

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
82177	0	0	0	0	I have been trying to understand the concept of "climatic impact drivers", which is new to me, and seems to have replaced "hazard". Maybe some useful questions to consider are, why are you trying to do this, and who are you doing this for (e.g. is it for scientists, or for decision-makers, etc.)? Is it to try to deal with the situation whereby changes to climatic conditions can create both risks and opportunities, i.e. some changes of climate may have harmful impacts to people or systems that are vulnerable and exposed to a hazard, but some changes of climate may be beneficial? For the beneficial aspects, it is difficult to talk about something being a hazard or a risk perhaps. I work in the area of climate services engaging with decision-makers and I have at times struggled when trying to write documents relating to this, but it's not clear that moving from a hazard and risk-based framework to something called climatic impact drivers will necessarily improve things. The hazard-vulnerability-exposure risk framework from AR5 was proving very useful for many people so it seems unusual to move away from that. I don't necessarily have a solution, but maybe I can some suggestions in case they are helpful. Could "climatic impact drivers" be replaced by something like "climatic conditions" in the text throughout the report? Or could there be two frameworks - one covering the negative/harmful impacts, which would simply be the risk framework used in AR5 based on hazard/vulnerability/exposure; and then another framework to cover the beneficial impacts and opportunities which would need to replace the words hazard and vulnerability which perhaps have a negative connotation, e.g. could hazard become asset, but I'm not sure what the opposite of vulnerability would be. I hope these comments help. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: Climatic impact drivers are only replacing hazard in a broader context than only the risk framework; the risk-based framework remains, and the propeller diagram in CH1 is set back with the "hazard" term. An in-depth discussion has taken place with WGII to properly frame these concepts.
15763	0	0	0	0	Throughout the chapter, references to past IPCC reports are currently heterogeneous, sometimes the acronym of the report is used (e.g. SR15, SREX), sometimes it uses IPCC (year), and sometimes it uses the XXX et al. using the name of the first author of the SPM of these reports. It could be good to homogenize this throughout. [Samuel Morin, France]	TAKEN INTO ACCOUNT: homogeneity has improved
86675	0	0	0	0	We struggle to find regional differences with respect to e.g. types of forests. Please consider to diversify more on regional levels. [Oyvind Christophersen, Norway]	REJECTED: the question is not clear enough
15765	0	0	0	0	The task that this chapter intends to fulfill is quite enormous, because it aims at providing climate change information, for all regions. In many cases, the level of detail is uneven, sometimes repeating or contradicting information provided in previous chapters (e.g. snow and ice information in chapter 12 vs. chapter 9 and/or SROCC), