues relating to a 1.5C limit compared to a larger limit. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted - the section is framing
4830	4	25	4	28	These two sentences are really pretty useless, basically requiring the reader to go read the two cited papers in order to try to figure out to whom these comments apply and indeed what is meant. I think revision is needed that explains the key points being made--so what is it that makes poverty and inequity worse, what is the nature of the risk management challenge? Is it economics, health, or whatever, but these statements are so vague as to not really be remembered. [Michael MacCracken, United States of America]	Taken into account - text revised.

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8948	4	25	4	34	Indeed, cliamte change might not only prolopng but actually trigger conflicts. See e.g. Schleussner, C.-F., Donges, J.F., Donner, R.V., Schellnhuber, H.J. (2016): Armed-conflict risks enhanced by climate-related disasters in ethnically fractionalized countries. Proceedings of the National Academy of Sciences (Early Edition, EE). [DOI: 10.1073/pnas.1601611113] [Heike Huebener, Germany]	Noted. Space does not permit adequate inclusion of this valuable point.
10484	4	25	42	5	The text should be shortened. Most of the content here is covered by Chapter 4. [Hong Yang, Switzerland]	Taken into account - text altered
38840	4	25	4	25	The first sentence here is very general and does not tell very much. It would be good if this section (1.4.1.) discuss and explain how to handle issues that are value related and for which people have diferent views and perspectives, due to their different value sets and backgrounds. [Jan Fuglestvedt, Norway]	Accepted. This section was significantly revised
39106	4	25	42	36	This is disturbing, in that it misses a basic ethical challenge - we have the knowledge of how our human activities are threatening the ability of future generations on this earth, but thus far choose not to stop or transform our activities sufficiently to protect the most vulnerable now and all future generations - p.2 http://www.quno.org/sites/default/files/resources/Climate%20Justice_August_2016.pdf The SR must highlight this foundational situation, if it is to address ethics effectively. [Lindsey Cook, Germany]	Taken into account - reference to intergenerational equity now included
61736	4	25	4	5	The work of Yann Robiou du Pont (Equitable mitigation to achieve Paris Agreement goals), Nature Climate Change, 2017 may be relevant. The whole section reads more like a review of the literature than an assessment, or a framing of how this dimension is addressed across chapters. I suggest to strengthen the integration of this section within the other chapters on this dimension of equity. [Valérie Masson-Delmotte, France]	Taken into account - text revised.
40680	4	33	4	34	Should read 'A focus … helps' not a 'a focus … help'. [Jonny Williams, New Zealand]	Accepted - text revised
30790	4	34	4	34	A focus ... helpS (language)? [Érika Mata, Sweden]	Accepted - text revised
40682	4	39	4	39	The word 'ambit' is not in common usage and should be changed to make this more generally interpretable. [Jonny Williams, New Zealand]	Accepted - text revised
51592	4	4	4	4	The footnote parenthetically states that one country didn't ratify the Rights of the Child, the US (that country) is a signatory, and the wording of the footnote implies otherwise. More importantly, the parenthetical comment implies that 1 country didn't ratify either the last, or all of the listed covenants. According to http://indicators.ohchr.org/ this is inaccurate and misrepresenting the situation. [Jason Donev, Canada]	Obsolete. Text removed.
40684	4	42	4	42	What is meant by 'hard and soft law' here? [Jonny Williams, New Zealand]	this wording was changed for greater clarity
24310	41	4	41	5	This entire section can benefit from simplified language. The SPM will be translated, but the main report not and should also be understandable to non-expert readers with English as a second or third language. [Joeri ROGELJ, Austria]	Taken into account - text altered
38842	41	4	41	12	Two relevant references on contributions and responsibiltyies: A recent commentary (peer reveiwed) by Otto et al in Nature Climate Chaneg is potentially relevant for this section: Assigning historic responsibility for extreme weather events. Nature Climate Change 7, 757–759 (2017)DOIdoi:10.1038/nclimate3419. AND: Skeie, R. B., Fuglestvedt, J., Berntsen, T., Peters, G. P., Andrew, R., Allen, M., et al. (2017). Perspective has a strong effect on the calculation of historical contributions to global warming. Environmental Research Letters 12. doi:10.1088/1748-9326/aa5b0a. [Jan Fuglestvedt, Norway]	Accepted
56694	41	4	41	26	Equity is well explained. Broad use of references that cover the topic well. [Cheryl Anderson, New Zealand]	Noted
47052	41	8	41	8	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	Taken into account - text altered
46302	41	13	41	26	The analysis of “four key asymmetries” is very valuable. You might add: when two or more asymmetries combine - for example, those who suffer worse impacts also lack power to take decisions and lack future-response capability - the resulting compound injustice radically exacerbates their disadvantage. (This is argued in Shue 2014 which you already cite.) [Henry Shue, United Kingdom (of Great Britain and Northern Ireland)]	Rejected - a good point, but beyond scope of chapter
51594	41	13	41	19	The point that this paragraph is making is subtle, important and politically charged. It's well written and well stated, but could be strengthened by a graphic. A graphic about this essential point would draw attention to the point and increase the likelihood that the point won't get lost in the text. [Jason Donev, Canada]	Rejected - a good point, but beyond scope of chapter
7382	41	15	41	18	The statement on the "general asymmetry of contributions to the problem" is a little too general, and fits only certain perspectives on historical contributions. A recent and comprehensive analysis of the issue (Skeie et al 2017, Environmental Research Letters 12, 024022) shows just how sensitive the estimates of "contributions" are to choices such as which components to include, start year and evaluation year, accounting basis, indcator of climate change, etc. This is not to suggest that it is impossible to make any clear statements, nor that large asymmetries do not exist, but the current text is a little to simplistic. One solution could be to add that these general patterns have held, but that developments over the last couple of decades (e.g. the large growth in emissions from emerging economics) has somewhat changed this picture. [Steffen Kallbekken, Norway]	Noted - given space constraints, the text has been refined
38844	41	17	41	18	The link from contributions to climate change to responsibilties is not trival and is discussed in the literature. See short discussion and further references in this paper: Skeie, R. B., Fuglestvedt, J., Berntsen, T., Peters, G. P., Andrew, R., Allen, M., et al. (2017). Perspective has a strong effect on the calculation of historical contributions to global warming. Environmental Research Letters 12. doi:10.1088/1748-9326/aa5b0a. [Jan Fuglestvedt, Norway]	Noted
13042	41	21	41	22	Delete the text "of connection in the climate-justice nexus". [Eleni Kaditi, Austria]	Accepted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
33030	41	21	41	26	The third point of connection - this point addressses aysymmeteries in decision making on climate reponses and solution - to mitigate these risks human rigts and gender equality must inform all climate action *(see Paris Agreement; Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change.) [Tara Shine, Ireland]	Noted
9672	41	38	41	48	Human rights is an important dimension but more important to reflect in the context of sustainable development is the right to growth and development. Hence, the question of how actions to limit warming to 1.5c are consistent with developing nations aspiration to development and prosperty should assume priority for this section. [Mustafa BABIKER, Sudan]	Taken into account - section 1.1 raises this matter.
32714	41	38	41	4	See generally: Anton, Donald K & Dinah Shelton, Environmental Protection and Human Rights (New York: Cambridge University Press, 2011). [Christopher Campbell-Duruflé, Canada]	Taken into account - the text on HR has been refined and reduced but not expanded given space constraints and comments. Shelton text is not new.
33228	41	38	41	48	This paragraph needs a stronger message to anser the question posed in the first sentence. To be consistent with human rights all climate action must repsect and protect human rights - as stated in the preamble of the Paris Agreement. See for example the benefits of repected rights in climate action in: Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change. ; Mary Robinson Foundation – Climate Justice (2015a) Right for Action: Putting People at the Centre of Action on Climate Change. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-Rights-for-Action-edition-2.pdf; UNEP (2015) Climate Change and Human Rights. [Tara Shine, Ireland]	Taken into account - the reference is used in section 1.1.
46304	41	38	41	48	This is another valuable paragraph. Additional support for it is in: Mary Robinson Foundation - Climate Justice (2015). Zero carbon, zero poverty the climate justice way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Dublin, Ireland. https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf. [Henry Shue, United Kingdom (of Great Britain and Northern Ireland)]	Noted - given space constraints, the text has been refined
63324	41	38	41	38	States: "How can action to limit warming to 1.5°C be consistent with the protection of human rights?" My question is, shall we abandon limiting warming to 1.5°C if it does not protect human rights? Doesn't limiting warming to 1.5°C automatically avert loss of human rights that will occur via warming? Where are these important considerations in this critical framing document????? [Greg Rau, United States of America]	Obsolete.
32712	41	43			The expression "according to some scholars" should be removed. The Internationla Court of Justice has clearly established that “the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.” (Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, I.C.J. Reports 1996 (I), para. 29) Furthermore, in 2003, an arbitration tribunal ruled that parties have an obligation of “disclosure of certain information”, “co-operation”, and to establish “secure arrangements, at a suitable inter-governmental level, for coordination of all of the various agencies and bodies involved” in order to prevent transboundary harm. (Permanent Court of Arbitration, MOX Plant Case (Ireland V. United Kingdom), Order n° 3, Suspension of Proceedings on Jurisdiction and Merits, and Request for Further Provisional Measures, 24 June 2003, at para. 66) The ICJ reaffirmed that the prevention of harm to the environment of another state has acquired the status of customary obligation and indicated that this imposes to a state the obligation to exercise “due diligence” regarding the activities within its territory or “in any area under its jurisdiction” (Pulp Mills on the River Uruguay (Argentina v. Uruguay), Judgment, I.C.J. Reports 2010, p. 14, at para. 101) More recently, the ICJ confirmed that this obligation was associated with a duty to repair transboundary environmental harm when caused. (Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) Compensation Owed by the Republic of Nicaragua to the Republic of Costa Rica, 2 February 2018, General List No. 150) See more generally: Birnie, Patricia W, Alan E Boyle & Catherine Redgwell. International Law and the Environment, 3rd ed ed (Oxford?; New York: Oxford University Press, 2009). [Christopher Campbell-Duruflé, Canada]	Obsolete.
32716	41	44	41	45	Human rights obligations do more than "dovetail" with the extensive web of obligations found in the UNFCCC, Kyoto Protocol and Paris Agreement. They provide an additional normtive and theoretical foundation for these obligations, that go far beyond "adaptation, finance and technology" to include all aspects of the response to climate change (including mitigation, cooperation, education, capacity-building, etc.) See generally: Bodansky, Daniel, Jutta Brunnée & Lavanya Rajamani, International Climate Change Law (Oxford, New York: Oxford University Press, 2017). [Christopher Campbell-Duruflé, Canada]	Noted - given space constraints, the text has been refined
56858	41	44	41	46	On the ethical imperative for clean technology transfer see Simon Caney (2016) ‘The Struggle for Climate Justice in a Nonideal World’, Midwest Studies in Philosophy: Volume XL “Ethics and Global Climate Change”, vol.XL no.1, 9-26. [Simon Caney, United Kingdom (of Great Britain and Northern Ireland)]	Noted - but not adopted due to space constraints and changed text
7422	41	46	41	48	Here, I think you are presenting a very risky assumption in the logic of your arguments, saying that ", without sustainable technology transfer and stable access to finance, rapid decarbonization can be expected to slow or stall growth and exacerbate poverty specially in less wealthy countries" which imply that mantainig or even increase growth is the final goal of the sustainable technology and the responsable financial access, and if we slow down growth would undoubtly exacerbate poverty, and I agree with many actors about the danger in those assumptions for the intergenerational wellbeing achievement. [Manuel MORALES, France]	Accepted - this text removed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40052	41	46		48	Trade is an important complement to investments and technology transfer in this regard and need to be highlighted as well. [Aziz ELBEHRI, Italy]	Obsolete.
33032	41	47	41	48	As useful additional point to make in this sentence is that unless all countries make the transition to zero emissions / decarbonsiation together - some countries with less capavcity risk being left behind again. Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Noted - given space constraints, the text has been refined.
56204	41	49	41	49	Add comma, so that it reads: "In contrast,". [Annika Herbert, Australia]	Editorial
56860	41	49	41	49	I would suggest deleting "in contrast". It is not clear how the point made in this paragraph is in contrast with that in the preceding paragraph. [Simon Caney, United Kingdom (of Great Britain and Northern Ireland)]	Editorial
40686	41	5	41	5	ecosystem' should read 'ecosystems'. [Jonny Williams, New Zealand]	Editorial
56206	41	5	41	5	Change to "ecosystems". [Annika Herbert, Australia]	Editorial
46306	41	51	41	52	Concrete examples of “implications for process and procedural equity including intergenerational equity” from “time scale lag effects” are provided in the following in-press article, which shows how the ratio of early ambitious mitigation to later carbon dioxide removal [CDR] strongly affects intergenerational equity: Shue, H. (2018). Mitigation gambles: uncertainty, urgency and the last gamble possible. Philosophical Transactions of the Royal Society A 20170105. doi:10.1098/rsta.2017.0105. [in press] [Henry Shue, United Kingdom (of Great Britain and Northern Ireland)]	Noted
4832	42	1	42	2	I think it would be clearer if it said "focus policy concretely on addressing issues of intergenerational …" One needs a very in there indicating what the intent of the policy is to be. [Michael MacCracken, United States of America]	Noted.
33034	42	1	42	5	The reference to intergenerational equity is important - but the overall message in this sentence is a little lost. A preresquisite to intergeneratonal equity is equity within current generations. And while all ecosysmes are not equally vulnerable neither are all people - e.g. gender differentiated / marginalised people [Tara Shine, Ireland]	Obsolete.
2858	42	2	42	2	on intergenerational equity [Christophe Deissenberg, Luxembourg]	Taken into account - text altered
2860	42	4	42	4	may be particularly vulnerable [Christophe Deissenberg, Luxembourg]	Taken into account - text altered
32718	42	4			Insert a comma after "for example". Possibly start a new sentence before. [Christopher Campbell-Duruflé, Canada]	Editorial
51596	42	4	42	4	The word 'some' should be 'Some'. [Jason Donev, Canada]	Editorial
696	42	1	42	1	A wide range of definitions for poverty exist AR5 discussed '.' needed after 'exist' [Robert Shapiro, United States of America]	Noted. Adjusted
2862	42	1	42	1	Poverty can be defined in many ways. AR5 discussed ‘poverty’ in terms of its [Christophe Deissenberg, Luxembourg]	Noted. But current sentence works better
4834	42	1	42	1	Need a period after "exist". [Michael MacCracken, United States of America]	Noted. Adjusted
13454	42	1	42	1	period after exist: poverty exist. [Sergio Aquino, Canada]	Noted. Adjusted
21492	42	1	42	1	a wide range od definitions for poverty exists. AR5…. [Nathalie HILMI, France]	Noted. Adjusted as proposed.
31114	42	1	42	19	adaptation is not just about reducing vulnerability but also building resilience [James FORD, Canada]	Noted. but not necessary for the framing chapter
38846	42	1	42	1	Something wrong with the sentence here. [Jan Fuglestvedt, Norway]	Noted. Adjusted.
39524	42	1	42	1	It seems that a comma or a point is missing immediately before "AR5". [Hernan Edgardo Sala, Argentina]	Noted. Adjusted.
40688	42	1	42	1	Missing full stop after 'exist'. [Jonny Williams, New Zealand]	Noted. Adjusted.
55282	42	1	42	1	dot missing afer "exist"? [ELISA BERDALET, Spain]	Noted. Adjusted.
56208	42	1	42	1	Insert period or colon before AR5. [Annika Herbert, Australia]	Noted. Adjusted.
57532	42	1	42	1	punctuation missing [Hans Poertner, Germany]	Noted. Adjusted.
57946	42	1	42	1	There is a missing sentence stop prior to AR5 in the phrase "A wide range of definitions for poverty exist AR5 discussed." [Siir KILKIS, Turkey]	Noted. Adjusted.
51598	42	14	42	17	A map showing where these 1.5 billion people are would strengthen this point. [Jason Donev, Canada]	Noted. But this could confuse the message that acute poverty exists in many parts of the world, side by side with affluence.
2864	42	15	42	15	Poverty Index and estimates [Christophe Deissenberg, Luxembourg]	Noted. Adjusted as proposed.
40690	42	17	42	17	Does this additional billion refer to the present world population or the future one? In either of these cases, what is the timescale involved? [Jonny Williams, New Zealand]	Rejected. At risk implies there is a possibility. It is not a definitive statement.
2866	42	19	42	2	A large and rapidly growing body of knowledge explores the connections between climate change and poverty. While climatic conditions are not seen as the sole cause of poverty, [Christophe Deissenberg, Luxembourg]	Noted. Adjusted as proposed.
21494	42	19	42	31	Are there more recent references for climate change linked to poverty? [Nathalie HILMI, France]	Noted.
33036	42	19	42	2	Suporting reference for this sentence:Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Accepted reference added in comment section on 1.1.2
40692	42	24	42	24	Again the use of the word 'poor' here in not advisable since it is relative. Does the author mean poor in relation to global average GDP, for example? [Jonny Williams, New Zealand]	Rejected. The term is widely used in the literature. Just a few sentences above, there is discussion about the multidimensionality of poverty.
2868	42	25	42	25	dependent on activities such [Christophe Deissenberg, Luxembourg]	Noted. Adjusted as proposed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4226	42	28	42	31	In this study (Nunes, submitted), participants' asset portfolio (tangible: financial, physical and place-based assets; and intangible assets: human and social assets) were found to determine their ability to adapt to extreme temperatures. Extreme temperatures were found to increase pressure on existing human assets (e.g. health status) with implications to the way older adults responded to extreme temperatures. For example, Nunes (2016) shows gaps in the literature and research concerning the need to mitigate the impacts of climate change on human health, which include a need for better understanding the role assets (tangible: financial, physical, place-based) and intangible: human and social) play in human vulnerability, resilience and adaptation; http://www.tyndall.ac.uk/sites/default/files/publications/twp163.pdf [Ana Raquel Nunes, United Kingdom (of Great Britain and Northern Ireland)]	Noted. added to comments
8532	42	28	42	28	shock does not seem to be the right word here if you are talking about "modest changes" - rethink [Pauline Midgley, Germany]	Noted.
40694	42	29	42	29	Again the use of the word 'poor' here in not advisable since it is relative. Does the author mean poor in relation to global average GDP, for example? [Jonny Williams, New Zealand]	see above.
40696	42	31	42	31	As mentioned earlier, I would suggest using the word 'societal' rather than social here. [Jonny Williams, New Zealand]	Rejected. Social networks is the appropriate language here.
40698	42	33	42	34	What is 'Agenda 2030'? It must be referenced. [Jonny Williams, New Zealand]	Noted. We are now using Agenda 2030 for Sustainable Development
38848	42	39	42	39	Section 1.4.3. Good to introduce this classification. [Jan Fuglestvedt, Norway]	Noted. thanks
2870	42	41	42	41	Humans can undertake [Christophe Deissenberg, Luxembourg]	Obsolete
4836	42	41	42	41	Somehow, the word "Humans" does not seem right here? Is this referring to personal responses only, or also to collective responses by governments, etc. I would think that the subject of sentence would better be "Society" or maybe "Nations and communities around the world are undertaking various types of responses to ..." [Michael MacCracken, United States of America]	Accepted
39108	42	41	42	52	This fails to mention some key mitigation responses - food waste reduction, plant-based diets, family planning/educating girls, yet give a paragraph to CDR and even more space to SRM. Serious concern here, as this wipes out policy makers' appreciation for mitigation potential of behavioural change. [Lindsey Cook, Germany]	Noted. Behavioural change has been mentioned in an improved version. Anyhow, Chapter 1 is a framing chapter. The details are discussed/assed in Chapter 2 and 4.
2872	42	42	42	51	are framed here. Mitigation refers to efforts to cut or prevent the emission of greenhouse gases, thus limiting the magnitude of future warming. It also may encompass attempts to remove greenhouse gases from the atmosphere. Mitigation requires behavioral changes, using new technologies, clean energy sources such as wind power, solar, geothermal, hydroelectric or nuclear, or enhancing energy, decreasing deforestation, and reducing industrial and agricultural emissions. Many of these approaches, which are widely supported by the public, have made such progress in both performance and cost (IPCC, 2014e) that their role in reducing air pollution and providing energy security outweighs their possible disadvantages (Chapter 2 and 4). [Christophe Deissenberg, Luxembourg]	Noted. Section has been shortened considerably to address chapter length issue.
7362	42	42	42	43	The meaning of "Mitigation" is showed at this point of the report for the first time. However, this term has been very frequently used before in the report. "Mitigation" can be applied to many different issues or activities. In the framework of this report, it refers specifically to the the magnitude of future warming. For this reason I suggest including the meaning of "mitigation" the first time it is used in the report. [Pedro Salvador, Spain]	Noted. Yes, there is also a glossary for definitions and we can't do everything first so something has to come later.
63144	42	42	42	44	States: "Mitigation refers to efforts to cut or prevent the emission of greenhouse gase limiting the magnitude of future warming. It also may encompass attempts to remove greenhouse gases from the atmosphere." Please be clear: does CDR = mitigation or not??? They are subsequently treated as separate approaches in many regions of the remaining report. (????) [Greg Rau, United States of America]	Noted. CDR is defined as a special type of mitigation, consisting of "net negative emission" strategies.
4838	42	43	42	45	Is this intended to also be inclusive of Carbon Dioxide Removal approaches? The general distinction to my mind has been that mitigation can refer to efforts to keep the CO2 from being emitted (so removing CO2 from the exhaust stream), but would not apply to Direct Air Capture, fertilizing the oceans, biochar, etc.; reforestation would be mitigation while afforestation would be CDR assuming some actions have to be taken to do this (fertilizing trees, etc.). It just seems to me that inserting this sentence here without development is confusing. On line 44, I would suggest saying "Mitigation can involve" instead of "Mitigation requires" as there are other possibilities for the various substances (and reducing deforestation might be mentioned). [Michael MacCracken, United States of America]	Obsolete.
53946	42	43	42	44	We strongly suggest deletion of the sentence "it may encompass attempts to remove GHG from the atmosphere" as this is NOT mitigation in neither IPCC or UNFCCC [Elenita Daño, Philippines]	Obsolete.
14002	42	44	42	45	The statement "Mitigation requires the use of new technologies, clean energy sources, change people's behaviour, or make older technology more energy efficient." is incorrect in several ways (eg nothing on land use change, soil carbon uptake, non-CO2 emissions etc.). Suggest delete it. [Ralph Sims, New Zealand]	Rejected.
14008	42	44	42	52	This whole paragraph is poorly written and uses dated references (eg IPCC 2014e when renewable energy costs continue to decline). Needs rewriting and updating - quoting 2017 IRENA, IEA, REN21 reports. [Ralph Sims, New Zealand]	Obsolete.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
51600	42	44	42	46	This is a much better framing than 'renewable' for discussing other energy types than fossil fuels. This document must be unambiguous on this point, the renewable nature of wind and solar (or geothermal and hydro) are a distant second to the GHG emissions. Focusing on the 'renewable' nature of the energy gives credence to the belief that the problem is that we are going to run out of fossil fuels. The biggest difficulty is that we are in absolutely no danger whatsoever of running out of fossil fuels, we're in grave danger of NOT running out! We have sufficient fossil fuels to create irreparable damage to society through climate change. This means that this document needs to focus on the carbon dioxide released from our energy choices, first and foremost. Listing the renewable nature of fuels detracts from the overall strength of the message: we must increasing the amount of carbon dioxide in the atmosphere. [Jason Donev, Canada]	Accepted.
8596	42	45	42	45	Grammatically this should read "changing people's behaviour, or making older technology more energy efficient" [Pauline Midgley, Germany]	Accepted
11024	42	45	42	47	Switching to low–carbon energy sources such as wind power, solar, geothermal, hydroelectric, fossil with high capture efficiency CCS or nuclear represents strategies [Wilfried Maas, Netherlands]	Obsolete.
13044	42	45	42	47	Delete the text "Switching to low–carbon energy sources such as wind power, solar, geothermal, hydroelectric or nuclear represents strategies for lowering the emissions of greenhouse gases in the atmosphere.". [Eleni Kaditi, Austria]	Obsolete.
17222	42	45	42	45	changes in peoples' behaviours [David Schoeman, Australia]	Accepted
31854	42	45	42	45	minor grammatical typo - should read "...changes to people's behaviour, or making older technology..." [Stuart Capstick, United Kingdom (of Great Britain and Northern Ireland)]	Accepted.
35474	42	45	42	45	change people's behaviour - perhaps mention that "change people's behaviour including, in particular, their consumption patterns and habits" [Ashok Sreenivas, India]	Accepted.
40700	42	45	42	45	In this sentence 'change people's behaviour' does not make grammatical sense. [Jonny Williams, New Zealand]	Noted.
40702	42	46	42	46	If the point here is that contemporary nuclear fission power stations do not directly emit greenhouse gases (like e.g. coal), then this should be contrasted with their radioactive by-products with half lives of many centuries. This point sets nuclear power widely apart from the other 4 truly sustainable energy sources listed and should, at the least, be expanded upon. [Jonny Williams, New Zealand]	Obsolete.
53948	42	46			Delete "nuclear", as this "strategy" carries unacceptable risks on people, nature and future generations. The sentence says "such as", so many other alternatives are not mentioned, so nuclear can be deleted. Proven and less controversial technologies may be mentioned as example instead. [Elenita Daño, Philippines]	Noted. Nuclear does not appear in the final version
13046	42	48	42	48	Delete the text "also". [Eleni Kaditi, Austria]	Obsolete.
9674	42	49	42	5	The argument that low emissions technolgies are consistent with large scale use need substantiation -- add citation [Mustafa BABIKER, Sudan]	Obsolete.
13048	42	49	42	52	Delete the text "These approaches are increasingly cost–competitive, consistent with large–scale use, and largely supported by public sentiment. Many renewable energy technologies have made progress in both performance and cost (IPCC, 2014e) and that their role in reducing air pollution and providing energy security outweighs possible disadvantages (Chapter 2 and 4).". [Eleni Kaditi, Austria]	Obsolete.
38850	42	49	42	52	The two last sentences in this para are not needed here, in my view. [Jan Fuglestvedt, Norway]	Obsolete. Text revised
40704	42	49	42	5	This sentence may be true but it is not appropriate to make such sweeping statements (whatever one's opinion) without references. [Jonny Williams, New Zealand]	Obsolete. Text revised
9676	42	5	42	52	The statement "The role of renewable energy technologies in reducing air pollutioin and providing energy security outweighs possible disadvantage" is rather strong one that hide beneath a cost-benerfit calaculus. Does such analysis has been carried by chapters 2 and 4? [Mustafa BABIKER, Sudan]	Obsolete.
40706	42	5	42	52	This sentence does not make grammatical sense and should be reworded. [Jonny Williams, New Zealand]	Noted.
14182	42	51	42	51	delete 'that' as unnecessary [Roger Bodman, Australia]	Obsolete.
51602	42	51	42	52	The assertion that renewable energy technologies have made progress in both performance and cost is grossly misleading. The assertion made after the citation that their role in reducing air pollution and providing energy security is overstated. Some sort of quantification of confidence needs to be included in this. [Jason Donev, Canada]	Obsolete.
56210	42	51	42	51	Remove "that", so that it reads: "…and their role…" [Annika Herbert, Australia]	Obsolete.
39930	43		44		Under 1.4.4 Governanace, it is suggested to add one pragraph or some revising in exsting paragraphs concerning the constitutional gaps that is require to improve in some developed and developing countries. [Hamidreza Solaymani Osbooei, Iran]	Rejected. constrained due to word count and potential for entering policy prescriptive territory.
2064	43	1	43	1	(at this location and generally) CDR is a less-general term than Greenhouse Gas Removal (GGR). Proposals to remove methane and CFCs are referenced elsewhere in this document - and this fact deserves at least a mention, if CDR is going to be used. [Andrew Lockley, United Kingdom (of Great Britain and Northern Ireland)]	Accepted.
2874	43	1	43	2	Carbon dioxide removal (CDR) or 'negative emissions' strategies involve reducing the amount of carbon dioxide already in the atmosphere (which is not the same as reducing the amount of carbon dioxide [Christophe Deissenberg, Luxembourg]	Rejected.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9678	43	1	43	8	CDR technologies such as CCS are well understood and have large potentials. Issues with large scale deployment are mainly due to cost and economics and not to technological feasiblity which may also be true to other CDR technologies that are described as feasible [Mustafa BABIKER, Sudan]	Noted.
4840	43	1	43	8	This is a pretty limited discussion of CDR options. So, there is biochar on land as well as afforestation. In the oceans, while iron fertilization was an original approach, there is now growing discussion of providing a fuller set of nutrients so one can sequester carbon in currently barren areas of the ocean. There is also enhanced weathering of rocks, etc. And then there are supposed advances in direct air capture. It seems to me the key point that needs to be made here is that none of the approaches can cost effectively be scaled up to deal with the current level of emissions, but that there is the potential for CDR to be cost effective if emissions are brought down considerably through traditional mitigation. So, at some point there may well be a crossing of the cost curves so that actual fossil fuel use to, for example, power aircraft might be offset by CDR, especially if it turns out that the land requirement for biofuels to replace aircraft fuel is too demanding. It seems to me really critical here to be giving a sense that the various approaches need to be considered as a comprehensive set and to stop playing off one versus others. None can do all that is needed--we need a comprehensive analysis--and one that evolves over time as technology develops and societal needs change. [Michael MacCracken, United States of America]	Rejected. Section 1.4 is classifying and defining response options. Detailed discussion and analysis are in Chapter 2.
40800	43	1	43	1	The 'negative emmissions' is not really explaining the C removal…alternative wording may be 'Net negative emissions' [NARESH KUMAR SOORA, India]	Accepted.
53950	43	1			delete "or negative emissions", as it is far from proven that CDR strategies would be "negative", even if some may eventually remove some CO2. That is far from "negative". [Elenita Daño, Philippines]	Rejected. By negative means absorption, not as in less than 0.
50478	43	1	43	44	I understand that there is a growing trend in the literature towards including CDR as a form of mitigation and treating SRM as an entirely different category, mainly based on risks assocatied with each category and the differences in possibilities for governance. I would like to remind here that the CDR/SRM differentiation, initiated by Shepherd et al. 2009, was used to demarcate geoengineering technologies, is based on micro-level chemical and physical processes, and does not cover important political differentiations such as jurisdiction or scale. Including all CDR measures (from biochar to ocean fertilization) as a form of mitigation is problematic, and excluding all forms of solar radiation management (including the local whitening of roofs or planting of light-colored crops) from adaptation measures is equally problematic. My suggestion to the authors of the 1.5 report is to consider an alternative/additional categorization, based on whether technologies are deployable within the sovereign territory of states (biochar, BECCS, afforestation, roof whitening, reflective crops) or intended for deployment in global commons (ocean liming, ocean iron fertilization, stratospheric aerosol injection, marine cloud brightning). This would ease the integration of some types of technologies (easily applicable at smaller scale) into national climate policies, while bundling those in need of international governance as an extra set. This type of differentiated understanding would also reflect policy makers' intuitive association of 'geoengineering' with technologies like stratospheric aerosol injection and ocean fertilization, while associating more familiar, smaller-scale technologies with conventional mitigation and adaptation measures. Using a more nuanced categorization like this would significantly facilitate the scientific and political discussion. I note that such a re-definition would lie in the power of the IPCC, as it has already decided to re-define SRM into RMM in the current version of the report. [Ina Möller, Sweden]	Noted. The assessment of mitigation pathways and technologies in the context of 1.5 C warming and sustainable development is discussed in Chapter 2.
14010	43	4	43	4	Reference Herzog 2001 very old for something"in its infancy"! Replace with more recent reference/s [Ralph Sims, New Zealand]	Accepted.
49688	43	4	43	5	Though some carbon removal techniques such as reforestation and ecosystem restoration are well understood. This assumption needs backing. All conferences on restoration that I have been attending recently claimed the opposite (e.g. IUFRO Puerto Rico June 2017, IUFRO Freiburg, Sep. 2017, GLF 2017) and that we still need to understand better how restoration works in technical, ecological and socio-political terms, e.g. concerning the impact of future climate change on the possibilities to restore with certain species (cf. Stanturf et al. 2015) or let alone the "human part" of it (value chains/markets/demand, supportive governance framworks, ethical / social support etc.). References: Stanturf, J. A., Kant, P., Lillesø, J-P. B., Mansourian, S., Kleine, M., Graudal, L., & Madsen, P. (2015). Forest Landscape Restoration as a Key Component of Climate Change Mitigation and Adaptation. Vienna, Austria: International Union of Forest Research Organizations (IUFRO). IUFRO World Series, Vol.. 34 [Sabine Reinecke, Germany]	Accepted.
53952	43	7			Delete sentence from "For this report" for the reasons mentioned in the general comment 1 above. CDR is not "mitigation" which is clear in the definition in AR5. [Elenita Daño, Philippines]	Rejected. CDR is a special mitigation
63146	43	7	43	8	States: "For this report, CDR is considered part of mitigation options (Chapter 2 and 4)." OK, CDR=mitigation. Not consistently used in remaining report. (?) [Greg Rau, United States of America]	Disagree. It is consistent
38852	43	8	43	8	You may just breifly mention the status on CH4 removal. (See e.g. references given in Fuglestvedt, J., et al. Implications of possible interpretations of "greenhouse gas balance" in the Paris Agreement. Phil. Trans. Roy. Soc. A, doi: 10.1098/rsta.2016.0445, in press (2018). [Jan Fuglestvedt, Norway]	Rejected. The section classify and define response options

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9680	43	1	43	19	Adaptation challenges for 1.5c are assumably less than the challenges associated with adaptation to higher warming such as 2c. By how much need for adaptation will be reduced by achieving 1.5c is a critical question that will have quite of a policy relevance. Shedding light on this dimension would represent a great value added. [Mustafa BABIKER, Sudan]	Noted.
2876	43	15	43	16	Cities and municipalities are at the frontline of adaptation and address their own climate–related challenges [Christophe Deissenberg, Luxembourg]	Accepted.
53624	43	19	43	19	Adaption tipping point should be mentioned [AKM SAIFUL ISLAM, Bangladesh]	Noted. Adaptation limits are discussed in Chapter 4 as part of the assessment process.
1026	43	21	43	44	This paragraph should mention that SRM is included within RMM in this report. [Jesse Reynolds, Netherlands]	We no longer use the term RMM
2060	43	21	43	44	SRM is portrayed as less developed than CDR. This is not necessarily true - certainly when considering the heterogeneity of each field. For example, urban albedo changes are better-understood than is OIF [Andrew Lockley, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. We are referring to large-scale SRM rather than land surface modifications
2062	43	21	43	44	The effect of SRM on the carbon cycle is overlooked. This is relatively well-established, although poorly constrained. https://www.nature.com/articles/nclimate3376 [Andrew Lockley, United Kingdom (of Great Britain and Northern Ireland)]	Noted. However this section in Ch1 only defining SRM. Issues associated with SRM are covered in the SRM box
2878	43	21	43	21	Remedial options are distinct from mitigation or adaptation. Their aim is to temporarily reduce [Christophe Deissenberg, Luxembourg]	Accepted.
7262	43	21	43	44	Excellent. This is accurate and nicely balanced. Well done. [Ben Kravitz, United States of America]	Noted
30794	43	21	43	21	As I understand the logics of this section, maybe "remedial options" should be in Bold instead of "Solar Radiation Management" which is only one in the category. Otherwise the logics in the narrative have to be revised. I also wonder if one could say more about other remedial options or explain why SRM is clearly nr 1. [Érika Mata, Sweden]	Accepted.
37454	43	21	43	44	If the new term RMM is retained in the report (against which I strongly advise given that it does not represent current terminology in the scientific literature) then this paragraph should mention the logical relationship between SRM and RMM (SRM being a subgroup of radiation modification geoengineering or radiative forcing geoengineering). [Matthias Honegger, Germany]	We no longer use the term RMM
40418	43	21	43	24	It is important to highlight here the unpredictability, potential irreversibility and-or wide scale (several countries, regions or worldwide) of potential negative effects of solar radiation management (SRM), as well as the many concerns in terms of environmental integrity, justice, equity and ethics. (see Macnaghten and Szerszynskic . 2013. Living the global social experiment: An analysis of public discourse on solar radiation management and its implications for governance Global Environmental Change 23(2) 465-474, and references therein) [Pedro Alfredo Borges Landaez, Venezuela]	Noted. However this section in Ch1 only defining SRM. Issues associated with SRM are covered in the SRM box
42750	43	21	43	44	Key specific issues/problems to consider even if it is feasible: suddenly stopping would be more catastrophic to biodiversity than gradual warming. Trisos et al., Potentially dangerous consequences for biodiversity of solar geoengineering implementation and termination, Nature Ecology and Evolution. Also, SRM would not address ocean acidification. Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume I. [Kristin Campbell, United States of America]	Noted. Impacts of SRM and considered in the SRM cross-chapter Box
42966	43	21	43	44	Key specific issues/problems to consider even if it is feasible: suddenly stopping would be more catastrophic to biodiversity than gradual warming. Trisos et al., Potentially dangerous consequences for biodiversity of solar geoengineering implementation and termination, Nature Ecology and Evolution. Also, SRM would not address ocean acidification. Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume I. [Durwood Zaelke, United States of America]	Noted. Impacts of SRM and considered in the SRM cross-chapter Box
53954	43	21			Delete "remedial options" (as SRM is not proven to be a remedy). Suggested reformulation: "Other proposals, are distinct from mitigation and adapation…" [Elenita Daño, Philippines]	Reject: to classify something as a remedy does not imply that it "works"
61738	43	21	43	44	I suggest to strongly shorten the part on solar radiation management and refer to the cross chapter box, explaining how this issue is assessed in the whole report without performing an assessment of the literature. [Valérie Masson-Delmotte, France]	Noted - text has been reduced.
63148	43	21	43	23	OK, so SRM = remediation. As far as I can tell this is the last time in the chapter that SRM/remediation is mentioned. Why? No equity, governance, societal issues?? Relabeled RMM in chapter 4, pg 8, line 6? [Greg Rau, United States of America]	Equity, governance, societal issues are covered in the SRM box
14012	43	22	43	23	Why throughout the text are capital letters used for words when followed by an acronym - such as Solar Radiation Management here, also SAI, MRB below and many other examples? Words should remain in lower case unless proper nouns. [Ralph Sims, New Zealand]	Acronyms are capitalized throughout the report
53956	43	22	43	25	Delete the word "most extensively" and "remedial". Geoengineering and SRM are NOT AT ALL EXTENSIVELY DISCUSSED. It is only discussed among a small number of scientists and their students, withoput any involvement of neither governments or society. Also, delete the word "net" and the word "peak" as this is only recently proposed by a couple fo geoengineers. Sentence should reformulated as: "One of these proposals is Solar Radiation Management (SRM), which aims to change Earth's albedo, to increase he amount of solar radiation reflected from Earth, with the aim to reduce temperature." [Elenita Daño, Philippines]	The phrase "extensively discussed" has been removed. We decided to keep the words "net" and "peak" as this is consistent with the literature cited
8598	43	23	43	23	insert missing closing parenthesis before the comma (SRM), [Pauline Midgley, Germany]	Missing parenthesis inserted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2880	43	24	43	24	from the Earth to [Christophe Deissenberg, Luxembourg]	Implemented
2882	43	26	43	29	). One of the most commonly proposed SRM techniques is the Stratospheric Aerosol Injection (SAI), consisting in an artificial emission of aerosols into the stratosphere (Crutzen, 2006; Rasch et al., 2008) to mimic the effect of volcanic eruptions in reducing the global average temperature. Another method is Marine Cloud Brightening (MCB), which [Christophe Deissenberg, Luxembourg]	Sentence has been deleted
4842	43	29	43	29	I would urge saying "proposed approach" instead of "method" [Michael MacCracken, United States of America]	Sentence has been deleted
2066	43	35	43	35	cirrus cloud thinning (AKA cirrus stripping) is omitted [Andrew Lockley, United Kingdom (of Great Britain and Northern Ireland)]	Agreed - we now refer to cirrus cloud thinning.
2884	43	35	43	36	Methods which change the local surface albedo have an effect on regional temperature only, with negligible effects on global temperature [Christophe Deissenberg, Luxembourg]	Sentence has been deleted
55620	43	36	43	36	negligible effects on global temperature note that this is scale dependent. [David Cooper, Canada]	This text has been deleted
2886	43	4	43	44	However, save for simulations using climate models and small scale field trials, SRM is largely theoretical and un–tested. Its unintended impacts (both biophysical and societal), its technical feasibility, its costs, the related governance, social, and ethical issues, need to be carefully considered (Schäfer et al., 2015; Section 4.3.9 and Cross–Chapter Box 4.29, (Section 4.3.9). [Christophe Deissenberg, Luxembourg]	Sentence has been deleted
4844	43	4	43	43	Four important suggestions: (1) Yes, SRM is itself untested, but it needs to be said that SRM basically mimics observed natural processes and that, for example, stratospheric aerosols would be enhanced by volcanic eruptions versus by human activities should not be expected to lead toa significantly different response--so I think mention needs to be made that natural analogs exist and can be used to estimate the potential response to human interventions such that the main issues relate to more the engineering of doing it rather than the science. (2) With respect to "unintended impacts", I think it needs to be indicated that all simulations to date indicate that SRM (at least SAI) will tend to largely offset the perturbations to the climate caused by the increased GHG concentrations--not perfectly, but quite likely to within the range of variability for when the GHG concentration increases were much less than lies ahead, and this applies for temperature and precipitation and on a local to regional basis. I would note that with respect to uncertainties, that SRM is based on amplification of natural processes an in the range of climate conditions that we are familiar with, the uncertainties associated with it are plausibly less than those associated with simulation of conditions when the global average temperature is degrees above the present level, and that the key SRM uncertainties relate in large part to engineering aspects, including especially the amounts that would be most effective for a particular response. (3) I think it needs to be said that no one in the field envisions SRM as an alternative to mitigation (although a number of the model calculations have been run on situations that might be interpreted in that way to achieve better signal to noise results in the calculations. Instead, SRM should be thought as an approach that might be used to shave down further what cannot or is not acheived by mitigation, CDR, and adaptation--and a modest effect that would be phased in early as mitigation and CDR build up and then phased out as they become effective. (4) At least some of the approaches to SRM could be used in ways that might offset mainly regional impacts rather than focused on trying to offset the increase in global average temperature--so it might be possible to use one or more of the approaches to moderate Arctic amplification, the likelihood of very strong tropical cyclones, shading of coral reefs, and so on. Overall, the text included here is just inadequate in presenting relevant issues. [Michael MacCracken, United States of America]	1. The text about SRM being un-tested has been removed 2. The phrase "unintended impacts" has been removed 3. We do not refer to SRM as an alternative, but state that it could potentially be used to Supplement mitigation. 4. The SRM text in Ch is simply to define SRM. Focussing on details such as Arctic amplification is beyond the scope of a framing chapter.
30796	43	4	43	44	Here we learn that much work is still needed to consider SRM carefully, whereas there is an entire paragraph about it. The review is indeed very nice, but the paragraph on Remedial Options is simply much more developed than the previous paragraphs on Mitigation, CDR and Adaptation. Could the authors consider a more equal presentation of options - thereby expanding the preceeding paragraphs - or explain the reasons for the current inequity? [Érika Mata, Sweden]	The SRM text has been reduced
37270	43	4	43	4	Note that no legitimate small-scale field experiments involving SAI have yet been conducted. The first such experiment, the Stratospheric Controlled Perturbation Experiment (SCoPEx), is currently being planned—see https://projects.iq.harvard.edu/keutschgroup/scopex. [Joshua Horton, United States of America]	This text has been deleted
38854	43	4	43	44	Re sentence "However,…": Such considerations could also be added for some of the other response options discussed and I am not sure if this fits here. A pointer to section 4.3.9 and the Box 4.2. should be enough) [Jan Fuglestvedt, Norway]	This text has been deleted
53958	43	4	43	43	Add after un-tested: "intended and unintended impacts". [Elenita Daño, Philippines]	This text has been deleted
8600	43	42	43	44	consideration of ethical issues is mentioned in both line 42 and 44; only one of these is needed [Pauline Midgley, Germany]	Implemented
47044	43	42	43	44	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	We disagree that stating the impacts of SRM need to be carefully considered is policy prescriptive
3190	43	43	43	44	The last sentence of this paragraph is a repetition of the previous sentence. [Vassilis Daioglou, Netherlands]	Implemented

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4846	43	43	43	44	I'd suggest that this statement really lacks needed context. Indeed, the consideration is needed, but it needs to be with respect to including SRM along with all other approaches versus just having available all the other approaches. There has been a tendency to analyze the social and other aspects of SRM on its own and not in the context of its role of offsetting the very serious climate perturbations being caused by the rising concerntations of GHGs. Indeed, all of these points need to be considered with respect to all of the approaches to dealing with climate change--so mitigation, adaptation, CDR, and so on. Just having this sentence for SRM seems incorrectly limiting of consideration of these issues. [Michael MacCracken, United States of America]	The SRM text in Ch1 is only about defining SRM, rather than an extensive assessment. Please refer to the cross chapter box on SRM.
53960	43	44			after "with SRM" add : "are highly controversial and there are also proposals to ban the technology." [Elenita Daño, Philippines]	Reject: this is not balanced. The cross chapter Box covers issues associated with SRM
53962	43	45			Add: All forms of geoengineering, including SRM and CDR are highly socially controversial and contested by civil society and scientists. Add additional reference: ETC Group (2018) The Big Bad Fix; The case against climate geoengineering." http://etcgroup.org/sites/www.etcgroup.org/files/files/big_bad_fix_2017_us_v7_4web.pdf [Elenita Daño, Philippines]	Reject: this is not balanced. The cross chapter Box covers issues associated with SRM
18	43	47	44	37	And also: https://www.sciencedirect.com/science/article/pii/S187734351730115X / and https://www.sciencedirect.com/science/article/pii/S187734351730091X and https://www.sciencedirect.com/science/article/pii/S1877343517301367 and https://www.sciencedirect.com/science/article/pii/S1877343517300891 [Thaler Thomas, Austria]	Noted.
56414	43	47	43	47	As commented on the FOD, this section should give prominence to the global adaptation goal in the Paris Agreement (Article 7.1), it is currently not mentioned. This is a very important omission. [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. Adaptation is given more prominence in the FGD
33038	43	49	5	37	This section on governace is lacvking a refernence to human rights as a critical elemnt of good governance. See for example http://www.ohchr.org/EN/Issues/Development/GoodGovernance/Pages/GoodGovernanceIndex.aspx [Tara Shine, Ireland]	Noted: human rights issues are addressed in subsection 1.1.1
37356	43	49	44	5	A key aspect missing in this otherwise very useful para is that fostering a transformation toward complete decarbonization is expected from institutions and governance instruments that actually rather reinforce drivers that lead to higher use of natural resources, see e.g. the analysis presented in Pichler et al., 2017, COSUST, vol 26, p33 [Helmut Haberl, Austria]	Noted. This is an important point, but lies outside the scope of a framing chapter. The need for transformation is addressed in chapters 4 and 5.
40708	43	5	43	5	needed changes' should be worded 'changes needed'. [Jonny Williams, New Zealand]	Implemented
63150	43	51	43	53	No mention of remediation in the context of SDGs??? [Greg Rau, United States of America]	Noted. The discussion of SDGs has been strengthened in the FGD
40710	44	1	44	1	include ability' should be reworded to 'include the ability'. [Jonny Williams, New Zealand]	Noted: word added
40712	44	1	44	5	This sentence is much too long and should be split. [Jonny Williams, New Zealand]	Editorial
2888	44	3	44	5	levels of government, and the capacity to raise financing and support for the needed technological and human resource development. [Christophe Deissenberg, Luxembourg]	Noted
38856	44	3	44	3	I think you need to explain "scalar interactions" [Jan Fuglestvedt, Norway]	Agreed: the word scalar has been removed to avoid confusion
56212	44	3	44	3	Remove "the", so that it reads: "…in archaeological…" [Annika Herbert, Australia]	Noted: word removed
54478	44	4	44	5	In addition it is important to emphasise the need for governance to organise and carry out disinvestment from maladaptive sectors and systems; This has proven as challenging as innovation, due to interest groups, institutional architecture, policy "lock-in" problems etc. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Rejected: unfortunately we are over page limit and cannot add text but this is discussed in later chapters
17966	44	7	7	12	See comment 6 on policy experimentation. It will be helpful to add few examples or a reference to other parts of the report where those are described. [Andrea TILCHE, Belgium]	Noted: text is removed to avoid exceeding page limit
2890	44	8	44	12	to low carbon transitions require policy experimentation. Extensive trials and smaller experiments strengthen policy-making capacity and help overcome barriers in adressing complex, multidimensional climate challenges. Thus, adaptive and flexible governance systems will be key to transitioning to a 1.5°C global warming. [Christophe Deissenberg, Luxembourg]	Noted: text removed
39526	44	9	44	1	Consider to modify the position of the commas. Instead of: "Extensive trials and smaller experiments strengthen policy and capacity and help overcome barriers and complex, multidimensional climate challenges." I propose: "Extensive trials and smaller experiments strengthen policy and capacity, and help overcome barriers and complex multidimensional climate challenges." [Hernan Edgardo Sala, Argentina]	Noted: text removed
2892	44	14	44	14	To date, it is not certain that [Christophe Deissenberg, Luxembourg]	Noted: text removed
9682	44	14	44	2	The insights that Strengthening governance to be consistent with 1.5c looks to be quite challenging in the context of current Paris Agreement given its agreed voluntary mechansims of "exper based" and "facilitative dialogue"compared to stringent mandatory mechanisms such as those of the Sendai framework is important to highlight in the executive summary and the SPM. [Mustafa BABIKER, Sudan]	Agreed: this discussion is well developed in later chapters. Due to page limit the Sendai Framework reference was removed

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38858	44	14	44	2	The "club approach" could also be mentioned here; see recent paper by Aakre et al in Nature Climate Chnage: Incentives for small clubs of Arctic countries to limit black carbon and methane emissions. tine Aakre, Steffen Kallbekken, Rita Van Dingenen & David G. Victor. Nature Climate Change volume 8, pages85–90 (2018) doi:10.1038/s41558-017-0030-8 [Jan Fuglestvedt, Norway]	Rejected: unfortunately we are over page limit and cannot add text
39528	44	14	44	15	Consider rewording the sentence "To date, it is not at all certain that the voluntary mechanisms of the Paris Agreement will be sufficient to achieve the ambitions of the Paris Agreement" An alternative might be: "To date, it is not at all certain that the voluntary mechanisms of the Paris Agreement will be sufficient to achieve its ambitions" [Hernan Edgardo Sala, Argentina]	Noted: text removed
51604	44	14	44	37	These three paragraphs are wishy-washy. State your position clearly, ambiguity will lead to no action being taken. [Jason Donev, Canada]	Noted
55284	44	14	44	15	Highlight this sentence [ELISA BERDALET, Spain]	Noted: text removed
2894	44	19	44	2	assumed that climate change adaptation can be enhanced through risk reduction, (Mysiak et al., 2016). [Christophe Deissenberg, Luxembourg]	Noted: text removed
52748	44	21	44	22	Under the chapter of governance, it is worth mentioning the transparency framework under the Paris Agreement. The transparency framework will link the multilateral treaty with the bottom-up actions at national level. The outcomes of the transparency framework will inform the global stock take about the level of ambition needed. [Iulain Florin VLADU, Germany]	Rejected: unfortunately we are over page limit and cannot add text but this is discussed in later chapters
13050	44	22	44	26	Delete the text "One of the outcomes of the Paris Agreement is the recognition of the need to link the multilateral treaty–regime with the bottom–up world of national and sub national climate action. To ensure that global mean warming does not exceed 2°C, and even stays toward 1.5°C, many have suggested that the voluntary pledges submitted by states and non–state actors to the Paris Agreement will need to be more firmly coordinated, evaluated and upscaled (Lövbrand et al., 2017).". [Eleni Kaditi, Austria]	Rejected: this is a key issue in the whole Report; discussed in later chapters
57948	44	22	44	26	The Bonn-Fiji Commitment of Local and Regional Leaders to Deliver the Paris Agreement At All Levels that was adopted by acclamation at the Climate Summit of Local and Regional Leaders may be mentioned to provide additional support for this paragraph <http://www.cities-and-regions.org/cop23/wp-content/uploads/2017/11/bonn-fiji-commitment-of-local-and-regional-leaders.pdf> [Siir KILKIS, Turkey]	Rejected: no room for more text
2896	44	25	44	25	submitted by the states [Christophe Deissenberg, Luxembourg]	Editorial
17968	44	28	44	28	This para can be taken to the respective chapter [Andrea TILCHE, Belgium]	Noted
37358	44	28	44	37	See comment above: fostering a transformation toward complete decarbonization is expected from institutions and governance instruments that actually rather reinforce drivers that lead to higher use of natural resources, see e.g. the analysis presented in Pichler et al., 2017, COSUST, vol 26, p33 [Helmut Haberl, Austria]	Noted: no room for more text
50638	44	28	44	37	Could emphasize more the impact of climate and non-climate stressor interactions in driving geo-political conflicts [Jagdish KRISHNASWAMY, India]	Rejected: no room for more text
54134	44	28	44	29	Policy arenas, governance structures and robust institutions are key enabling conditions for transformative climate action in achieving the global response to 1.5°C warming. See report of CLGD 2016, 2017, plenty of material on climate governance specifically from hundreds of lawers through dozens of workshops [Ayman Bel Hassan Cherkaoui, Morocco]	Noted: no room for more text.
31116	44	32	44	33	also see Berrang-Ford et al 2014 in Climatic Change who statistically correlate adaptation actions with governance [James FORD, Canada]	Rejected: no room for more text
46334	44	34	44	34	I don't think the study by Vosky is the best reference to cite in order to get a balanced overview of the burgeoning debate on climate - conflict and migration. This reference is actually not cited in chapter 3. I would suggest Seter, H. (2016). Connecting climate variability and conflict: Implications for empirical testing. Political Geography, 53, 1-9. doi:http://dx.doi.org/10.1016/j.polgeo.2016.01.002. Alternatively one could cite symmetrically Selby, J., Dahi, O. S., Fröhlich, C., & Hulme, M. (2017). Climate change and the Syrian civil war revisited. Political Geography, 60(Supplement C), 232-244. doi:https://doi.org/10.1016/j.polgeo.2017.05.007 and Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. Proceedings of the National Academy of Sciences(March 2, 2015). doi:10.1073/pnas.1421533112 [Etienne Piguet, Switzerland]	Noted: text was removed to avoid exceeding page limit.
55286	44	35	44	37	Highlight this sentence [ELISA BERDALET, Spain]	Noted
13052	44	36	44	37	Delete the text "within the adaptation–mitigation–sustainable development nexus". [Eleni Kaditi, Austria]	Rejected: no reason is given. This relationship is key in this report.
13456	44	37	44	37	missing a table with response systems and their possibilities [Sergio Aquino, Canada]	Rejected: no room for more tables/text
17	44	4	45	22	See also: https://www.sciencedirect.com/science/article/pii/S187734351730074X and https://www.sciencedirect.com/science/article/pii/S1877343517300702 [Thaler Thomas, Austria]	Reference was reviewed
33040	44	4	42	22	This section would benefit from references to the literature (grey and academic) on just transition as a critical element of effective transformation pathways e.g. The Geographical Journal, 2013, doi: 10.1111/geoj.12008 The political economy of the 'just transition'. PETER NEWELL AND DUSTIN MULVANEY ; the ILO Guideline son a just Transition http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_432859.pdf [Tara Shine, Ireland]	Rejected: no room for more text

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40926	44	4	45	22	The discussion on technological, economic, institutional, and behavioural lock-in in Section 1.2.6 seems misplaced there along with inertia in the geophysical climate system. It seems to belong to Section 1.4.5 where transformation and transformation pathways are discussed. Consider consolidating the two in one place. [Neelam Singh, United States of America]	agreed - we blended these sections
55768	44	4	45	22	The definitions for transformation and transition are necessary [Dong-Woon Noh, Republic of Korea]	agreed - we developed framing definitions of both
29750	44	42	45	22	The section on transformation/transition should probably make clear how the two concepts are distinguished from another in the report. The literature within transition studies (e.g. Geels et al., https://doi.org/10.1016/j.joule.2017.09.018) could probably be drawn on to clarify the definitions. [Bård Lahn, Norway]	agreed - we developed framing definitions of both
39110	44	42	45	22	Again, fails to explore potential of transformation - of concern since few States engage with their citizens on the level of seriousness of the climate situation, as detailed by the IPCC. While 'policy systems' or transformations have happened historically in wartime situations, due to clear policy decisions, including asking citizens to risk their lives to fight, this report appears to assume that citizens would not want to change their behaviour in order to ensure the safety of their children, which is untrue. Please consider the assumptions being made and explore in depth the possibilities of change, or you inappropriately influence policy decision makers. [Lindsey Cook, Germany]	agreed - we developed framing definitions of both
38860	44	43	44	44	The sentence "The pace and process…" seems very general and obvious. I suggest either removing it or saying a bit more. [Jan Fuglestvedt, Norway]	Noted: text is removed.
2898	44	44	44	44	Fundamental elements of the [Christophe Deissenberg, Luxembourg]	Accepted: word changed
4848	44	44	44	45	Is there not also an element of decoupling economic growth from the need for energy, and not just carbon emissions. Given the high percentage of energy that is provided by fossil fuels, the decoupling really also has to be with energy--that is certainly what efficiency is about, and it is a very critical aspect of a comprehensive response strategy. I'd suggest it would be worth also making this point. [Michael MacCracken, United States of America]	noted the text was revised to illustrate this point
8950	44	44	44	5	carbon sequestration technologies: e.g. using biochar in concrete as building material during further urbanization. See: H.-P. Schmidt, 2013: The use of biochar as building material - cities as carbon sinks. Ithaka Journal for terrior-wine and biodiversity, ISSN 1663-0521. http://www.ithaka-journal.net/pflanzenkohle-zum-hauser-bauen-stadte-als-kohlenstoffsenken?lang=en [Heike Huebener, Germany]	the refs seemed to more appropriate for chapter 4
35476	44	44	44	45	In addition to decoupling economic growth from emissions, it would also be good to mention that, for some regions/countries, it may be time to consider stopping economic growth / reach steady state economics. [Ashok Sreenivas, India]	noted the text was revised to illustrate this point
37360	44	44	44	6	Large literatures meanwhile suggest that "decoupling" - while of course useful and beneficial - will not be sufficient to bend the curve. See e.g. Martinez-Alier, 2002. The Environmentalism of the Poor. E.Elgar. Haberl et al. 2011. Sustain. Develop. vol 19, p1ff; Kallis, et al. 2012. Ecological Economics 84, 172–180; Herring 2006. Energy 31, 10–20 and many others. Hence I think the framing should not only build on decoupling but also on other approaches such as demand-side options, sufficiency, new welfare indicators, etc. that take a more agnostic perspective regarding GDP growth. The main goal should be to provide humans with sufficient services such as shelter, mobility, healthcare, food, etc. for a good life (high quality of life), but not to maximize a specific indicator such as GDP. I know that concepts of degrowth - while meanwhile investigated in large and thriving scientific communities - may be considered a no-go here, but only relying on GDP growth and hoping for decoupling may well not work, and so I think a bit broader approaches than just decoupling GDP from GHG emissions should be visible here. [Helmut Haberl, Austria]	noted - we added some detail to these issues but others are outside the scope of the report
40054	44	44		45	Such transformation requires that we rethink the neoclassical growth paradigm and with it rethink the enabling role of trade in facilitating mitigation and adaptation options (NOTE: trade and trade policy - a critical global enabling driver was nearly completed omitted from this report draft) [Aziz ELBEHRI, Italy]	Rejected: no room for more text
55524	44	44	44	44	This reference illustrates the multiple facets of the transformation of the energy system, at global, national and local levels. It could be added here: Giannakidis G., K. Karlsson, M. Labriet, B. Ó Gallachóir (eds.), 2018. Limiting Global Warming to Well Below 2°C: Energy System Modelling and Policy Development. Springer, Lecture Notes in Energy, in press. [Maryse Labriet, Spain]	the refs seemed to more appropriate for chapter 4
2900	44	46	44	46	zero carbon as well as carbon [Christophe Deissenberg, Luxembourg]	Accepted: word changed
63152	44	46	44	47	Rewrite: "....leap-frogging development to new and emerging low-, zero- and negative-CO2-emissions technologies,...." [Greg Rau, United States of America]	Accepted: word changed
55526	44	5	44	5	The following reference describes the the connection between transformative climate action and sustainable development, and could be inserted here. It is in Spanish, not sure if accepted: González García A., M. Labriet, JC. Romero Mora, A. Conchado Rodríguez, P. Linares Llamas. 2016. Las agendas de Cambio Climático y de Desarrollo Humano Sostenible en las cumbres de París y Nueva York: Una historia de dos ciudades. ICADE journal, 97:21-56 [Maryse Labriet, Spain]	noted - seems like a comparative case study and not a full assessment
2902	44	52	44	52	intergenerational equity, and [Christophe Deissenberg, Luxembourg]	Accepted: word changed
63154	44	53	44	53	No mention of remediation? [Greg Rau, United States of America]	it is mentioned elsewhere in the chapter
2904	45	1	45	1	sector specific contexts, and [Christophe Deissenberg, Luxembourg]	Accepted: word changed

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37362	45	1	45	6	In my view, these formulations overstate the role of values and norms (which are of course also important, but alone cannot explain the phenomenon) and under-appreciates the role of manufactured capital respectively "in-use stocks" of materials respectively infrastructures, production capacities, transport networks and settlement patterns, etc.. See e.g. Chen & Graedel 2015, PNAS, vol 112, Weisz et al., 2015, PNAS, vol. 112, Haberl et al., 2017, sustainability 9, 1049, Pauliuk & Müller, 2014, Global Env Change, vol 24, p132ff, and many other papers. [Helmut Haberl, Austria]	noted - we added some detail to these issues but others are outside the scope of the report
2906	45	1	45	12	THE SENTENCE IS OBSCURE. IN PARTICULAR, WHAT CAN HELP OR HINDER ACTION? [Christophe Deissenberg, Luxembourg]	Accepted: word changed
2908	45	13	45	23	Potential precursor or early warning conditions [Christophe Deissenberg, Luxembourg]	Accepted: word changed
34236	45	17	45	2	Sentence says "incremental transformation." Preceding sentence talks about incremental change setting in motion transformations; incremental changes may indeed add up to transformation, but incremental transformation is an oxymoron. Could be amended to be "incremental change" [Joe Thwaites, United States of America]	Agreed: this is added .
2910	45	2	45	22	When focused on infrastructure hardening and short–term risk reduction, disaster and engineering resilience efforts may limit future incremental and transformation change because of infrastructure dependency (Rosenzweig et al., 2018; Solecki et al., 2017). [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
38862	45	25	46	1	I find this section very general with rather well known and obvious reflections and I hope it can be made more concrete or shortended. [Jan Fuglestvedt, Norway]	Noted: this is a framing chapter. Subsection was shortened
2912	45	28	45	28	major challenge for constraining global temperature [Christophe Deissenberg, Luxembourg]	Noted
4850	45	28	45	31	This listing seems to be missing the issue of inertia created by investments that are not yet depreciated--so invested capital, not to mention the issue of active and misleading opposition by entrenched interests (not to mention ideological reactions); at the very least, these issues are hidden in some rather general language. I would hope that actual causes of the difficulty would be more clearly stated. [Michael MacCracken, United States of America]	Rejected: unfortunately we are over page limit and cannot add text, but this is discussed in later chapters
29632	45	28	45	28	Please insert after "to 1.5°C": While policy instruments need to be much more stringent than they have been to date in order to reach an 1.5°C-compatible path, political opposition against such instruments is difficult to overcome (Michaelowa et al. 2018)." Reference: Michaelowa, Axel; Allen, Myles; Fu Sha (2018): Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, in: Climate Policy, 18, p. 275-286 [Mareike Blum, Germany]	Rejected: no room for more text
37438	45	28	45	28	Insert after "to 1.5°C": Accordingly, new and increasingly stringent policy instruments need to be introduced in order to stay within reach of the 1.5°C target (Michaelowa et al. 2018)." Reference: Michaelowa, Axel; Allen, Myles; Fu Sha (2018): Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, in: Climate Policy, 18, p. 275-286 [Matthias Honegger, Germany]	Rejected: no room for more text
12790	45	3	45	3	add "Shaw & Corner, 2017" to references in brackets - full reference = "Shaw, C and Corner, A. (2017) 'Using Narrative Workshops to socialise the climate debate: lessons from two case studies - centre-right audiences and the Scottish public.' Energy Research and Social Science. Vol 31. p.273 - 283 https://doi.org/10.1016/j.erss.2017.06.029 [Jamie Clarke, United Kingdom (of Great Britain and Northern Ireland)]	Noted
49676	45	3	45	31	Include behind "and practices": "and political economy" or "and political interests" and substitute the "and" before "practices" with a comma. Attitudes or values are not covering interest-based aspects in the list of barriers appropriately. (References: Geels, Frank W, Tyfield, David, Urry, John (2014): Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective. Theory, Culture & Society Vol 31, Issue 5, pp. 21 - 40; Jenkins, J.D. (2014), Political economy constraints on carbon pricing policies: What are the implications for economic ef?ciency, environmental ef?cacy, and climate policy design? Energy Policy, Vol 69, pp. 467-477; Michaelowa, Axel; Allen, Myles; Fu Sha (2018): Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, in: Climate Policy, 18, p. 275-286 [Sabine Reinecke, Germany]	Rejected: no room for more text
49678	45	3	45	31	To reflect political realities more prominently insert after "(Mimura et al., 2014)": "While policy instruments need to be much more stringent than they have been to date in order to reach an 1.5°C-compatible path, political opposition against such instruments is difficult to overcome (Michaelowa et al. 2018)." Reference: Michaelowa, Axel; Allen, Myles; Fu Sha (2018): Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, in: Climate Policy, 18, p. 275-286. [Sabine Reinecke, Germany]	Rejected: no room for more text
2914	45	32	45	36	The tremendous regional diversity between highly carbon–invested economies and emerging economies are important considerations for sustainable development and equity in achieving 1.5°C warming. Key sectors such, as urban systems, food security and water supply, are critical. Key to implementing response options is the incorporation of strong linkages across sectors, the devolution of power and resources to sub– national and local governments with the support of national government, and the facilitation of partnerships 5 among public, civic, private sectors and higher education institutions (Leal Filho et al., 2018). [Christophe Deissenberg, Luxembourg]	Editorial
13054	45	32	45	32	Delete the text ", including highly carbon–invested and emerging economies,". [Eleni Kaditi, Austria]	Noted
51606	45	34	45	44	This sentence is very awkward. Break it into several sentences. [Jason Donev, Canada]	Noted: text removed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2916	45	38	45	39	The implementation challenges of 1.5ºC pathways are greater than those of well below 2ºC pathways, particularly concerning the scale and speed of the transition and the distributional impacts on socio–economic actors. [Christophe Deissenberg, Luxembourg]	Editorial
3192	45	38	45	38	The sentence "Implementation challenges of 1.5ºC pathways are larger than for well below 2ºC..." seems a bit strange. The term "Well below 2C" has not been defined, and one may think that 1.5C is already "well below" 2C. This sentence should be rephrased. [Vassilis Daioglou, Netherlands]	Editorial
8602	45	38	45	38	suggest putting the phrase "well below 2ºC" in inverted commas to show that it is being quoted from the Paris Agreement. Otherwise it reads oddly since 1.5 itself could be factually described as being well below 2ºC [Pauline Midgley, Germany]	Editorial
9684	45	38	45	39	The statement "Implementation challenges of 1.5c pathways are larger than for well below 2c particularly concerning scale and speed of tranition and the distributional impacts on socioeconomic actors" is critical and should be highlighted in the executive summary and the SPM. [Mustafa BABIKER, Sudan]	Noted
14184	45	38	45	38	delete 'well below' and comma after '2C' [Roger Bodman, Australia]	Noted: Comma added
33042	45	38	45	39	This point is made in the following publications: Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change. And Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Rejected: unfortunately we are over page limit and cannot add text but this is discussed in later chapters
45474	45	38	45	38	Mitigation challenges are larger, adaptation less. Need to look out for seeing everything through a mitigation lens. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Rejected: no reason is given
4852	45	4	45	41	This seems to me to be so naïve and idealistic as to not really recognizing the magnitude of the international and institutional challenge and the need for very near-term action for there to be any reasonable likelihood of staying below 1.5 C. And the rest of the paragraph is not much better--there is a tremendous financial and workforce investment in the present system and so tremendous inertia and reluctance to change, and I am not at all convinced that any of the approaches mentioned here are anywhere near powerful enough to counter societal inertia. That change needs to occur has been recognized since at least the mid-1980s and the progress (except for actions under the Montreal Protocol) have been very limited. [Michael MacCracken, United States of America]	Noted: text is removed
33044	45	4	45	41	Another criticla barrier is access to climate finance. [Tara Shine, Ireland]	Noted: this is a key issue that is referred above and is discussed in later chapters
2918	45	41	45	42	(Uittenbroek et al., 2013). However, conflicts may arise when implementing mitigation or adaptation policies, when there is e.g. [Christophe Deissenberg, Luxembourg]	Noted: text removed
2920	45	43	45	45	I DO NOT UNDERSTAND THE SENTENCE [Christophe Deissenberg, Luxembourg]	Noted: text removed
14186	45	43	45	43	sort out '-,' [Roger Bodman, Australia]	Noted: text removed
56696	45	43	45	43	Comma appears after dash and should not be there. [Cheryl Anderson, New Zealand]	Noted: text removed
21496	45	45	45	45	or different options of adaptation for example [Nathalie HILMI, France]	Noted.
2922	45	47	46	2	I SUGGEST DELETING THESE SENTENCES AS THEY MOSTLY REPEAT PREVIOUS TEXT [Christophe Deissenberg, Luxembourg]	Noted
40714	45	47	45	47	different scales, different capacities' should read 'different scales and different capacities'. [Jonny Williams, New Zealand]	Editorial
54136	45	47	45	49	Uncertainties in climate change at different scales, different capacities to respond coupled with the complexities of social–ecological systems point to a need for diverse implementation options within and among different regions involving different actors. Specific research on capacity building needs as identified in the NDCs exist and should be used: http://www.climatelawgovernance.org/wp-content/uploads/2017/09/CLGI-Research-Announcement-Countries-stress-the-importance-of-legal-and-institutional-reforms-and-capacity-building.pdf [Ayman Bel Hassan Cherkaoui, Morocco]	Noted: no room for more text
13056	45	49	45	51	Delete the text "The tremendous regional diversity between highly carbon–invested economies and emerging economies are important considerations for sustainable development and equity in achieving 1.5°C warming.". [Eleni Kaditi, Austria]	Rejected: no reason is given
33046	45	49	45	51	a publication to support this point is Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Noted
57534	45	51	45	51	revise punctuation [Hans Poertner, Germany]	Editorial
17970	45	52	45	52	food security should be replaced by "food system", since "food security" is not a sector [Andrea TILCHE, Belgium]	Accepted: word changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
12792	46	2	46	3	add after the sentence ending "options." - "There remains a need to develop a robust and inclusive framework for sharing knowledge and best practice amongst the public, researchers, intermediaries and policy actors (Shaw et al, 2018)" - full reference = Shaw, C, Hurth, V, Capstick, S and Cox, E. (2018). 'Intermediaries' perspectives on the public's role in the energy transitions needed to deliver UK climate change policy goals.' Energy Policy. Vol. 116. p.267-276 https://doi.org/10.1016/j.enpol.2018.02.002 [Jamie Clarke, United Kingdom (of Great Britain and Northern Ireland)]	Noted: text is removed
2924	46	4	46	19	The implementation process of climate policy is not well understood let alone mastered when it comes to integrating it with other territorial, urban and sectoral policies like disaster risk reduction measures, and to using public participation mechanisms (Forino et al., 2017). [Christophe Deissenberg, Luxembourg]	Paragraph has been shortened and significantly edited
17972	46	4	46	1	The whole para looks out of place and superflous and can be taken out [Andrea TILCHE, Belgium]	Noted: text is removed
33048	46	4	46	6	Procedural rights are critical. Consider referencing the litaerature on the Aarhus Convention or the Regional Agreement on Access to Information, Public Participation and Access to Justice in Environmental Matters in Latin America and the Caribbean. Emphasise also the need for women's particiation - see for example Mary Robinson Foundation – Climate Justice (2015c) Women's participation: An enabler of Climate Justice. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-_Womens-Participation-An-Enabler-of-Climate-Justice_2015.pdf . Also on procedural rights Procedural Rights as a Crucial Tool to Combat Climate Change Georgia Journal of International and Comparative Law, Vol. 38, No. 3, Spring 2010 Svitlana Kravchenko Advancing Climate Justice and the Right to Health Through Procedural Rights Margaux J. Hall Health and Human Rights 2014, 16/1 [Tara Shine, Ireland]	Noted: text is removed. Discussion is done in later chapters
35478	46	4	46	5	It is not clear why public participation is mentioned as useful / necessary only for urban climate adaptation. It should be a necessary prerequisite to any successful climate action, be it adaptation or mitigation, and be it urban or rural. [Ashok Sreenivas, India]	Noted: text is removed
56698	46	4	46	1	Paragraph is not clear. There are a number of studies that demonstrate that participation and transparency in process is beneficial for developing plans and strategies. The second sentence runs on. There should be commas. It also contradicts the first sentence. It leaves the reader unsure about the use of participatory processes. This seems to be a very subjective statement, and in regard to substance, it does not make clear the scientific finding. [Cheryl Anderson, New Zealand]	Paragraph has been shortened and significantly edited
39530	46	11	46	11	Consider to eliminate the (colored) line above the title of this box, and replace it by a simple blank line. [Hernan Edgardo Sala, Argentina]	Noted
44012	46	11	49	2	The framing of feasibility is weak, because the dynamic aspects are ignored for technology and economic feasibility, as well as the concept of cobenefits that is also very relevant for economic feasibility, but also for cultural, social and institutional dimensions. [Carl-Friedrich Schleussner, Germany]	agreed the box was heavily edited, sharpened and streamlined to framing concepts
15	46	12	49	2	I would suggest to include discourse of Patterson et al. (2018): Political feasibility of 1.5°C societal transformations: the role of social justice. Current Opinion in Environmental Sustainability 31, 1-9. Especially try to link discussion of social justices and feasilibity within your box [Thaler Thomas, Austria]	Reference was reviewed and included
17974	46	12			Cross chapter box 1.3 The key ideas covered within this box are also referred to within Section 1.2.6. Therefore either we transfer the content to section 1.2.6 or merge section 1.2.6 within this box. [Andrea TILCHE, Belgium]	Noted
38864	46	12	46	26	This box starts out very well and promising. But the rest of the box is somehwat unclear and would benefit from some sharpening [Jan Fuglestvedt, Norway]	agreed the box was heavily edited, sharpened and streamlined to framing concepts
45478	46	12	46	12	Good box - limited references to it in the text. Could make better use. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	Noted
56214	46	12	46	12	Change "condition" to "conditions". [Annika Herbert, Australia]	Noted
39532	46	15	46	15	There is a comma missing between "Joeri Rogelj" and "William Solecki". [Hernan Edgardo Sala, Argentina]	Noted
4854	46	18	46	19	Change "is it" to "it is" on line 18 and "it" to "warming" on line 19. [Michael MacCracken, United States of America]	Noted. Adjusted
2926	46	21	46	23	a more tangible, policy–relevant understanding; what are the enabling conditions for making the transition to a 1.5°C warmer world using both climate mitigation and climate adaptation while being compatible with sustainable development objectives. [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
53766	46	23	46	23	be compatible or "compatibility" [Patrik Winiger, Netherlands]	Noted
56216	46	23	46	23	Change "compatible" to "compatibility". [Annika Herbert, Australia]	Noted
40716	46	25	46	25	overshoot or overshoot' does not make grammatical sense. [Jonny Williams, New Zealand]	Noted
2928	46	3	46	32	For a given objective – in this case a 1.5°C warmer world –'feasibility' is framed, building on back castingtechniques, in terms of the enabling conditions and policy implications of different pathways (Robinson, 1982). [Christophe Deissenberg, Luxembourg]	Accepted: word changed
2930	46	3	46	32	THE SENTENCE IS OBSCURE. POSSIBLY MORE THOUROUGH EXPLANATIONS WOULD BE USEFUL [Christophe Deissenberg, Luxembourg]	Accepted: word changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
63158	46	3	46	31	You mean: "....in this case the requirements of limiting warming to 1.5°C – and aims to reveal the enabling conditions...." [Greg Rau, United States of America]	Noted
57536	46	31	46	31	requirements of a 1.5°C warmer world sounds misleading; it is required to "limit" warming to 1.5°C; suggest rephrasing [Hans Poertner, Germany]	Accepted: word changed
38866	46	32	46	32	backcasting is not know for all readers. An explaiantion or rewording would be good. [Jan Fuglestvedt, Norway]	Noted: text is removed
57950	46	32	46	32	The term "back casting" is used in the literature as a single (combined) word as "backcasting" that may be updated in the phrase "building on back casting techniques (Robinson, 1982)." [Siir KILKIS, Turkey]	Noted: word removed
40420	46	34	46	44	Indigenous and local knowledge is relevant when talking about feasibility and enabling environments. It should be considered here. (See Ford et al (2016) "Including indigenous knowledge and experience in IPCC assessment reports", Nature Climate Change volume 6, pages 349–353; and references there in.) [Pedro Alfredo Borges Landaez, Venezuela]	Noted: no room for more text due to space limit
51608	46	34	46	37	This paragraph grossly mis-represents Heard et al 2017. Re-read the paper, this is not what he's claming. [Jason Donev, Canada]	agree - reference was deleted
698	46	35	46	35	the feasibility of specific technological solution 'of' 'a' 'specific' [Robert Shapiro, United States of America]	Noted: text removed
56218	46	35	46	35	Change "solution" to "solutions". [Annika Herbert, Australia]	Noted. Adjusted
13058	46	36	46	36	Delete the text "100% renewables electricity production (Heard et al., 2017) or". [Eleni Kaditi, Austria]	agree - reference was deleted
2932	46	37	46	37	analyses of least–cost pathways (IPCC, 2014a; Iyer et al., 2015; Loftus et al., 2015). However, not [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
2934	46	46	47	3	To illustrate the diverse elements of the pathways to a 1.5°C warmer world, we decompose the feasibility concept into three dimensions associated to different types of enabling conditions: 1) The geophysical and environmental–ecological dimension, that addresses the capacities of physical systems to meet the requirements of achieving the 1.5°C objective and adapting to its impacts; 2) The technological and economic dimension, that investigates the engineering, economic, and financial implications; and 3) The cultural, social and institutional dimension, that captures 1 the evolutions in the social and 2 the institutional context required for the needed deep socio–technical changes and to facilitate adaptation. [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
700	46	47	46	47	associated to' should be 'associated with' [Robert Shapiro, United States of America]	Noted. Adjusted
38868	46	5	46	5	I don't understand why you include adpatation here [Jan Fuglestvedt, Norway]	after much discussion it was recognized that adaptation is part of the feasibility framing of 1.5 degree and it was included in the feasibility discussion
33050	47	1	47	3	add a 4th point on ethical and rights dimensions. [Tara Shine, Ireland]	Noted: this is a key issue that is referred above and is discussed in later chapters
54480	47	1	48	27	This is a useful box for showing what the some of the existing assumptions and relations that exist between various disciplines and approaches to linking climate policy to SDGs. However, it ultimately seems to reify them, rather than showing the limitations of, say, divorcing technology and economics from culture. Perhaps a second table could illustrate how the IPCC intends to overcome this with truly social-environmental framework. which starts SDG imperatives and the values, indicators, and feasibilities they implicate in relation to l.5 degree imperatives. This would better expose the clear feasability gaps of reaching 1.5 under BAU or modest reform efforts. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	good point: text was edited to reflect this point
2936	47	7	47	12	Systemic effects. Each feasibility dimension and its associated enabling conditions embed system level functions that could include linear and non–linear connections and feedbacks. It is through these systems level mechanisms that feasibility can be more fully captured. For example, a more rapid deployment of technology and larger installations (e.g., new large-scale energy, renewable or low carbon mega–projects) can be associated with large initial costs or heightened societal concerns and hence, with a potential reduction [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
37364	47	7	47	17	In this discussion I completely miss the lock-in and legacies related to existing infrastructures (transport systems, settlement patterns, existing houses, existing production facilities, etc.). See e.g. Chen & Graedel 2015, PNAS, vol 112, Weisz et al., 2015, PNAS, vol. 112, Haberl et al., 2017, sustainability 9, 1049, Pauliuk & Müller, 2014, Global Env Change, vol 24, p132ff, and many other literatures [Helmut Haberl, Austria]	Agreed: this is added .
9686	47	1	47	12	Feasibility discussion of Box1.3: "The statement that the requirements of 1.5c of more rapid deployment of technology and larger installations makes 1.5 less feasible from economic social perspectives" needs qualification as compared to what. [Mustafa BABIKER, Sudan]	noted: this text was edited
63156	47	1	47	14	On the other hand, wouldn't rapid deployment (e.g, of mitigation) be extremely beneficial in averting a 1.5degC overshoot??? Tradeoffs? [Greg Rau, United States of America]	good point: text was added to reflect this
2938	47	14	47	14	positive or negative feedbacks [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
51610	47	15	47	15	I do not believe that it is appropriate to cite Jacobson et al's 2015 paper. The paper has grave problems in its modeling and I am concerned about its scientific validity. He fails to properly account for difficulties with indeterminacy, which is a serious problem with a grid that depends as much on wind and solar as he claims. [Jason Donev, Canada]	Reference was reviewed and adjustments were made
2940	47	16	47	16	development goals, requires deep consideration. [Christophe Deissenberg, Luxembourg]	Noted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
34238	47	19	47	3	The example of energy infrastructure path dependency is a good example of dynamic effects. Another potential example of dynamic effects would be investment in mitigation technologies such as renewable energy driving down costs, which increases feasibility of certain emissions reduction pathways. [Joe Thwaites, United States of America]	good point: text was added to reflect this
2942	47	2	47	24	spatial contexts. It is important to distinguish between feasibility in the near–term (defined as the next several years up to two decades) and in the long–term (defined as the next several decades). For instance, actions taken to promote a short–term trajectory of emissions reduction consistent with low carbon transitions such as the replacement of coal with natural gas could negatively [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
13060	47	22	47	26	Delete the text "For instance, actions taken to promote a near–term trajectory of emissions reduction consistent with low carbon transitions such as actively pursuing replacement of coal with natural gas could negatively impact the opportunity for longer–term feasibility because of energy infrastructure path dependency (Section 1.2.6).". [Eleni Kaditi, Austria]	good point: text was edited to reflect this point
2944	47	27	47	3	WHAT DO YOU MEAN EXACTLY? WHY CAN IT BE UNFEASIBLE TO REACH A PARTICULAR INTERPRETATION? WHY IS THE LEXICOGRAPHIC IMPORTANCE OF FEASIBILITY DIMENSIONS (THE FIRST DIMENSION THAT BECOMES UNFEASIBLE MAKES HE OTHERS IRRELEVANT) OF RELEVANCE FOR THE COMPARATIVE IMPORTANCE OF DIFFERENT METRICS, OR EVEN OF DIFFERENT INDICATORS OF FEASIBILITY?. [Christophe Deissenberg, Luxembourg]	Noted
9688	47	32	47	4	The feasibility or infeasibility of 1.5c is a global dimension, so regional and spatial dimensions must be aggregated to inform on the global feasiblity. That is to say the regional aspects of the feasibility does not prevent answering the question at the global level. Treating the question in terms of enablers would anwering a different question. [Mustafa BABIKER, Sudan]	good point: text was edited to reflect this point
30802	47	32	47	38	Note that a same sentence is repeated in this paragraph in lines 32-33 and 37-38 [Érika Mata, Sweden]	Noted. Adjusted
56220	47	32	47	32	Change "also is" to "is also". [Annika Herbert, Australia]	Noted
57952	47	33	47	33	The order of words in "might be not feasible in others" may be updated as "might not be feasible in others." [Siir KILKIS, Turkey]	Noted. Adjusted
2946	47	34	47	36	feasibility will be dependent on regional environmental resource limits, social organization, cultural beliefs and worldviews, urbanization, and financial and institutional capacities. Regional feasibility does not necessarily imply feasibility at the global scale, and vice versa. [Christophe Deissenberg, Luxembourg]	Noted. Adjusted
2948	47	44	47	47	The assessment of the feasibility of limiting warming to 1.5°C is not a matter of “yes” or “no”. Rather, it is a frame to organize the different types of enabling conditions for changes compatible with a 1.5°C warmer world, given the three challenges (i.e., the systemic, dynamic, and spatial effects) presented above. [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
2950	47	48	48	5	to 1.5°C, and to adapt to its impacts. They help clarify the associated opportunities and challenges in each community of interest, including national and sub–national policy stakeholders, practitioners, and private sector decision–makers. Clearly, the way feasibility will be addressed and presented to the potential stakeholders will influence their engagement and their conception of what are the relevant operational indicators. Data quality and scenario and pathway projections are other important elements associated with the feasibility concept. For example, statements on uncertainty, likelihood and risk will influence the definition of feasibility criteria with their multiple interactions, and the way they are interpreted by the users. [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
8604	47	48	47	48	to limiting should be " to limit" [Pauline Midgley, Germany]	Accepted: word changed
54456	48	1	48	26	Consider inclusion of the following concepts: - Human Resources development - Education and training - Engagement of academic and R&D institutons - Industry - academia collaboration for specific issues - Design thinking and incorporation of sustainable development concepts in nfrastructure design - Intellectual property protection and management - Promote creation of knowledge based economies in countries and cities for rapid economic gains. [RABIZ FODA, Canada]	thanks. Considered and some elements blended in
2952	48	6	48	11	Each dimension builds on different disciplines – physical sciences, engineering/economics perspectives, social sciences, and humanities (i.e. ethics) – each having its specific approaches to the question with distinctive premises and requirements as starting point for the feasibility discussion. Combining multiple methods and approaches to ‘feasibility’, including quantitative modeling and qualitative storylines, is key to building robust and integrated visions of climate transition pathways useful for stakeholders and practitioners (Flynn et [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
33052	48	6	48	12	Add a reference to human rights as a criticial discipline. Social / cultural issues must include human rights and gender equality. In the box make sure gender equality is added. [Tara Shine, Ireland]	Noted
38870	48	6	48	6	I dont agree that "each dimension builds on a different disicpline". This sounds too narrow to me, and I think more than one dicipline contribute to the understanding of a single dimension. [Jan Fuglestvedt, Norway]	good point: text was edited to reflect this point
8534	48	7	48	7	parenthesis not closed; presumably it should be immediately after the word "ethics"? [Pauline Midgley, Germany]	Agreed. Changes made
34240	48	7	48	7	Missing closing ellipsis after the word "ethics" [Joe Thwaites, United States of America]	Agreed. Changes made

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40718	48	7	48	7	The opening bracket on this line does not have a corresponding closing bracket. [Jonny Williams, New Zealand]	Agreed. Changes made
44808	48	7	48	9	Missing right parenthesis. Due to this missing meaning of this sentence become ambiguous. [Hiroaki Kondo, Japan]	Agreed. Changes made
2954	48	14	48	2	Organizing the discussion of feasibility along the three dimensions presented earlier should help define and bridge the gaps between the different communities. Defining quantitative and/or qualitative indicators and metrics of feasibility that are as transferable within and across communities is key to enable a fruitful dialogue. See Cross–Chapter Box 1.3 Table 1.1 below). Each indicator and metric in the Table is based on data that are already being collected or could easily be collected in the future. These data are only a sample of the variables that could be considered. [Christophe Deissenberg, Luxembourg]	Agreed
51232	48	18	48	19	In "Each indicator and metric reflect data already are being collected", "are" seems to be deleted. [Muhammad Latif, Pakistan]	Agreed. Changes made
4156	48	19	48	19	Insert "that" after "data". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Agreed.
51234	48	19	48	2	The statement , "The empirical measures provided are but a sample of variables that could be considered." needs to be clarified. [Muhammad Latif, Pakistan]	Agreed. Changes made
57954	48	19	48	19	The word "are" may be deleted in the phrase "reflect data already are being collected" to read "reflect data already being collected." [Siir KILKIS, Turkey]	Accepted: word changed
2956	48	22	48	22	and assessed in the report. Chapter 1 [Christophe Deissenberg, Luxembourg]	Accepted: word changed
702	48	26	48	26	current and 'brining' should be 'bringing' [Robert Shapiro, United States of America]	Accepted: word changed
2958	48	26	48	26	integrate all relevant aspects. [Christophe Deissenberg, Luxembourg]	Agreed.
10486	48	26	49	2	The clarity of the table in the Box needs to be improved. [Hong Yang, Switzerland]	table was removed
49580	48	26	48	27	With geophysical/env. impacts, legacy effects should be mentioned, e.g. along with tipping points (legacy is something different to tipping point, but for both the temporals scale is key) [Karlheinz ERB, Austria]	noted: text was edited
57538	48	26	48	27	Why is “Mal-mitigation” in italics? [Hans Poertner, Germany]	Accepted: word changed
3194	48	27	48	27	In the table, under "Technological and economic" -> "Technological", third bullet point, the word "bringing" has been misspelt. [Vassilis Daioglou, Netherlands]	Accepted: word changed
40720	48	27	48	27	In the 'Technological' box the word 'brining' is presumably a misspelling of bringing. [Jonny Williams, New Zealand]	Accepted: word changed
46382	48	27	48	27	Cross–Chapter 1.3, Table 1: Dimensions of feasibility, Technological and Economic (Dimensions), Technological (Characteristics), the Indicators and Metrics "Current and brining immature technologies ….." has confusion. Brining may be bringing. [Ijaz Ahmad, Pakistan]	Accepted: word changed
54772	49				As above, meeting the climate change is not just about mitigation, adaptaiton and sustainable development. It's much more exomplex than that. It's about comprehensive risk management, about employing a range of approaches across sectors and ensuring they are integrated with or congruent with sustainable development. [Erin Roberts, United Kingdom (of Great Britain and Northern Ireland)]	Noted: most of this text is eliminated, and there is not room to expand.
51612	49	1	49	2	Table titles normally go at the top, and do go at the top in later chapters. [Jason Donev, Canada]	Agreed. Changes made
53768	49	2	49	2	Isn't the table caption usually above the table? [Patrik Winiger, Netherlands]	Agreed. Changes made
30808	49	5	49	5	It seems clear that this section is written by a different group of authors, as presents frameworks (SDGs, Sendai) and abbreviations (SDG, CDR, SRM) for the first time, as if they had not been presented before (though they all have been already presented). Coordination is needed. Also, I wonder why are SDGs presented in a box and not Sendai agenda or the Paris Agreement in itself, as both latter documents have an equally important role in this SR. Furthermore, the SDGs are (as are cleary defined in icons and small texts), from my perspective, much easier to understand than the two others, so maybe the authors could consider to put some additional effort in making the other documents as easily understandable as the SDGs. [Érika Mata, Sweden]	Noted. Introductory material moved. Due to space limitation, we do not introduce Sendai here again.
38872	49	5	5	13	I suggest that the authors consider possibitiles for shorterning this section and try to focus more on less general issues. [Jan Fuglestvedt, Norway]	Agreed: we reduce examples and refer to subsequent chapters.
2960	49	7	49	8	Development is multidimensional, and its sustainability entails the coevolution of several objectives pertaining among others to the social, economic and environmental sphere (Climate Change 2014: Synthesis Report. [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
57542	49	8	49	1	Revise citation of synthesis report [Hans Poertner, Germany]	Agreed. Changes made
39534	49	9	49	9	Consider to replace the expresion: "Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" by a shorter one; specially considerating that it appears three times in the same page. Some alternative shorter expressions could be: Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC Contribution of Working Groups I, II and III to the IPCC AR5 Contribution of IPCC AR5 WG I, II and III [Hernan Edgardo Sala, Argentina]	Agreed. Changes made

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2962	49	1	49	13	Panel on Climate Change, 2014; Fleurbaey et al., 2014a). As noted in Denton et al. (2014), climate change constitutes 'a moderate threat to current sustainable development and a severe threat to future sustainable development' (high confidence), and 'ill–designed responses' could 'offset already achieved gains'. The international community has endorsed a universal agenda [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
13062	49	12	49	13	Delete the text "and that 'ill–designed responses' could 'offset already achieved gains'". [Eleni Kaditi, Austria]	Agreed. This text is deleted.
57956	49	14	49	15	The acronym "SDGs" has already been introduced in the chapter so that the phrase "widely known as the Sustainable Development Goals (SDGs)" may be revised. [Siir KILKIS, Turkey]	Agreed. Changes made
4158	49	15	49	15	Insert a comma after "(SDGs". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Agreed. Changes made
33054	49	18	49	2	useful refences to support this point: Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change. Mary Robinson Foundation – Climate Justice (2015a) Right for Action: Putting People at the Centre of Action on Climate Change. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-Rights-for-Action-edition-2.pdf Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	First reference cited in Ch1. Second reference cited in Ch5.
2964	49	21	49	22	the risks posed by a changing climate are constant in time up to and beyond 2030. [Christophe Deissenberg, Luxembourg]	Agreed. Changes made
57544	49	23	49	25	Revise citation of synthesis report and check status of Dasgupta et al [Hans Poertner, Germany]	Agreed. Changes made
39536	49	24	49	24	Same comment as above. [Hernan Edgardo Sala, Argentina]	Agreed. Changes made
8952	49	25	49	25	Year is missing at Dasgupta et al reference [Heike Huebener, Germany]	Agreed. Changes made
13064	49	25	49	26	Delete the text "by managing risks within a 1.5?C warmer world through mitigation and adaptation responses.". [Eleni Kaditi, Austria]	Agreed. Whole sentence is deleted from rewritten version.
57958	49	25	49	25	The reference "Dasgupta et al." is missing the year of publication. [Siir KILKIS, Turkey]	Agreed. Changes made
2966	49	28	49	33	There is a wide scope for diversity and flexibility in the implementation choices for adaptation and mitigation, and a wide range of potential trade–offs and synergies between these choices (Chapter 5). For example, in the health sector, trade–offs occur when adaptation to heat stress includes increased air conditioning, which leads to higher energy use and thus to higher emissions. On the other side, there are synergies when measures that increase conservation through greater energy efficiency and behavioural change both make human settlements more resilient to drought and heat waves and reduce the emissions [Christophe Deissenberg, Luxembourg]	Comment not clear.
7364	49	28	49	4	I think that at the end of the paragraph some comments on the negative sinergies between air pollution and climate change should be included. For instance: "Air quality and climate change are intertwined and should therefore be tackled together using policies and measures that must be developed using an integrated approach. Some negative feedbacks of climate on air quality have been evidenced in European countries. Recent examples are the negative impacts that the subsidisation of diesel cars (with lower carbon dioxide (CO2) but higher PM and NOx emissions) and the increased use of biomass combustion without adequate emission controls have on air quality (EEA Report, Nº 13/2017, "Air quality in Europe - 2017 report". European Environment Agency, 74 pp., doi: 10.2800/358908). [Pedro Salvador, Spain]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
10488	49	28	49	29	… and a potential for trade-offs and synergies between these choices (Chapter 5)'. Shouldn't it be in Chapter 4? Section 1.1.3 describes the Report Structure. Chapter 4 is stated as 'considers the costs and benefits of 1.5 warming, synergies, trade-offs and ….', and 'Chapter 5 covers linkages between achieving the SDGs and 1.5C. Section 1.7 Storyline of the report basically repeats Section 1.1.3 (suggesting one of the sections should be removed), but with significant different descriptions on Chapter 4 and Chapter 5 from those in Section 1.1.3. [Hong Yang, Switzerland]	Agreed: chapter 4 reference added.
17976	49	28	49	4	After the examples provided on synergies and trade-offs, you could include another one on synergies between disaster risk reduction and ecosystem-based adaptation/nature-based solutions, for example: "'EbA, Eco-DRR and related approaches aim to generate additional environmental, economic, and social benefits beyond adaptation and disaster risk reduction. They are often referred to as low-regrets or no-regrets options as they can generate benefits regardless of uncertainties in climate projections. For example, mangrove restoration can stabilize sediments and protect coastlines, and through increasing habitat for fish and other species, also enhances and sustains livelihoods and contributes to carbon storage". [Andrea TILCHE, Belgium]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
55528	49	3	49	31	The following reference assesses the links between heating/cooling (adaptation to climate change) and mitigation strategies: Labriet M., S.R. Joshi, F. Babonneau, N.R. Edwards, P.B. Holden, A. Kanudia, R. Loulou, M. Vielle. 2015. Worldwide impacts of climate change on energy for heating and cooling. Mitigation and Adaptation Strategies for Global Change, 20(7):1111-1136 10.1007/s11027-013-9522-7 [Maryse Labriet, Spain]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
49582	49	31	49	37	The text should explicitly state thet CDR or SRM also are subject to the trade-offs/synergies interactions with other dimesions, just like adaptation and mitigation. [Karlheinz ERB, Austria]	Agreed: this is added .
50700	49	32	49	32	The reviewer suggests to insert "use of renewable energies, waste heat" after "efficiency" [Francisco Javier Hurtado Albir, Germany]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
37450	49	34	49	36	This is in contradiction to the statement made in chapter 1, page 43, line 7-8, classifying CDR as part of "mitigation". Rephrase to: "In addition to reducing GHG emissions and adaptation, the response to 35 climate change could include carbon dioxide removal (CDR), whereby CO2 is actively removed and 36 stored (Rockstro?m et al., 2016)," [Matthias Honegger, Germany]	Agreed: CDR is now a special type of mitigation, instead of just a type of mitigation, and we remove this sentence because of space limitations.
48246	49	34	49	37	In addition to mitigation and adaptation, the response to climate change could include carbon dioxide removal (CDR)... This is inconsistent with the new definition in section 1.4.3 which classifies CDR as mitigation (if it IS mitigation, it cannot be IN ADDITION to mitigation). This needs to be rephrased. Also the reference given later in the sentence to Rockström (2016) is not fitting in this context, better would be the most recent major assessmet reports by Schäfer et al. (2015) and McNutt (2015a) (the latter of which is the NAS report, which oddly doesn't seem to be included in the reference lists in any of the relevant chapters). [Mark Lawrence, Germany]	Agreed. Definition of CDR as a special type of mitigation included.
50702	49	34	49	34	Before "In addition", this sentence would make the paragraph more complete "The use of locally available building materials (of vegetal or animal origin, indigenous Earth materials or recycled materials) in rural or less developed areas is a synergie combining gains in efficiency, protection face to heat stress and also reduction of emmissions because of the savings in transport and manufacturing". Reference for this aspect: J.C. Morela, A. Mesbaha, M.Oggerob, P. Walkerc. “Building houses with local materials: means to drastically reduce the environmental impact of construction”. Building and Environment. Volume 36, Issue 10, December 2001, Pages 1119-1126. [Francisco Javier Hurtado Albir, Germany]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
50704	49	34	49	34	In the same point as the previous comment, a further comment to passive climatisation: "Similarly passive climatisation offers also a synergie". The following reference could be used: T.A.J. van Hooff, B.J.E. Blocken, J.L.M. Hensen, H.J.P. Timmermans, “On the predicted effectiveness of climate adaptation measures for residential buildings”. Building and Environment, Vol. 82(2014), p. 300-316, 2014 [Francisco Javier Hurtado Albir, Germany]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
53964	49	34	49	37	Delete " the response to climate change could" and instead add "some actors propose geoengineering measures, such as CDR and SRM." [Elenita Daño, Philippines]	Sentence removed due to space limitations
63162	49	34	49	36	You have previously equated CDR with mitigation (pg 47 lines 7-8), but here they are separated out. So which is it? Please be consistent! [Greg Rau, United States of America]	Agreed: CDR is now a special type of mitigation, instead of just a type of mitigation, and we remove this sentence because of space limitations.
2968	49	35	49	4	I SUGGEST DELETING THESE SENTENCES: THEIR ARGUMENT WAS MENTIONNED PREVIOUSLY AND DISTRACTS FROM THE MAIN ARGUMENT IN THIS SECTION [Christophe Deissenberg, Luxembourg]	Text removed.
30806	49	35	49	35	The abbreviation CDR has already been presented. [Érika Mata, Sweden]	Agreed
4856	49	37	49	37	Please capitalize "Earth"--it is the planet that is being talked about, not the relfectivity of dirt. Just as the names of the other planets of the other planets are always capitalized, that should be the case for our planet. [Michael MacCracken, United States of America]	Agreed.
9690	49	38	49	4	Pathways aiming at 1.5c are associated with high co-benefits for some SDGs (health, air pollution) but increased risk of negative side-effects for a number of other SDGs such as poverty, inequality, and energy access. This a good statement to move to the executive summary and the SPM. [Mustafa BABIKER, Sudan]	Agreed: SPM includes (this is more addressed in other chapters).
33056	49	38	49	4	references to support this point: Robinson, M. & Shine, T. (submitted) Achieving a climate justice pathway to 1.5oC. Nature Climate Change. Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf [Tara Shine, Ireland]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
37452	49	38	49	4	This doesn't sound right, suggest to rephrase: "Climate change is expected to cause substantial risk of failing to achieve SDGs, limiting warming to 1.5° would be expected to significantly lower that risk. At the same time, there are concerns that the dramatic transformations required to achieve this target could also impose trade-offs on dimesions of development (e.g. land-use requirements of some mitigation and negative emissions approaches). [Matthias Honegger, Germany]	Agreed: done
63164	49	38	49	4	Stated; "While pathways aiming at 1.5?C are associated with high co–benefits for some SDGs (i.e., health and air pollution), the magnitude and fast pace of the transitions lead to increased risk for negative side– effects for a number of other SDGs, particularly risk of hunger, poverty, inequality and energy access." Give an example, and what happens if increased hunger, poverty and inequity (if any) are counterbalanced by increased health and reduced air pollution via mitigation? Shall we let achieving perfect climate and SDG solutions be the enemy of achieving adequate climate solutions??? [Greg Rau, United States of America]	Noted: modified following 37452: we cannot add more text here, but refer the reader to chapters 4 and 5.
58492	49	4	49	4	Could add: "Although not a 1.5C scenario, the IEA's Sustainabel Development Scenario suggests that climate change action can be achieved simultaneously with achieving universal energy access (SDG 7) and reducing the health impacts of air pollution (SDG 3.9) [Andrew Prag, France]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
33058	49	42	49	43	climate justcie is an approach that clarifies the links between the SDG and climate action; e.g. Development December 2016, Volume 59, Issue 3–4, pp 223–228 | The 2030 Agenda for Sustainable Development: Bringing Climate Justice to Climate Action Gabriel Ferrero y de Loma-Osorio [Tara Shine, Ireland]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
55288	49	42	49	42	Highlight this sentence [ELISA BERDALET, Spain]	Rejected: Text is not highlighted in the SR1.5.
63166	49	42	49	42	Stated: "Achieving the SDGs can also enhance the ability to adapt and mitigate the risks of climate change." What about visa versa - achieving climate goals is essential for achieving SDGs. No liveable climate, no SDGs(?) [Greg Rau, United States of America]	Agreed: phrasing changed as requested in comment 37452, which addresses this).
57546	49	44	49	46	Revise citation of synthesis report [Hans Poertner, Germany]	Agreed
39538	49	45	49	45	Same comment as above. [Hernan Edgardo Sala, Argentina]	Agreed
8954	49	49	49	5	interactions … need to be considered (not: needs) [Heike Huebener, Germany]	Agreed
2970	49	51	5	2	Urban areas exemplify how synergies between mitigation, adaptation, and SDGs can be enhanced (e.g. Rao et al., 2013). Examining the climate response and SDGs together is valuable, since urban areas must negotiate trade–offs at different scales, including 1 the rural–urban interface (Landauer et al., 2015). [Christophe Deissenberg, Luxembourg]	Agreed
63168	5	4	5	7	If you are saying that there can be no attainment of climate goals without also achieving SDGs, you are placing our planet are grave risk. This is supposed to be a report about achieving climate goals, which have great sustainable development benefits as made abundantly clear in the report (chapter_____). What is important and essential is that mitigation, adaptation and remediation MUST NOT IMPEDED PROGRESS TOWARD ACHIEVING SDGS. PERIOD! Instead the reader is told we must not attempt either goal, without achieving both, simultaneously(!), i.e., the perfect solution to climate and SD shall be the enemy of possibly acceptible solutions to limiting warming to 1.5degC. Once the planet has reached 4degC warming without achieving SDGs, imagine a global show of hands as to how rationale your "perfect solution or no solution" strategy was. Where in this report is this critical issue raised??? How about some balance? [Greg Rau, United States of America]	Noted: we reduce the text here and reference the reader to the relevant later chapters.
2972	5	5	5	8	is a central point of this report and is discussed in detail in Chapter 5. Intuitively, it seems plausible that addressing the different goals simultaneously is more likely to achieve a cost–effective and socially acceptable solution than addressing them piecemeal (Stechow et al., 2016). How, the synergies and trade–offs may be different at 2°C (Stechow et al., 2016) and at 1.5°C warming [Christophe Deissenberg, Luxembourg]	Agreed. Text changed and reduced to make more clear.
46502	5	5	5	6	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Noted. Text removed.
4858	5	7	5	7	Delete the first comma. [Michael MacCracken, United States of America]	Agreed.
58490	5	7	5	7	Another useful reference here, on synergies of climate with other SDGs, is IEA World Energy Outlook 2017 (Sustainable Development Scenario). [Andrew Prag, France]	Reject: unfortunately we are over page limits and cannot add text, but this is discussed in later chapters
7174	5	9	5	13	The AR5 talked about "climate resilient pathways" (in Denton et al. 2014). Here, we use/introduce "climate-resilient development pathways" (spelled with a hyphen), and we explain how the definition since the AR5 has evolved. Please don't confuse these two. [Petra Tschakert, Australia]	Noted: the text is clear on this distinction
2974	5	12	5	12	regions or the world (Denton et [Christophe Deissenberg, Luxembourg]	Rejected: not clear what comment is.
17978	5	13	51	11	It would be worth including an additional box on the CBD Strategic Plan of Biodiversity and its Aichi Targets: https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf [Andrea TILCHE, Belgium]	Rejected: no room for more text
17224	5	15	5	15	This entire box needs careful copy editing. [David Schoeman, Australia]	Box removed.
45714	5	15	51	1	Considering the importance of SLCF and the role of many of those as air pollutants, it is surprising that the SDGs do not include a goal on Clean Air. It seems in this context, that a statement is appropriate commenting and/or criticizing the absence of a clean air related SDG, which would co-benfit SDGs 13, and relate also to SDGs 3 and7. [Astrid Kiendler-Scharr, Germany]	Noted: no room to discuss this here, but discussed in later chapters
51614	5	15	5	15	Refer to box 1.2 more in the text when talking about Sustainable Development Goals [Jason Donev, Canada]	Box removed and new cross chapter box included.
63170	5	15	51	1	None of these goals is achievable without climate stabilization, whereas achieving SDGs does not guarantee climate stabilization. Thus, requiring that both climate and sustainability goals be achieved simultaneously (by 2030) runs the risk that neither will be. Because achieving SDGs depends at least in part on limiting warming, actions that limit warming by definition help achieve SDGs. That said, the ultimate goal sould be to identify actions to mitigate or adapt to climate change that do not impede attainment of SDGs (?!) [Greg Rau, United States of America]	Noted: discussed in later chapters
56222	5	17	5	17	Add "the", so that it reads: ", the international…" [Annika Herbert, Australia]	Text removed.
13066	5	2	5	2	Replace "2012" with "2015". [Eleni Kaditi, Austria]	Text removed.
46458	5	2	5	2	the SDGs were adopted in 2015, and not 2012, as the text says [Sven Harmeling, Germany]	Text removed.
4860	5	21	5	21	The word "announces" does not seem to fit--how about changing this to "aims" [Michael MacCracken, United States of America]	Text removed.
13068	5	25	5	25	Delete the text "'indivisible'". [Eleni Kaditi, Austria]	Rejected: no reason is given and word clarifies issues
13070	5	28	5	28	Replace "Commitments" with "Achievements related". [Eleni Kaditi, Austria]	Accepted. Commitments has been deleted here.
57960	5	3	5	3	The link "https://sustainabledevelopment.un.org/hlpf/2017/news/07/21" should be given as a formal reference rather than directly in the text. [Siir KILKIS, Turkey]	Text removed.
61740	5	3	5	3	web sites are not accepted references in IPCC reports. [Valérie Masson-Delmotte, France]	Text removed.
2696	5	32	29	33	everywhere (with monetary poverty defined as less than $1.25/day and multidimensional poverty defined locally [Christophe Deissenberg, Luxembourg]	Noted. Text removed.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4862	5	32	5	33	For clarity, it should be noted that this means a per capita income of $1.25/day (so not just that as a wage as one must account for non-workers). [Michael MacCracken, United States of America]	Text removed.
39540	5	32	51	1	I suggest to add a point (.) at the end of each of the 17 goals. [Hernan Edgardo Sala, Argentina]	Text removed.
57550	5	32	51	1	check and revise upple and lower case, should be consistent [Hans Poertner, Germany]	Text removed.
2698	5	36	5	36	and Well-Being: [Christophe Deissenberg, Luxembourg]	Text removed.
2700	5	37	5	37	Quality Education: [Christophe Deissenberg, Luxembourg]	Text removed.
3694	5	37	5	37	Change Educati0n to Education [Castor Muñoz Sobrino, Spain]	Text removed.
4160	5	37	5	37	Typo "Education". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Text removed.
7008	5	37	5	37	Replace "Quality Educati0n" with "Quality Education" [Serhat Sensoy, Turkey]	Text removed.
36384	5	37			Please, write Education, instead of Educati0n. [Emilio Cerdá, Spain]	Agreed
39346	5	37	5	37	Educati0n must be Education [Olga Alcaraz, Spain]	Text removed.
40722	5	37	5	37	There is a number 0 in the word 'educat0in' rather than a letter o. [Jonny Williams, New Zealand]	Text removed.
40802	5	37	5	37	Educati0n should be Education [NARESH KUMAR SOORA, India]	Text removed.
46384	5	37	5	37	Educati0n needs correctionto Education. [Ijaz Ahmad, Pakistan]	Text removed.
51236	5	37	5	37	Educati0n may be replaced with "Education". [Muhammad Latif, Pakistan]	Text removed.
51616	5	37	5	37	Education not Educati0n [Jason Donev, Canada]	Text removed.
53770	5	37	5	37	change "Quality Educati0n" to "Quality Education" [Patrik Winiger, Netherlands]	Text removed.
56224	5	37	5	37	Change "educati0n" to "education". [Annika Herbert, Australia]	Text removed.
57548	5	37	5	37	replace 0 by o in "Education" [Hans Poertner, Germany]	Text removed.
57962	5	37	5	38	The number 0 should be substituted with the letter "o" in the phrase "Goal 4 Quality Educati0n" and capitalization should be checked in the description to comply with the formatting in the other goals. [Siir KILKIS, Turkey]	Text removed.
2702	5	42	5	42	Affordable and Clean Energy [Christophe Deissenberg, Luxembourg]	Text removed.
51618	5	42	5	43	There's probably not much that can be done about this, but 'modern energy' isn't defined. I consider nuclear energy to be modern, but I doubt that's what's meant. Is this 'non-solid fuels'? Electricity? [Jason Donev, Canada]	Text removed.
2704	5	44	5	44	Affordable and Clean Energy [Christophe Deissenberg, Luxembourg]	Text removed.
4162	5	53	5	53	I assume the SDGs cannot be changed, but Goal 13 really needs a qualifier such as "detrimental" or "damaging" before impacts. Some impacts of climate change may be beneficial, and one would not wish to see action to combat such impacts. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted: text is removed.
4864	51	15	51	15	Change to "report are global" and change "includes" to "include" [Michael MacCracken, United States of America]	Addressed, text changed accordingly
24792	51	15	51	17	In order to highlight the necessity of avoiding delays or inaction I would add the next sentence after the sentence: Despite the ispread of uncertainties in the evaluation of impacts, this should not be an excuse for delays or inaction in adaptation, given that Water Resources systems can be very vulnerable. Considering uncertainties, the adaptation must be flexible, and adopt a comprehensive approach, considering not only Climate Change but also other potential socio-economic changes (UN, 2009). UN, 2009. Guidance on Water y Adaptation to Climate Change, ECE/MP.WAT/30, United Nations, Geneva. [David Pulido-Velazquez, Spain]	This comment is misplaced, not related to lines 15 to 17 on page 51 as indicated
30816	51	15	51	15	Unless the report has been majorly updated from FOD (have only scrolled through the other chapters at this point), I would disaggree with this statement. Litle regional analysis is included in this SR. [Érika Mata, Sweden]	Regional analysis is included in all chapters but specifically in Chapter 3, section 3.3 and Boxes 3.2 and 3.3, Chapter 4, section 4.4 and Boxes 4.1 to 4.8 and Chapter 5, section 5.6
36386	51	15			I would write "The information and data for this report are global in scope and include region-scale analysis", instead of "The information and data for this report is global in scope and includes region-scale analysis" [Emilio Cerdá, Spain]	Addressed, letter "s" deleted
53772	51	18	51	2	Consider changing to: "Global level statistics including physical science and social science data are used, as well as detailed and illustrative case study material of particular conditions and contexts. " [Patrik Winiger, Netherlands]	Addressed, text changed accordingly
2976	51	19	51	21	science data are used as well as detailed and illustrative case study material of particular conditions and contexts. The main time scale of the assessment is the 21st century, subdivided into the near–term, the medium term, and long term. The spatial and temporal contexts are [Christophe Deissenberg, Luxembourg]	Addressed, text changed accordingly
8956	51	19	51	19	… data are used and as well as … delete "and" [Heike Huebener, Germany]	Addressed, text changed accordingly
13072	51	19	51	19	Delete the text "and". [Eleni Kaditi, Austria]	Addressed, text changed accordingly
56226	51	19	51	19	Remove "and", so that it reads: "…are used as well as…". [Annika Herbert, Australia]	Addressed, text changed accordingly
57552	51	19	51	19	..are used and as well as…: remove "and" [Hans Poertner, Germany]	Addressed, text changed accordingly
38874	51	2	51	21	The report needs to make it clear why the main timescale for the assessment is thr 21st century. And also what this means for treatment of responses on longer timescales; permafrost, ice sheets, sea level etc. [Jan Fuglestvedt, Norway]	Useful comment in relation to treatment of responses on longer timescale: permafrost, ice sheets, sea level rise but most of literature and including those assessed fro this report focus on 2100 as end of the century
4866	51	21	51	21	Change to "separated" [Michael MacCracken, United States of America]	Accepted
8958	51	21	51	21	separate … I think it should be "separated" [Heike Huebener, Germany]	Addressed, replace "separate" with "separated"
17226	51	21	51	21	Replace "separate" with "separated". [David Schoeman, Australia]	Addressed, replace "separate" with "separated"
53774	51	21	51	21	separate or separated ? [Patrik Winiger, Netherlands]	Addressed, replace "separate" with "separated"

Comment No	From Page	From Line	To Page	To Line	Comment	Response
57964	51	21	51	21	The word "separate" should be "separated" in the phrase "separate into the near–term, medium term, and long term" to read "separated into the near–term, medium term, and long term." [Siir KILKIS, Turkey]	Addressed, replace "separate" with "separated"
57966	51	21	51	27	The chapters may be mentioned in parenthesis for ease of reading to read "The spatial and temporal contexts are illustrated throughout the chapters including assessment tools that include dynamic projections of carbon budgets and mitigation costs (Chapter 2), methods for assessing observed impacts and projected risks at 1.5°C and higher levels of warming in natural and managed ecosystems and human systems (Chapter 3), mitigation potential assessment framework and the connection to social innovation (Chapter 4), and linkage of the shared socioeconomic pathways (SSPs) and SDGs (Chapter 5)." [Siir KILKIS, Turkey]	Addressed, text changed accordingly
2978	51	24	51	25	impacts and projected risks in natural and managed ecosystems and human systems at 1.5°C and higher warming levels [Christophe Deissenberg, Luxembourg]	Addressed, included new text "in natural and managed ecosystems and human systems"
7176	51	26	51	27	Ch5 only briefly touches upon the SSPs. Please update for the final draft. [Petra Tschakert, Australia]	Addressed
2992	51	3	52	3	A LAUNDRY LIST RATHER THAN A WELL-ARGUMENTED PRESENTATION [Christophe Deissenberg, Luxembourg]	Noted. section heavily revised
2980	51	32	51	35	Depending on the policies and investments adopted, the emission reductions required for a 1.5°C warming world and the associated adaptation present variable multidimensional costs and benefits in different regions and countries at the technological, economic and socio–cultural as well as at the natural systems levels (Admiraal et al., 2016; Rose et al., 2017). Actions and strategies for a [Christophe Deissenberg, Luxembourg]	Accepted - text revised
13074	51	35	51	37	Delete the text "Actions and strategies for a 1.5°C warming world will originate from international agreements that must be translated to national and sub–national levels.". [Eleni Kaditi, Austria]	Noted and revised
4164	51	36	51	36	Change "warming" to "warmer". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted - Text was revised
33060	51	36	51	37	These international agreements include human rights treaties. See for example CIEL (2018) States' Human Rights Obligations in the Context of Climate Change http://www.ciel.org/wp-content/uploads/2018/01/HRTBs-synthesis-report.pdf [Tara Shine, Ireland]	Noted.
38876	51	36	51	36	I suggest adding "processes and" before "agreements" [Jan Fuglestvedt, Norway]	Noted and revised
5562	51	39	52	3	the sections is primarily critical about economics and other approaches, but very little is provided about alternative approaches [Kirsten Halsnaes, Denmark]	Text comment is related to has been deleted
17980	51	39	52	5	Please explain why issues related to cost-benefit analysis are analysed (while other techniques are not), or include an assessment of other techniques, or recommend a combination of approaches (quoting others). [Andrea TILCHE, Belgium]	The text only explain that Cost-benefit analysis is one of the assessment tools that can be used for decision making but can be difficult to use in the case of climate change in the anthropocene so was not used in the report. Most of the text under the cost-benefit analysis sub-section were also deleted.
63172	51	39	51	53	Contrary to your statement, cost/benefit analysis is essential and central to rational decisionmaking. What is needed is a broader definition of "cost" and "benefit" to include social, environmental, intergenerational, etc dimensions, not just monetary. Clearly you are making such broadly defined, (often subjective) value judgements (cost/benefit analyses) throughout the entire report, so please define accordingly and acknowledge usefullness. [Greg Rau, United States of America]	Noted and revised
4166	51	4	51	4	See comment (45). Here too, a qualifier such as "detrimental" or "damaging" is needed before "impacts". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Discussion of impacts was heavily revised in the chapter and framing was sharpened
2982	51	41	51	44	However, even though some basic cost–effectiveness estimates are part of the integrated assessment models reviewed in Chapter 2 of this report, these tools can be difficult to use because of the disparate impacts versus costs and the complex interconnectivity of the global social–ecological system. [Christophe Deissenberg, Luxembourg]	Accepted - text revised
38878	51	41	51	41	in the Antropocene is not needed. I think this just disconnects from many readers. [Jan Fuglestvedt, Norway]	Rejected, the need for a review such as this one is to bring new approaches to help strengthen the global response. The Anthropocene is one of these innovative approaches that situate climate change in a broader perspective assisting with the potential for adaptation and mitigation
2984	51	42	51	42	WHAT DO YOU MEAN WITH "the disparate impacts versus costs and"? [Christophe Deissenberg, Luxembourg]	Accepted - text revised to illustrate a globally dispersed impacts
42752	51	44	51	47	Compounding tipping points can further increase the costs. Cai Y., et al. (2016) Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction, NATURE CLIMATE CHANGE 6:520–525, 520 ("[P]assing some tipping points increases the likelihood of other tipping points occurring to such an extent that it abruptly increases the social cost of carbon."). [Kristin Campbell, United States of America]	Noted.
42968	51	44	51	47	Compounding tipping points can further increase the costs of coping with climate change, especially when feedbacks increase warming to the threshold of offsetting other feedbacks. See Cai Y., et al. (2016) Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction, NATURE CLIMATE CHANGE 6:520–525, 520 ("[P]assing some tipping points increases the likelihood of other tipping points occurring to such an extent that it abruptly increases the social cost of carbon."). See also Weitzman M. (2011). Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change. Review of Environmental Economics and Policy 5(2):275-292. [Durwood Zaelke, United States of America]	Noted.

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2986	51	45	52	3	in monetary terms, but not all. Climate change impacts humans' lives and livelihoods, culture and values, and whole ecosystem. It has unpredictable feedback loops and impacts on other regions, making it difficult to quantify (IPCC, 2014c), as indirect, secondary and tertiary costs and opportunity costs are typically extremely difficult to quantify. Monetary quantification is further complicated by the fact that costs and benefits can occur in different regions at very different times, possibly spanning centuries, while it is extremely difficult if not impossible to meaningfully estimate discount rates for the future costs and benefits. Thus, standard cost–benefit analyses become difficult to justify (Dietz et al., 2016; IPCC, 2014c). The cost of catastrophic events may be unpredictable, and result not only in large impacts on the regiondirectly affected but may also extend to other areas through trade linkages and or increased susceptibility to further, even minor, impacts, (Hsiang et al., 2017; Schleussner et al., 2016a). A full accounting of recovery costs and longer–term secondary and tertiary costs is very [Christophe Deissenberg, Luxembourg]	Revised text accepted and included
4868	51	45	51	45	I'd suggest changing "human's" to "people's" [Michael MacCracken, United States of America]	Noted
51620	51	48	51	48	Define indirect, secondary and tertiary costs, the terms are used differently by people in different contexts. Differentiate what's meant by these as well as define them. [Jason Donev, Canada]	additional explanation was provided
3196	51	49	51	52	These two sentences are intimatelly related (discount rates and valuing costs over long periods of time), yet they are presented as two separate issues. These should be rephrased. [Vassilis Daioglou, Netherlands]	Accepted - text revised
38880	51	52	51	52	re cost-benefit analysis: You may add reference to other places in the report where this is discussed. [Jan Fuglestvedt, Norway]	Noted and revised
13458	52	1	52	1	comma: directly affected, but could also [Sergio Aquino, Canada]	Text including the word is deleted
38882	52	1	52	5	This is a huge issue. Please check that you use relevant references here. [Jan Fuglestvedt, Norway]	Text comment is related to has been deleted
56228	52	1	52	1	Insert slash, so that it reads "and/or". [Annika Herbert, Australia]	Text including the word is deleted
13460	52	7	52	7	affected regions. No space before comma. [Sergio Aquino, Canada]	Text including the word is deleted
14188	52	7	52	7	delete extra space after 'regions', before ',' [Roger Bodman, Australia]	Text including the word is deleted
33062	52	7	52	14	cognisant of the fact there there will be winners and losers - it is important to respect human rigts and gender equality in all climate actions to mitigate against negative impacts on people and their rights. [Tara Shine, Ireland]	Text comment is related to has been deleted
2988	52	7	52	23	Climate change tends to enhance pre–existing inequalities, between and within affected regions, increasing losses in already disadvantaged areas (Aaheim et al., 2016; Hsiang et al., 2017; Schleussner et al., 2016a). If actions are taken to limit the warming to 1.5C, the costs and benefits will among others depend on the approaches adopted to move from high to low emission. The transition pathways are likely to directly generate losses and opportunities for different sectors, e.g. fossil fuel–related industries versus low emissions– oriented ones, for specific socio–economic groups and locations, and indirectly affect many other actors due to the existing strong global interlinkages and inequalities (Admiraal et al., 2016; Hsiang et al., 2017). The significant benefits from low emissions development pathways will profit future generations but are also likely to be felt by current society as intergenerational investments and through numerous direct and indirect benefits, for example in terms of health and quality of life (Admiraal et al., 2016). Large–scale interventions in the Earth's climatic system, e.g. through solar radiation management (see Cross–Chapter Box 4.2) could imply long-term costs and obligations to sustain the efforts, some lasting well beyond the current generation. Available higher global welfare losses also are indicated for the 2°C post–2030 pathway (Rose et al., 2017). [Christophe Deissenberg, Luxembourg]	Full paragraph is deleted
51622	52	7	52	7	regions , should be regions, [Jason Donev, Canada]	Text including the word is deleted
4168	52	9	52	9	Insert "rise" after "temperature". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Word is deleted
4870	52	11	52	11	Wording a bit mixed up--what are "tansitions pathways"? [Michael MacCracken, United States of America]	Text including the word is deleted
46504	52	11	52	11	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Text including the word is deleted
56230	52	11	52	11	Change "transitions" to "transition". [Annika Herbert, Australia]	Text including the word is deleted
46506	52	16	52	16	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Text including the word is deleted
53776	52	16	52	16	I entered some commas (not my strength): "The significant benefits to future generations from low emissions development pathways are likely to be experienced by current society, in part as intergenerational investments, although there may be several direct and indirect benefits to present society, for example in terms of health and quality of life (Admiraal et al., 2016). " [Patrik Winiger, Netherlands]	Text including the word is deleted
33064	52	16	52	19	Important to emphasise the need to balance the needs of current and future generations e.g. https://www.mrfcj.org/wp-content/uploads/2017/08/Global-Guardians-A-Voice-for-Future-Generations-April-2017.pdf and https://www.mrfcj.org/wp-content/uploads/2015/09/Intergenerational-Equity-Position-Paper-2013-11-16.pdf [Tara Shine, Ireland]	Text comment is related to has been deleted
57554	52	19	52	2	use acronym SRM instead of "solar radiation management" [Hans Poertner, Germany]	Text including the word is deleted
53778	52	21	52	21	The word "some" can be removed here. All SRM would have to be sustained 'forever'. [Patrik Winiger, Netherlands]	Text comment is related to has been deleted
30818	52	22	52	22	Can one say "AVAILABLE losses"?(language) Maybe "potential" or just no adjective? [Erika Mata, Sweden]	Text including the word is deleted

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53780	52	22	52	22	If you mention "..addition to anticipated benefits" then you might as well also mention "potential unintended consequences" which can be far reaching (e.g., acid rain for sulphate applied as SAI) and disrupting in their own way. [Patrik Winiger, Netherlands]	Text comment is related to has been deleted
2990	52	25	52	3	The costs and benefits of a 1.5°C warming world should take into account all these elements and be used to assess the desirability of alternative development frameworks such as sustainable development pathways (Fuss et al., 2016; Honegger and Reiner, 2017). Key to balancing costs and benefits across scales for different systems and sectors is policy flexibilit at multiple scales to facilitate appropriate timing, innovations and technology as well as a conducive economic and socio–cultural environment (Admiraal et al., 2016). [Christophe Deissenberg, Luxembourg]	Paragraph is deleted
21498	52	25	52	3	Costs may appear in the short term and benefits in longer term [Nathalie HILMI, France]	Text comment is related to has been deleted
38884	52	25	52	3	I am afraid that this para will not be well understood. Cost and benefits compared to what? Today, pre-ind? What is baseline? I also feel that the second sentence is long and heavy, and that this has been said before. [Jan Fuglestvedt, Norway]	Text comment is related to has been deleted
37442	52	27	52	27	Please replace "pathways" with "goals" [Matthias Honegger, Germany]	addressed, word deleted
37444	52	27	52	27	I don't see how introducing the notion of anthropocene is relevant here; suggest to delete. Introducing the use of grey literature here may require a bit more explanation as to the selection (when no relevant peer-reviewed literature can be found on a key issue)? [Matthias Honegger, Germany]	Addressed
53966	52	27			delete the reference to (Honegger and Reiner. 2017), as the article referred to does not evaluate cost and benefits of a 1.5C world as the paragraph announces. It is a comparison of speculative cost of SRM techniques only. [Elenita Daño, Philippines]	Text including the Reference is deleted
2994	52	35	52	38	This report is based on a comprehensive assessment of documented evidence on the enabling conditions for maintaining the global temperature at 1.5°C and adapting to this level of warming in the Anthropocene (Delanty and Mota, 2017). Two sources of evidence are used; peer reviewed scientific literature and grey literature, with the former being the by–far the dominant source. [Christophe Deissenberg, Luxembourg]	Addressed and deleted "epoch" and add "the"
61742	52	35	53	48	I suggest to be more explicit on the tools common with those used in the AR5 in this whole section (CMIP outputs, IAM model outputs in chapters 2-3). These chapters rely on methods very similar to those in AR5 and this should be more explicit. Please add to the glossary "HAPPI" and "ISI-MIP" if this is used in various chapters. [Valérie Masson-Delmotte, France]	Noted and added reference to their use in chapter 2 section 2.6
4170	52	36	52	36	Insert "rise" after "temperature". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Addressed
17228	52	37	52	37	Lists are initiated with a colon; elements are separated by semi-colons. [David Schoeman, Australia]	Addressed
33066	52	37	52	38	The Mary Robinson Foundation - Climate Justice has several publications relevant to this chapter. They are grey literature - but reviewed by experts in the relevant field. Some of these are referenced in chapter 5 and are also relevant to chapter 1. e.g. Mary Robinson Foundation – Climate Justice (2015a) Right for Action: Putting People at the Centre of Action on Climate Change. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-Rights-for-Action-edition-2.pdf Mary Robinson Foundation – Climate Justice (2015b). Zero Carbon Zero Poverty the Climate Justice Way: Achieving an equitable phase-out of carbon emissions by 2050 while protecting human rights. Available online at https://www.mrfcj.org/pdf/2015-02-05-Zero-Carbon-Zero-Poverty-the-Climate-Justice-Way.pdf Mary Robinson Foundation – Climate Justice (2015c) Women's participation: An enabler of Climate Justice. Available online at https://www.mrfcj.org/wp-content/uploads/2015/11/MRFCJ-_Womens-Participation-An-Enabler-of-Climate-Justice_2015.pdf UN Women & the Mary Robinson Foundation – Climate Justice (2016). The Full View second edition. Ensuring a comprehensive approach to achieve the goal of gender balance in the UNFCCC process. Available online at https://www.mrfcj.org/wp-content/uploads/2016/11/MRFCJ-Full-View-Second-Edition.pdf [Tara Shine, Ireland]	Sentence only stated two sources of evidence are used in this report and once source is grey literature which are referenced in other chapters like chapter 5.
38886	52	38	52	38	I suggest you insert "so-called" before "grey literature"; and adds explanation of what this is. [Jan Fuglestvedt, Norway]	Addressed and examples given in sub-section 1.5.1 3rd paragraph
17230	52	4	52	48	It might be worth having a short definition of "knowledge". To me, knowledge is merely accumulated information that is supported by verifiable evidence. Almost everything else is belief. So there is a question around whether there is more than one "type of knowledge". And if there IS more than one type, what is stopping a climate skeptic from simply asserting the validity of their knowledge, albeit unsupported by verifiable evidence? I would argue that the items listed here are sources of information, not "knowledge". I would especially argue against future projections being classed as "knowledge", at least until the projections have been verified by observation, at which point they are no longer projections. [David Schoeman, Australia]	Addressed
38888	52	4	52	4	Re "1) State of knowledge": This sounds as you refer to assessment reports, and it is not clear that this is the literature consisting of separate studies and papers. I suggest you reformaluate this. [Jan Fuglestvedt, Norway]	Addressed

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39542	52	4	52	44	Because the word "and" it is repeated several times in the sentence: "1) State of knowledge regarding the physical climate system...". I suggest to simplify it in the following way: "1) State of knowledge regarding the physical climate system and human–induced changes, the associated impacts, vulnerabilities and adaptation options, established from work based on empirical evidence, simulations, modelling and scenarios with emphasis on new information since the publication of the IPCC AR5 to the cut–off date for this report (May 2018)" [Hernan Edgardo Sala, Argentina]	Accepted and addressed
51624	52	4	52	48	Please format this as more of a bullet point presentation for clarity with each number starting a new line. It will dramatically simplify reading the points. [Jason Donev, Canada]	Rejected since text has been improved
2996	52	41	52	43	and human–induced changes, associated impacts, vulnerabilities, and adaptation options, obtained from empirical evidence, simulations, modelling, and scenarios, with emphasis on new information from the publication [Christophe Deissenberg, Luxembourg]	Accepted and addressed
8536	52	44	52	44	what is "human" doing here? Should it be "humanities"? [Pauline Midgley, Germany]	Addressed
9554	52	44		47	Local experiences and knowledge (as referred to here) are different from Indigenous knowledge and this difference must be clear in the report. IK has undergone a long process of validation, and is therefore more akin (quality-wise) to science than local experience. Furthermore, as mentioned above, Indigenous knowledge systems MUST be recognized and applied on equal footing alongside western knowledge systems and NOT considered WITHIN another scientific knowledge form such that IK is forced to be conformed to something it is not. As such, in future assesments, Indigenous Knowledge should be included as its own point on the list of types of knowledge and evidence used in the reports. As mentioned in a previous comment, the Inuit Circumpolar Council advocates for the co-production of knowledge approach that recognizes IK (and particularly IK holders) right from the start, and works with them throughout the process rather than at the review stage. The IPCC could take their assessments as an opportunity to exemplify to scientists and researchers around the world what co-production of knowledge could look like and what it means to apply IK on equal footing. (Are any of your authors Indigenous scholars?) [Joanna Petrasek MacDonald, Canada]	Addressed
2998	52	46	52	48	the social–ecological systems, development, equity and justice, and the role of governance. Local knowledge from indigenous knowledge systems; and 3) Mitigation pathways based on climate projections. [Christophe Deissenberg, Luxembourg]	Accepted and addressed
8960	52	46	52	47	within which is body of local knowledge … I think here is a word missing? [Heike Huebener, Germany]	Addressed by restructuring the sentence
32720	52	47			Insert "the" before "body". [Christopher Campbell-Duruflé, Canada]	Text including the word is deleted
2246	52	5	52	52	Why is it important to include grey litterature? This could be motivated more since the use of grey litterature opens up for criticism that this assesment is not baed on science, and that the choice of grey sources may be subjective [Gustav Strandberg, Sweden]	Use of grey literature is done according to Procedure on the use of literature in IPCC Reports (Annex 2 to Appendix A to the Principles Governing IPCC Work, 2013)
3000	52	5	52	52	The grey literature category also includes empirical observations, interviews, technical and consultancy reports and conference papers, government reports, reports from development agencies and non–governmental organisations (NGOs), and other sources. [Christophe Deissenberg, Luxembourg]	Accepted and addressed
38890	52	5	52	5	grey literature need explanation; here or above. [Jan Fuglestvedt, Norway]	Addressed and examples given in sub-section 1.5.1 3rd paragraph
53968	52	52			Grey litterature on geongineering is scarce to say the least, and NGO documents virtually non-existent except for those written by ETC Group. None of those of critical views from the sparse grey literature on the subject is reflected in this Report at all. Please include this reference: ETC Group (2018) The Big Bad Fix; The case against climate geoengineering." http://etcgroup.org/sites/www.etcgroup.org/files/files/big_bad_fix_2017_us_v7_4web.pdf [Elenita Daño, Philippines]	Noted
3002	52	53	53	5	The assessment does not cover non–written evidence and does not use oral evidence, media reports, or newspaper publications. Except for Australia and to some extent China, published knowledge from the Global South, the most vulnerable part of the world, is rare (Czerniewicz et al., 2017). [Christophe Deissenberg, Luxembourg]	Accepted and addressed
8538	52	53	53	1	Suggest including a reference to the IPCC procedure on the use of literature (Annex 2 to Appendix A to the Principles Governing IPCC Work, 2013) [Pauline Midgley, Germany]	Addressed
29752	53	1	53	4	The sentence on scarcity of literature emerging from the Global South conveys a crucial point, and it is very welcome that this fact is proactively acknowledged. The way the sentence is currently formulated makes it however very difficult to understand. It seems to suggest, for example, that Australia is seen as part of the "Global South", which is contrary to common use of the term (the word Global implying that it is not pointing to the geographical south but rather to its political/cultural connotations). Also, the concept of geopolitics seems strange to invoke in this context. It may instead be possible to point to published bibliometric analyses to substantiate the point about a lack of publications from the Global South, and to distinguish this more clearly from the more general point about the lack of literature on 1.5 overall. Also highly relevant to cite here is Corbera et al (https://doi.org/10.1038/nclimate2782). [Bård Lahn, Norway]	Accepted and text deleted
51626	53	1	53	4	These four lines are phrased poorly, could this be re-written? [Jason Donev, Canada]	Addressed by restructuring the sentence
2378	53	2			Australia is not part of the global South. [Debra Roberts, South Africa]	Noted

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4302	53	2	53	3	global south normally refers to most developing countries, instead of southern hemisphere countries. Here Australia and China are lised as "global south" countries, which is quite confusing. Please revise according to your definition of global south. [Gensuo JIA, China]	Accepted and text deleted
33068	53	2	53	4	Articles relevant to this point are: Reconciling justice and attribution research to advance climate policy Christian Huggel, Ivo Wallimann-Helmer, Dáithí Stone & Wolfgang Cramer Nature Climate Change volume 6, pages 901–908 (2016) AND Improving poverty and inequality modelling in climate research Narasimha D. Rao, Bas J. van Ruijven, Keywan Riahi & Valentina Bosetti Nature Climate Change volume 7, pages 857–862 (2017) [Tara Shine, Ireland]	Noted
17232	53	3	53	3	Publications cannot be "far lower"… [David Schoeman, Australia]	Deleted
38892	53	3	53	4	geopolitics of documented knwoledge will be unclear to many readers. I suggest you explain in simple terms. [Jan Fuglestvedt, Norway]	Addressed
38894	53	6	53	11	i feel that this has been said many times before. Therefore I suggest deleting this. [Jan Fuglestvedt, Norway]	Rejected, important to reinforce the message
3004	53	8	53	11	establish resources for implementing responses to a 1.5°C warming world (James et al., 2017). Incorporating knowledge from different sources, settings and information channels while building awareness at various levels, will advance decision making and motivate the implementation of context specific responses to 1.5°C warming (Somanathan et al., 2014). [Christophe Deissenberg, Luxembourg]	Addressed
4172	53	8	53	8	Change "warming" to "warmer". [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted and addressed
13076	53	9	53	11	Delete the text "Incorporating knowledge from different sources, settings and information channels while building awareness at various levels will advance decision making and motivate implementation of context specific responses to 1.5°C warming and associated uncertainties (Somanathan et al., 2014).". [Eleni Kaditi, Austria]	Rejected, important to reinforce the message
45570	53	14			I think that this section should be earlier in chapter 1, probably in section 2. Explaining earlier at least in part the models used will help to understand the previous graphics. [Adela M Sánchez-Moreiras, Spain]	Noted but more relevant to this section on assessment frameworks and methodologies
3006	53	19	53	19	models are numerical models of varying complexity [Christophe Deissenberg, Luxembourg]	Word is part of deleted text
40724	53	2	53	2	It is not true that climate models are 'typically' earth system models. Due to the significantly increased run times compared to classical climate models without earth system components, their use is still limited but growing. [Jonny Williams, New Zealand]	Text comment is related to has been deleted
38896	53	21	53	21	includeing biogeochemical processes is not needed. There are so many types of process included that we cannot list these or select some. [Jan Fuglestvedt, Norway]	Text comment is related to has been deleted
36892	53	23	53	4	In our view, use of efficient Earth system models constrained by historical data also provides a useful basis for constructing climate projections. See Goodwin. P., A. Katavouta, V.M. Roussenov, G.L. Foster, E.J. Rohling and R.G. Williams, (2018) Pathways to 1.5 and 2 °C warming based on observational and geological constraints, Nature Geoscience, doi:10.1038/s41561-017-0054-8. [Richard Williams, United Kingdom (of Great Britain and Northern Ireland)]	Text comment is related to has been deleted
4872	53	24	53	24	I'd suggest changing "computed" to "conducted" [Michael MacCracken, United States of America]	Accepted and addressed
39544	53	26	53	26	SREX has not been previously defined in this chapter. I suggest to include its full named accompanied with the abbreviation: Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). [Hernan Edgardo Sala, Argentina]	Accepted and addressed
40726	53	26	53	26	The term 'SREX' is not defined anywhere in this document. [Jonny Williams, New Zealand]	Accepted and addressed
57556	53	26	53	26	provide full name for SREX + acronym at first mention [Hans Poertner, Germany]	Accepted and addressed
38898	53	27	53	27	This was not the case for WGII, I think. WGI did. [Jan Fuglestvedt, Norway]	Noted
19156	53	32	53	32	Also cite, if convenient, Tobin et al. (2018), a recent study using EURO-CORDEX simulations to assess impacts on the energy sector under 1.5ºC, 2ºC and 3ºC global warming. REF: Tobin, I., Greuell, W., Jerez, S., Ludwig, F., Vautard, R., van Vliet, M.T.H., and Bréon , F.?M. (2018). Vulnerabilities and resilience of European power generation to 1.5°C, 2°C and 3°C warming . Environmental Research Letters, in press. [Sonia Jerez, Spain]	Noted. Reference reviewed
4174	53	36	53	4	How does the HAPPI protocol account for volcanic activity in the period 2091-2100 compared with that in the period 2006-2015? [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	the related text was moved to chapter 2 and dealt with there
3760	53	4	53	4	Another set of simulation specifically for 1.5C but with coupled ocean-atmosphere model is provided in Sanderson et al., (2017) [Yangyang Xu, United States of America]	the related text was moved to chapter 2 and dealt with there
3008	53	43	53	43	systems (e.g. models [Christophe Deissenberg, Luxembourg]	Word is part of deleted text
40728	53	43	53	43	system' should read 'systems'. [Jonny Williams, New Zealand]	Word is part of deleted text
3010	53	45	53	45	of the impacts [Christophe Deissenberg, Luxembourg]	Word is part of deleted text
3012	53	47	53	47	which have recently conducted new analyses [Christophe Deissenberg, Luxembourg]	Word is part of deleted text
56232	53	47	53	47	Remove repeat use of "Project". [Annika Herbert, Australia]	Word is part of deleted text
57558	53	47	53	47	delete "Project" [Hans Poertner, Germany]	Word is part of deleted text
13464	54	1	54	1	would like to see a table with reference to the latest climate models [Sergio Aquino, Canada]	Not possible due to space restrictions but climate models are included in the text

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61744	54	1	54	4	D&A is only marginally used in this report (especially in chapter 3, which is focused on projections). I suggest to strongly shorten this section and only introduce what is strictly needed for this report. [Valérie Masson-Delmotte, France]	Accepted and addressed
13462	54	6	54	6	The reader is referred to these reports. Omit past. [Sergio Aquino, Canada]	Word is part of deleted text
8608	54	7	54	8	The sentence beginning "It is noted .." is a bit clumsy and it is not clear what is being compared; reword? [Pauline Midgley, Germany]	Word is part of deleted text
40730	54	7	54	7	It is noted that attribution of GHG on climate requires different techniques,…' does not make grammatical sense. [Jonny Williams, New Zealand]	Word is part of deleted text
40804	54	12	54	13	The indicated rise of 0.13oC is not constant with the estimated increase in temperature per decade as mentioned in the same sentence of change over 2006-2015 period…this needs refinement to 0.904oC.with are rate of 0.017oC per year [NARESH KUMAR SOORA, India]	Comment not related to text (page number and line number) quoted
2248	54	22	54	27	Somewhere around here it could be acknowledged that the choice of scenario actually may influence the simulated climate so that the +1.5 climate and its impacts are different according to RCP2.6 and RCP8.5. See e.g. Bärring and Strandberg, 2017. Does the projected pathway to global warming targets matter? https://doi.org/10.1088/1748-9326/aa9f72 [Gustav Strandberg, Sweden]	the related text was moved to chapter 2 and dealt with there
51238	54	24	54	25	The statement ...attributed to human influence up to present..., "up to present" may be replaced by "up to the present". [Muhammad Latif, Pakistan]	Accepted and addressed
8610	54	25	54	25	i.e. for °C should presumably be " i.e. for 1 °C " [Pauline Midgley, Germany]	Addressed
8962	54	25	54	25	… i.e. for °C .. I think there shold be a number bfore the °C [Heike Huebener, Germany]	Addressed
17234	54	25	54	25	There is a number missing before the "ºC" [David Schoeman, Australia]	Addressed
39546	54	25	54	25	A value is missing before "°C". [Hernan Edgardo Sala, Argentina]	Addressed
40732	54	25	54	25	There is a number missing in this statement 'i.e. for °C global warming'. [Jonny Williams, New Zealand]	Addressed
51240	54	25	54	25	In "…..i.e. for °C global warming…", the temperature quantity is missing that should probably be 1.5? [Muhammad Latif, Pakistan]	Accepted and addressed
57562	54	25	54	25	guess it should say "...for 1°C global warming" (1 missing) [Hans Poertner, Germany]	Addressed
46508	54	26	54	26	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	Addressed
39548	54	29	54	29	Replace "long –term" by "long–term" (delete space before hyphen). [Hernan Edgardo Sala, Argentina]	Word is part of deleted text
51628	54	3	54	32	This is awkward phrasing, please re-write [Jason Donev, Canada]	Deleted
8540	54	43	54	43	in sections 1.6.1, 1.6.2, 1.6.3, italicise confidence and likelihood expressions [Pauline Midgley, Germany]	We have not done this, as this is framing and not the actual assessment
45480	54	43	54	43	This essentially restates previous IPCC uncertainty guidance - cant it just be cited rather than spelled out? [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	This would have to be a co-chair decision. Our judgement was that these terms are essential for the report and that readers will find it hard to go back to the earlier resources for these terms.
57284	54	43	55	37	Presenting the AR5 graphics/images here would assist the reader [Hans Poertner, Germany]	No space, unfortunately.
57686	54	43			Opposite to what is announced in the title there is nothing about the risk framework in the following sections.This gap should be closed and definitions of impacts, risk etc adjusted according to comments given earlier. [Hans Poertner, Germany]	The section addresses uncertainty specifically with a view on the risk assessment. The risk framework itself is outlined earlier in the chapter.
57104	54	43			SECTION 1.6. The definitions of confidence and likelihood are too far down into chapter 1: they need to be seen earlier. In addition, in the actual text form they are not visible (nor easy-to-grasp) enough. I would transform sections 1.6 (preamble), 1.6.1, 1.6.2 in 2 boxes (confidence and likelihood), and move it into earlier in ch.1, somewhere in section 1: these boxes (i.e. this sections 1.6.1, 1.6.2) will be a reference for all other chapters and the reader should not have to seek for it all over the chapter (consider that these "specific terms were adopted to ensure consistency of language across chapters". [alessandra conversi, Italy]	We are not sure this switch would make much of a difference. Chapter 1 contains essential information for the report and everything is "early in the report".
38900	54	51	54	51	I suggest "confidence" in italics [Jan Fuglestvedt, Norway]	Noted
38902	54	52	54	52	I suggest "agreement" in italics [Jan Fuglestvedt, Norway]	Noted
38904	54	53	54	53	I suggest "likelihood" in italics [Jan Fuglestvedt, Norway]	Noted
55432	55	3	55	4	I find the assertion problematic that the differences between WGs was simply an emerging difference of practice. Many WGI folks would argue that they simply deal much more with quantifiable and quantified issues (model ensembles that do not involve societal choices, and observational datasets) than WGII and WGIII. I suggest you delete the phrase "Differences of practice emerged" and end up with a much more robustly factual statement. [Andy Reisinger, New Zealand]	Our chapter team finds the discussion about working group "cultures" extremely un-interesting for the readers of the report. We have therefore deleted the last remaining traces of it.
51630	55	9	55	22	The figure that has been used before to explain confidence would help here. Remember, no matter how old this stuff is to you, it's new to many of your readers. [Jason Donev, Canada]	We have unfortunately no space left for additional figures.
46516	55	11	55	22	IPCC uncertainty language should be highlighted in italic font. [Sarah Connors, France]	We have not done this, as this is framing and not the actual assessment
4874	55	13	55	13	Change "or" to "and" [Michael MacCracken, United States of America]	We prefer the current wording and have kept it.
38906	55	14	55	14	I suggest "confidence" in italics [Jan Fuglestvedt, Norway]	We have not done this, as this is framing and not the actual assessment
38908	55	14	55	24	I suggest "agreement" in italics [Jan Fuglestvedt, Norway]	We have not done this, as this is framing and not the actual assessment

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7178	55	16	55	17	The single line of evidence argument is appealing, but was not used as such in the SOD. Consistency is needed. [Petra Tschakert, Australia]	We do not wish to change the IPCC concept at this point.
29332	55	16	55	16	How do you define 'robust' and 'robustness'? [Borbala Galos, Hungary]	We believe there is a common understanding of these terms and we therefore do not give a hard definition.
38910	55	17	55	17	I suggest "likelihood" in italics [Jan Fuglestvedt, Norway]	We have not done this, as this is framing and not the actual assessment
38912	55	17	55	17	I suggest "understanding" in italics [Jan Fuglestvedt, Norway]	We have not done this, as this is framing and not the actual assessment
55434	55	19	55	19	As in my comments on the FOD, I don't see how you can end up with a high confidence statement if you have individually robust studies that disagree in their outcomes. What is it that you would have high confidence in? The discussion a few lines earlier is correct, you can have a few very robust studies, or you can have many studies with different lines of evidence that individually may not be that robust but collectively give a robust picture. Both lead you to high confidence. But disagreement between individually brilliant studies emphatically cannot result in high confidence (other than a statement that the studies disagree - but that's not the point here). Please delete this phrase and ensure the concepts expressed a few lines above are carried through consistently, otherwise this text is not consistent with the IPCC guidance on uncertainties. [Andy Reisinger, New Zealand]	We do not wish to change the IPCC concept at this point.
4876	55	27	55	37	A key issue not covered here is what the underlying statement being evaluated is. Typically, one has to achieve such levels of likelihood to conclude that some finding is not just a natural event or outcome. However, as has been argued by Trenberth (and others) that with as much CO2 and forcing as presently results, everything is being affected by its alterations of the global energy balance and there should be a requirement that there needs to be good evidence that some event our outcome is not being influenced by human activities. Basically, then, a key issue is that there has not been discussion about the presumption and how it should be formulated. Somewhere this needs to be added. [Michael MacCracken, United States of America]	We do not wish to change the IPCC concept at this point.
46494	55	27	55	57	IPCC uncertainty language should be highlighted in italic font. [Sarah Connors, France]	We have not done this, as this is framing and not the actual assessment
53620	55	29	55	29	The word "about as likely as not " can be termed as "less likely" [AKM SAIFUL ISLAM, Bangladesh]	We will not change the established terminology at this stage.
40734	55	31	55	35	This sentence is much too long and should be split. [Jonny Williams, New Zealand]	Obsolete. Text revised
8964	55	33	55	34	… does not correspond actual probability … I thinkt it should read "does not correspond to actual probability" [Heike Huebener, Germany]	thanks, has been added
704	55	34	55	34	correspond actual' should be 'correspond to actual' [Robert Shapiro, United States of America]	thanks, has been added
38914	55	4	56	24	I think the rationale and motivations presented here makes sense. But it is very important that this is stronly coordinated across chapters and also across all the three Special Reports. [Jan Fuglestvedt, Norway]	As this is standard IPCC practice, the level of coordination should be quite high.
55440	55	4	56	24	Given how the concept of risk is (mis-)used in this report, I would find it helpful to angle back into the definition of risk here and how it relates to likelihood, including where likelihood cannot be quantified and cases of deep uncertainty. [Andy Reisinger, New Zealand]	There is unfortunately no space to do this.
56416	55	4	55	4	As commented on the FOD, it is vital that this section needs to talk about uncertainty of changes in the scale and frequency of extreme weather events associated with 1.5 degrees, as well as uncertainty associated with extremes of human (e.g. Kates. R.W. et al, 2006, Reconstruction of New Orleans after Hurricane Katrina: A research perspective. PNAS, 103: 40, 14653-14660, doi: 10.1073/pnas.0605726103) and ecosystem responses (e.g. Palmer G et al. 2017 Climate change, climatic variation and extreme biological responses. Phil. Trans. R. Soc. B 372: 20160144. http://dx.doi.org/10.1098/rstb.2016.0144) associated with 1.5 degrees. It is these extremes rather than the general trends that should be the focus of this entire report and that will be defining of impacts on ecosystems and people, their responses and ability to adapt. [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	There is no space to enter into the extreme event discussion here - it is being dealt with in chapter 3 appropriately.
55436	55	44	55	52	So what you're saying is, you could make likelihood statements in this report, but most would not be high confidence but lower confidence. If that's the case I suggest you say so explicitly. If you don't mean this, then I don't understand your reasoning (since the convention, as per IPCC guidance, is that UNLESS STATED OTHERWISE, likelihood statements have at least high confidence. That convention could simply be continued and there's no reason to depart from this in this report, and you'd only need to give the confidence level if it's less than high). [Andy Reisinger, New Zealand]	The shortening of the text does account for this implicitly now.
3014	55	45	55	49	45 literature on 1.5°C mean that there may be very few findings that are based on multiple lines of robust evidence for which quantitative probabilistic results can be obtained. Moreover, these rare findings may not be the most policy–relevant. This introduces a challenge for the current assessment: in AR5, whenever a likelihood assessment was given, it could be assumed that it was associated with high or very high confidence. Hence, the associated degree of confidence was not explicitly stated. [Christophe Deissenberg, Luxembourg]	We are not sure what this comment suggests to do.
46518	55	49	55	49	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	We have not done this, as this is framing and not the actual assessment
46510	55	51	55	51	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	We have not done this, as this is framing and not the actual assessment

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45572	56		57		I find section 1.7, and specially Fig. 1.7, highly clarifying of the structure and purpose of the report. Could not be placed earlier in chapter 1? It will help in understanding the different sections [Adela M Sánchez-Moreiras, Spain]	If this switch was made now then certainly someone would propose that other, equally important sections are moved to earlier positions. We therefore prefer to leave the placement as it is. In any case, this entire chapter is placed in the beginning of the report.
4176	56	6	56	6	Change "global temperatures are at 1.5 deg C" to "global temperature is 1.5 deg C above a pre-industrial level" or something similar. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	This has been defined elsewhere. It would render sentences too difficult if it was added everywhere all the time.
3016	56	8	56	8	In the second case, the risks need to allow [Christophe Deissenberg, Luxembourg]	This text has been deleted for lack of space.
46512	56	12	56	13	Check use of IPCC uncertainty language. Text should be highlighted in italic font when used. Please use alternative wording if not meant to be official IPCC uncertainty language. [Sarah Connors, France]	We have not done this, as this is framing and not the actual assessment
55438	56	12	56	14	This is a misuse of the term risk. By definition, a risk isn't likely or unlikely, risk is the product (even if not necessarily in the mathematical sense) of likelihood and consequence. A risk can be high or low, it cannot be likely or very likely. [Andy Reisinger, New Zealand]	Accepted. Sentence has been revised.
47046	56	23	56	23	Avoid policy prescriptive language like should / must / need. Replace with alternative terms such as 'would need to', 'could' etc. [Sarah Connors, France]	We disagree. "Should" or "must" are policy-prescriptive if they refer to actual policy. When these words refer to something else, like the interpretation of some result, then there is not a trace of policy-prescriptiveness in them.
5746	56	27	57	19	What each chapter would cover is discussed for all chapters except for Chapter 3 [Govindasamy Bala, India]	we have added the reference to chapter 3
7366	56	27	57	19	A small summary of the storyline of the IPCC Special Report on 1.5ºC has been carried out in section 1.7. The different Chapters are mentioned and described from Chapter 1 to Chapter 5 with the exception of Chapter 3. Please, review carefully this issue. [Pedro Salvador, Spain]	we have added the reference to chapter 3
30822	56	27	56	27	Could this section 1.7 be first in the Chapter? [Érika Mata, Sweden]	the decision was made to leave this material in this section
40422	56	27	56	27	The storyline of the report (Section 1.7) does not include Chapter 3 in the text, only in the figure. [Pedro Alfredo Borges Landaez, Venezuela]	we have added the reference to chapter 3
63174	56	27	57	19	It would seem a more logical story line would be: Chapter 1 intro, framing and ground rules, Chap 2 impacts and consequences of exceeding 1.5degC warming (providing rationale for action), Chapter 3 methods of limiting warming to 1.5degC, Chapter 4 models of method applications and their effectiveness, impacts and consequences, Chapter 5 Social and economic dimensions of the preceding and impementation issues. [Greg Rau, United States of America]	we have adjusted the text to reflect some of these points
56418	56	27	56	27	Again restating a comment on the FOD, it is vital that the storyline gives due prominence to the scale and frequency of extreme weather events associated with 1.5 degrees, as well as uncertainty associated with extremes of human (e.g. Kates. R.W. et al, 2006, Reconstruction of New Orleans after Hurricane Katrina: A research perspective. PNAS, 103: 40, 14653-14660, doi: 10.1073/pnas.0605726103) and ecosystem responses (e.g. Palmer G et al. 2017 Climate change, climatic variation and extreme biological responses. Phil. Trans. R. Soc. B 372: 20160144. http://dx.doi.org/10.1098/rstb.2016.0144) associated with 1.5 degrees. It is these extremes rather than the general trends that should be the focus of this entire report and that will be defining of impacts on ecosystems and people, their responses and ability to adapt. (e.g. Palmer G. et al. 2017 Climate change, climatic variation and extreme biological responses. Phil. Trans. R. Soc. B 372: 20160144. http://dx.doi.org/10.1098/rstb.2016.0144) [Richard J. Smithers, United Kingdom (of Great Britain and Northern Ireland)]	agreed. We have done so
3018	56	32	56	32	and adaptation opportunities while including SDGs–related conditions for poverty [Christophe Deissenberg, Luxembourg]	Accepted - text revised
706	56	35	56	35	the strengthening the global response' should be 'the strengthening of the global response' [Robert Shapiro, United States of America]	Noted
3020	56	36	56	36	temperature goal of the Paris Agreement, i.e., the strengthening the global response to the threat [Christophe Deissenberg, Luxembourg]	Noted
56234	56	36	56	36	Remove "the", so that it reads: "…strengthening the…." [Annika Herbert, Australia]	Noted
57968	56	36	56	36	There is a missing word "of" in the phrase "the strengthening the global response" so that it may read "the strengthening of the global response." [Siir KILKIS, Turkey]	Noted
30820	56	38	56	38	Very strange to have Chapter 1 presented now that one has already read it. [Érika Mata, Sweden]	Noted and revised
3022	56	39	56	4	defining the character of the key report element – 1.5°C itself, how 1.5°C is defined and understood, what is the amount of climate change to date, and what is the present trajectory of [Christophe Deissenberg, Luxembourg]	Accepted - text revised
4178	56	4	56	4	Delete "current" (or "to date"). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted - text revised
7180	56	42	56	48	It's important to be clear here that Ch2 is primarily about emissions pathways - should say so in the first sentence too. [Petra Tschakert, Australia]	Noted and revised
54482	56	44	56	44	Please define 'rapid and unprecedented societal transformation'. This kind of radical language does not jive with language like 'cross-sectoral linkage' used elsewhere, which is very conservative. It also underesimates strategic responses made his human evolution both in terms of fundamental reorganization and mobilization. [Thomas Thornton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Tone and definitions were made consistent
57106	56	51	57	4	I presume this paragraph regards Ch. 3, so mention Ch. 3 [alessandra conversi, Italy]	agreed, we have made adjustment
29334	56	53	57	4	A reference to Chapter 3 is missing (the paragraph already includes references to Chapter 2 and Chapter 4) [Borbala Galos, Hungary]	we have added the reference to chapter 3

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3024	57	1	57	1	global warming of 1.5°C that will be felt within, and last at least, a generation. The projected impacts will [Christophe Deissenberg, Luxembourg]	edited
39112	57	2	57	4	Agreement in the second week of the COP. [Lindsey Cook, Germany]	noted
3026	57	3	57	4	to adaptation, of the potential impacts avoided through limiting warming to 1.5°C, and a comparison of the impacts at 1.5°C and 2°C [Christophe Deissenberg, Luxembourg]	edited
3028	57	6	57	7	With a better understanding of emission pathways and impacts, response options emerge in Chapter 4. Attention is directed to questions of implementation and of profound [Christophe Deissenberg, Luxembourg]	agreed and noted
8612	57	1	57	1	Should this be "large-scale" or "global scale" trends? Not necessary to be both? [Pauline Midgley, Germany]	agreed, we have made adjustment
30824	57	13	57	15	This sentence is rather confusing as attributes to Chapter 5 key words that in the fig 1.7 are attributed to other chapters. [Érika Mata, Sweden]	agreed. We attempted to restructure the figure
45482	57	13	57	13	in fact the CRDPs are dropped in very late in chapter 5 and scarcely fulfil this purpose. [Skea Jim, United Kingdom (of Great Britain and Northern Ireland)]	noted. We edited the text
24312	57	19	57	23	I think the story got lost in this figure. I don't think that describing the impacts as "what are the benefits" works. Chapter 3 does not just provide an overview of what the benefits are (for that one would need to compare to a world without climate change mitigation). It rather shows what the remaining impacts are which still need to be considered. [Joeri ROGELJ, Austria]	agreed. We attempted to restructure the figure
21500	57	2	57	23	Poverty eradication or alleviation? [Nathalie HILMI, France]	the figure was significantly edited and this issue was addressed; the eradication was part of the SR1.5framing
22748	57	2	57	23	Figure 1.7 is recommendable to appear in SPM for better understanding this whole 1.5 report [Shuzo Nishioka, Japan]	noted
49324	57	2	23	57	Figure 1.7 and framing discussion in Box 1.1 look disjoint. Whether they need to be connceted need serious discussion at LAM4 and a substantial concensus. Secondly, at least what chapter 5 does and chapter does are not reflected correctly. It needs substantial changes. It needs serious discussion at LAM4 if this figure needs to stay in final draft. [Joyashree Roy, India]	agreed. We attempted to restructure the figure
53782	57	2	57	2	I know it's just a place holder, but there is a typo in the figure (in case it gets used elsewhere). The outer-most (bottom) text ring reads "Cllimate-resiliant" [Patrik Winiger, Netherlands]	the figure was significantly edited and this issue was addressed
46386	57	21	57	23	Figure 1.7: Climate-resilient is wrongly spelled to Cllimate-resiliant. [Ijaz Ahmad, Pakistan]	the figure was significantly edited and this issue was addressed
51242	57	21	57	23	In the Figure 1.7, the spellings of "Cllimate-resiliant" may be corrected to Climate-resilient. [Muhammad Latif, Pakistan]	the figure was significantly edited and this issue was addressed
14190	57	23	57	23	no longer 'Placeholder'? [Roger Bodman, Australia]	edited
30826	57	23	57	23	I see substantial potential for improving fig 1.7. The esthetics, to start with. Then all Chapters are presented as connected to everything. What is the logic for choosing words around the circle? If there are synergies and trade-off, why in the right side only the benefits are mentioned? How can Chapter 5 "Response options" be in the right, and "How do we get there" in the left? ...etc. I understand of course that fig 1.7 is very difficult to produce, and would just encourage the authors to keep on working on it. [Érika Mata, Sweden]	agreed. We attempted to restructure the figure
38916	57	23	57	23	This figure is promising, but it may be improved to commuicate better. I struggle wit the separation fo left and right side. And I also wonder why the box on response option is not placed in the middle. Different verisons could be tested out wrt how people understand this figure. [Jan Fuglestvedt, Norway]	agreed. We attempted to restructure the figure
88	58	1	58	39	FAQ 1.1: GREAT addition! Simplifies thrust of chapter for all readers. [Paul Doyle, Canada]	Noted
33496	58	1	58	44	It is good to have this as one of the FAQs. Some comments – the answer is repetitive (italicised text and that below it); spells out UNFCCC on line 18 (which will have already happened in this report); the answer should usefully acknowledge that for many years 2°C of warming was the main limit discussed internationally but as knowledge of climate change impacts developed we came to understand that this was not good enough; and the answer should note that temperature limits are essentially a proxy for many climate-related impacts - Governments more or less agreed that above a temperature limit is “dangerous climate change” while below the limit risks are acceptable. [Stephen Cornelius, United Kingdom (of Great Britain and Northern Ireland)]	he first paragraph at the beginning of every FAQ aims to provide a summary of the content, with the rest of the text available for readers who wish to know more information. UNFCCC has now been explained at the first instance of its use. The FAQ is focused on which COP agreements have discussed 1.5°C rather than if a shift in focus from 2°C to 1.5°C is occurring.
49418	58	1	58	39	In the FAQ 1.1., there is no a simple answer on the question on the number ‘1.5ºC’ itself. Why 1.5ºC? But not 1.49ºC or 1.52ºC? This threshold is tentative and more conventional-like than physically established. It is necessary to describe this conventional character of the threshold directly in this section (as the most appropriate place). [Alexander Chernokulsky, Russian Federation]	Noted. The aim of this FAQ is to give some historical context to where the term 1.5°C came from, rather than why the 1.5°C value was chosen.
52750	58	1	58	44	Consider adding a reference to the 2013-2015 review and the Structured Expert Dialogue that led to the reference to 1.5°C in the Article 2 of the Paris Agreement. Refer also to the fact that the Paris Agreement entered into force. [Iulain Florin VLADU, Germany]	The Cancun Agreement, Review Period and Structured Expert Dialogue have been added to the FAQ text.
55530	58	1	59	51	FAQ 1.1 and FAQ 1.2 are extremely important. They may need to be presented at the very beginning of the report. [Maryse Labriet, Spain]	Obsolete. Text revised
55950	58	1	59	51	These FAQs, in this and subsequent chapters are really EXCELLENT. Consider even expanding, though to no more than 4-5 per chapter to maintain current readability. [Pamela Pearson, United States of America]	Obsolete. Text revised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
57110	58	1	59	51	Great initiative to write these FAQ. I think that some references should be added (example: By the decade 2006–2015, human activity had already raised global average temperature by 0.87°C relative to 1850–1900); (example: This means that warming 50 in many regions already exceeds 1.5°C. Over a fifth of the global population live in regions that have 51 already experienced more than 1.5°C of warming in at least one season) [alessandra conversi, Italy]	As FAQs are aimed at broader audiences than the main IPCC chapter texts, citing references within the text is avoided.
39550	58	3	58	3	Delete space before the comma in "world ,". [Hernan Edgardo Sala, Argentina]	Obsolete. Text revised
49460	58	5	58	6	the Agreement was signed ... replace "signed" by "adopted" - the signature opened on 22 April 2016 - months after the adoption of the Agreement in Paris (see http://unfccc.int/paris_agreement/items/9511.php) [Manfred Treber, Germany]	Accepted
38918	58	8	58	8	I dont think "avilable" is the right word alone. Could be reowrded to "availabe in the modelling literature" or something like that. [Jan Fuglestvedt, Norway]	accepted
46460	58	12	58	18	the description of the background to the 1.5C limit is incomplete. It ignores the fact that 1.5C was referenced in the Copenhagen Accord from COP15 2009, as a response to the demands in particular from the group of the Climate Vulnerable Forum which held its first summit in 2009 before Copenhagen. this also provided the basis for the first periodic review under the UNFCCC and the Structured Expert Dialogue process, which scientifically helped prepare the ground for the inclusion of the 1.5C limit in the Paris Agreement. Schleussner et al. provide more background here: https://www.nature.com/articles/nclimate3096.epdf?author_access_token=RexikyN5vxy3ugz-flUY7NRgN0jAjWel9jnR3ZoTv0OZIUAyrJekwZ4HMq3DtbGkVcyLY2h9bp31usCfC_u2h2g9dVxNGp7x5wx9RnALdQbHs8mUKSwWRZf1ZPgp9tzH [Sven Harmeling, Germany]	The Cancun Agreement, Review Period and Structured Expert Dialogue have been added to the FAQ text.
3030	58	17	58	18	world, of a transition to climate resilient development pathways. Progress along these pathways will involve learning, adjustment, and reflexivity to maximize the benefits of jointly pursuing climate stabilisation [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
39552	58	18	58	18	Instead of using the full wording "United Nations Framework Convention on Climate Change (UNFCCC)" in Line 18, I suggest to use it before, in the Line 6 of this page, where it says solely "UNFCCC". [Hernan Edgardo Sala, Argentina]	Obsolete. Text revised
38920	58	21	58	21	As above, i dont think "available" works. I suggest just deleting. [Jan Fuglestvedt, Norway]	Accepted
50674	58	29	58	31	Rather than "…lack of access to fresh water," instead put "…lack of access to clean water." Fresh water in this context can be referred to as lakes, rivers, streams, wetlands and aquifers, but essentially there needs to be an emphasis on water that is safe to drink, hence "clean water." [Jasmin Irisha Jim Ilham, Malaysia]	Accepted
5504	58	31	58	32	It is not clear why the risk of 2 Vs 1.5 is substantially greater while the risks of 1.5 Vs 1 C are not deemed substantially greater. Suggest removing "substantially". [Haroon KHESHGI, United States of America]	Substantial has been deleted
22750	58	31	58	32	substantial': Is it confirmed/? Needs to be refered to the sentence in this 1.5. report. [Shuzo Nishioka, Japan]	Substantial has been deleted
24082	58	31		32	substantial': Is it confirmed/? Needs to be refered to the sentence in this 1.5. report. [Shuzo Nishioka, Japan]	Accepted: Removed substantial
33070	58	34	58	39	FAQ - include a reference to human rights in this discussion of the impacts of both climate change and climate action.- - both can undermine human rughts - hence the importance of the Paris Agreement preamble which reminds Parties to respect human rights in all climate actions. [Tara Shine, Ireland]	This topic is covered in Chapter 5 FAQs.
53622	58	38	58	38	The "island countries" should be included with "developing countries" [AKM SAIFUL ISLAM, Bangladesh]	Accepted
89	58	42	58	44	Love this suggestion to enhance understanding of all readers. [Paul Doyle, Canada]	Noted
24100	58	42			Figure suggested is welcome [Shuzo Nishioka, Japan]	Accepted. Figured added
42970	58	42	58	44	Figure suggestion: combine information from Figure 5 from Drijfhout et al 2015 “Catalogue of abrupt shifts in Intergovernmental Panel on Climate Change climate models” and Figure 1 from Ramanathan and Feng 2008 “On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead” to show the connection between warming and the probability of various tipping points. [Durwood Zaelke, United States of America]	Timeline figure has been added.
90	58	47	59	51	FAQ 1.2: GREAT addition! Simplifies thrust of chapter for all readers. [Paul Doyle, Canada]	Noted
32724	58	47			Numbers (such as the 1.5 degree target) can be very efficient at communicating an idea. In this sense, I am wondering if it would be helpful to include a translation of the 1.5-degree target in terms of GHG concentration (e.g. 430 PPM) and of carbon budget left (e.g. 400 GtCO2e), just like the following websites do: https://www.theguardian.com/environment/datablog/2017/jan/19/carbon-countdown-clock-how-much-of-the-worlds-carbon-budget-have-we-spent and https://www.co2.earth/. I am not a natural scientist and there may be valid reasons not to do so, but it may be helpful for the public to be able to translate from degrees Celsius to PPM and to Gt. Or at least to explain how these three metrics are related, if this is not already the case elsewhere in the report, since they are commonly used in the literature and in the media. [Christopher Campbell-Duruflé, Canada]	Rejected. This is not possible to say with confidence as the warming for any specific amount of CO2 in the air is uncertain from uncertainty in climate sensitivity.

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61746	58	47	59	51	The first paragraph is a repetion from the penultimate paragraph of this FAQ. I think that this section should avoid repeating the Paris Agreement but focus on how do we measure the level of global warming (global mean surface temperature, how is this calculated, which reference period), where we stand now, what is the difference between "weather" (one month, one year) versus "climate" (decades). I suggest to remove "scientists do not usually compare conditions between single years", as some institutions have communicated on when GMST is expected to reach 1.5°C (see also annual reports of WMO on the state of climate). It would make sense to indicate that regions have already encounted GMST above 1.5°C (due to the difference between regional and global T, maybe with a few words explaining physically why there is such difference, including land sea contrasts and Arctic amplification), when GMST may reach 1.5°C for a single year (based on recent trends and ENSO), and when global warming (defined over decades) may reach 1.5°C. Finally, I suggest to remove the statement at the bottom part of page 58 ("if emissions increase and warming continues to accelerate") : what is the evidence for any acceleration in warming rates? Figure 1.2 for instance suggests a steady rate of increase since the mid 1970s, unless my visual interpretation of the orange line is not correct. [Valérie Masson-Delmotte, France]	The first paragraph at the beginning of every FAQ aims to provide a summary of the content, with the rest of the text available for readers who wish to know more information. The difference between weather than climate is not covered in the underlying chapter text of the report, and the addition of this discussion to the explanation of single & multi year global average temperature could add confusion (weather is sub-year variability and thus another term to define, which is not strictly relevant to this section). "scientist do not usually..." has been deleted. Impacts and unequal warming and how this may change is already covered in more detail Chapter 3 FAQs and this is mentioned at the end of this FAQ. The statement "if emissions continue" has been deleted.
62044	58	48	58	53	The first paragraph is paraphrasing too much the Paris Agreement text and uses acronyms not yet introduced (e.g. UNFCCC). I suggest to stick to the key points : invitation to prepare a report by governement at COP21; decision of the IPCC panel to embed the invitation in further dimensions (strengthening the response, eradication of poverty, sustainable development). This is the actual context for the report (why are we preparing this report). The second part of the question (why are we talking about 1.5°C) may also make clear a few elements of context : we are already at about 1°C; more warming, more risk; the lack of elements in AR5 for risks associated with 1.5°C versus 2°C; the fact that the AR5 report stressed reasons for concern already at 2°C for some ecosystems and some impacts on human societies; the lack of elements in AR5 on greenhouse gas emission trajectories compatible with 1.5°C warming. The end of the paragraph is focused on ethics and equity for those vulnerable to climate change, but not for those vulnerable to response options related to ambitious mitigation. A more balanced approach would better reflect the content of the assessment in SR1.5. [Valérie Masson-Delmotte, France]	Accepted, the section has been reviewed extensively
8968	58	49	58	53	I'm missing in the FAQ answer the fact of the commited warming due to emissions already in the atmophere today. With the delayed reaction of the climate system to current GHG levels, we should take into account some already commited warming so as not to lead the readers to the misconception that we can still emit 50% of what we have emitted since preindustrial times. [Heike Huebener, Germany]	Noted and revised; the FAQ was significantly revised
39554	58	49	58	49	I suggest to replace "preindustrial" by "pre-industrial", in order to keep consistency of language along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Accepted - text revised
57286	58	49	58	53	Please include warming of 1C in 2017 (see ES page 4 line 44) [Hans Poertner, Germany]	Noted.
5846	58	5			The value in the FAQ of 0.87K differs from that in Section 2 (0.85K). I would ensure an exact match between the figure here and whatever the eventual figure you use in Section 1.2 is. [Peter Thorne, Ireland]	Noted and revised; attempts were made to clarify the definitions and distinctions
48364	58	5	58	5	Change 0.87°C to 0.90°C (AR5 avg replaced by "Oper5" avg) [David Clarke, Canada]	Noted and revised; attempts were made to clarify the definitions and distinctions
4180	58	51	58	51	Change "compared preindustrial times (1850-1900)" to "compared to 1850-1900". 1850-1900 is not pre-industrial according to the IPCC's own definition of the term, as noted in earlier comments. A sentence could then be added to the effect that the warming from the start of industrialization to 1850-1900 is uncertain, but is thought likely to be below about 0.1 deg C, and thus insignificant in the context of this Special Report. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Noted and revised; the FAQ was significantly revised
4878	58	51	58	51	Change "compared" to "compared to" [Michael MacCracken, United States of America]	Accepted - text revised
8966	58	51	58	51	…. Compared preindustrial times … -> "compared to preindustrial times" [Heike Huebener, Germany]	Accepted - text revised
38922	58	51	58	51	I suggest you insert the numbers for curent warming rates. [Jan Fuglestvedt, Norway]	Noted and revised; the FAQ was significantly revised
39556	58	51	58	51	I suggest to replace "preindustrial" by "pre-industrial", in order to keep consistency of language along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Accepted - text revised
56236	58	51	58	51	Change to: "…compared to preindustrial…" [Annika Herbert, Australia]	Accepted - text revised
3032	58	52	58	52	expect the world would reach human–induced global warming of 1.5°C in the 2040s, but this could happen [Christophe Deissenberg, Luxembourg]	Noted
38924	59	5	59	9	The issue here is improtant and may need some more nuances reflections. The statment "scientists need to define what both of these terms mean" is in my view too simple and needs some more nuances. Scientists cannot, in my view, define these things alone, but can provide possible defintions that can be presented to policymakers. Dialog here is important. [Jan Fuglestvedt, Norway]	Rephrased to 'To answer the question of how close are we to 1.5°C of warming, authors of this Special Report need to first interpret what both terms mean to them' as response to comment ID 38924.
3034	59	8	59	8	scientists need to first define what both terms mean. [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
4182	59	8	59	8	The word "define" should be changed to a word such as "interpret". The Paris Agreement was reached by the parties to the UNFCCC, and it is these parties that should provide definitions, under scientific advice where needed, in cases of ambiguity. The scientists who have the task of trying to answer the question posed do have to make their own interpretation in the case of ambiguity, but it is for the UNFCCC parties to decide whether they agree with the scientists' interpretation. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Rephrased to "To answer the question of how close are we to 1.5°C of warming, authors of this Special Report need to first interpret what both terms mean to them."

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3036	59	11	59	11	revolution, but the number of available direct observations decreases as one goes back in time. Defining a [Christophe Deissenberg, Luxembourg]	Accepted
39558	59	12	59	12	I suggest to replace "preindustrial" by "pre-industrial", in order to keep consistency of language along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Accepted
39560	59	13	59	13	I suggest to replace "preindustrial" by "pre-industrial", in order to keep consistency of language along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Accepted
3038	59	17	59	18	average temperature, can change the estimates of historical warming by a couple of tenths of a degree. [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
4184	59	22	59	22	represent should be changed to "approximate" to be consistent with the terminology used in AR5, as discussed in comment (30). [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted
4186	59	25	59	25	the reference period should be changed to "one of the reference periods", as AR5 did not use a single reference period to characterize pre-industrial conditions. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Accepted
4188	59	26	59	27	This statement is incorrect.The reference period 1850-1900 was NOT the basis for AR5's 0.85 deg C figure, and this figure was NOT identified in AR5 as the warming above pre-industrial conditions. AR5 may have been misquoted in the negotiations leading up to the Paris Agreement, but that's another matter. As can be read in either the AR5 Synthesis Report or the SPM of the WGI contribution, the 0.85 deg C figure was derived from the linear trend in GMST data from 1880 onwards. Data from 1850-1879, which were available only from a single source, HadCRUT4, where not included in this calculation. The word "pre-industrial" does not appear in the sentences that quote the 0.85 deg C figure. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account: the text has been clarified.
4190	59	26	59	27	The WGI SPM, but not the Synthesis Report, in addition quotes a warming of 0.78 deg C from 1850-1900 to 2003-2012 based on HadCRUT4 alone. Again, however, the SPM does not identify the period 1850-1900 as pre-industrial. This is consistent with WGI's defininition of pre-industrial as prior to 1750. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Taken into accountA: the text has been clarified.
3040	59	3	59	3	The amount of warming is defined as the change [Christophe Deissenberg, Luxembourg]	Obsolete. Text revised
40736	59	31	59	31	Earlier in this chapter it is made clear that it is the surface air temperature and sea surface temperature which are used. This should be clarified here. [Jonny Williams, New Zealand]	Obsolete. Text revised
3042	59	33	59	33	since the natural [Christophe Deissenberg, Luxembourg]	Obsolete.
40738	59	33	59	33	don't' should be replaced with 'do not'. It is an informal abbreviation and is not suitable for this type of document. [Jonny Williams, New Zealand]	Accepted. Figured added
33498	59	34	59	36	Data for 2017 will be available. Suggest "...For example, 2015, 2017 and 2017 were substantially warmer than 1°C, but 2015 and 2016 were also affected by the strong El Niño event that took place at that time…" [Stephen Cornelius, United Kingdom (of Great Britain and Northern Ireland)]	This sentence focuses on El Nino adding to global temperatures that are rising from climate change, thus only 2015 & 2016 are mentioned.
56238	59	35	59	35	Change to "….but were also affected…." [Annika Herbert, Australia]	Obsolete. Text revised
48366	59	4	59	4	Change 0.87°C to 0.90°C (AR5 avg replaced by "Oper5" avg) [David Clarke, Canada]	Reject - use the value stated by the AR5.
39562	59	43	59	43	I suggest to replace "preindustrial" by "pre-industrial", in order to keep consistency of language along this chapter and across chapters. [Hernan Edgardo Sala, Argentina]	Accepted
17236	59	44	59	44	Terminal punctuation seems to be bolded for some reason. [David Schoeman, Australia]	Noted. Space constraints, text revised for clarity
4192	59	47	59	47	Replace the word "scientists" by something that is more all-encompassing. The change in global average temperature is a metric of interest to many policymakers and many members of the public at large. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account: Rephrased to infer that scientists define global avg temperature, rather than only scientists use the global average temperature metric.
4194	59	49	59	49	Change "are" to "have recently been". Delete "This means that". See comment (35), which points out that from the late 19th century to the 1970s, the rise in temperature over land was not larger than the rise over sea. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account: Rephrased to "Most land regions have been warming faster than the global average since the 1970s, for example."
29336	6		6		I would suggest a map that shows the regions where 1.5 °C warming is already reached and which regions are very close (e.g. within the next 20 years) to reach the 1.5 °C threshold [Borbala Galos, Hungary]	Taken into account: Figure showing level of current warming (global mean temperature) added to FAQ. This suggestion will be considered for the Chapter 3 FAQ.
91	6	1	6	2	Love this suggestion to enhance understanding of all readers. [Paul Doyle, Canada]	Noted
40806	6	1	6	2	Figure suggestion In addition to 1.5 oC, also add 2oC position [NARESH KUMAR SOORA, India]	Noted
57108	6	1	6	2	FIGURE: I suggest a figure such as this from the World Meteorological Organization, https://public.wmo.int/en/media/press-release/global-climate-2011-2015-hot-and-wild) . It shows area warming faster then others vs areas that are actually cooling [alessandra conversi, Italy]	Noted. Figure showing level of current warming (global mean temperature) added to FAQ.
55292	61	57	61	58	Delete submitted paper. [ELISA BERDALET, Spain]	Noted and revised
57540	64	4	64	5	Please check status of this submitted publication (Dasgupta et al, here an p 49 line 25); only to be considered if accepted by cut-off date May 15 [Hans Poertner, Germany]	deadlines for all publications were set
36388	65	57			Gradstein, F.M., Ogg, J.G, Schmitz, M.D. and Odd, G.M. (eds) (2012). [Emilio Cerdá, Spain]	Accepted - text revised
46336	67	14	67	14	Atlas deS migrations [Etienne Piguet, Switzerland]	Accepted - text revised
36390	76	58			changing climate: Cilmate adaptation. (That is, : between climate and Climate). [Emilio Cerdá, Spain]	Accepted - text revised

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50676	159	47	159	47	Prefer to use the word "informs" instead of "tells" to convey a more informative and meaningful manner. [Jasmin Irisha Jim Ilham, Malaysia]	Accepted - text revised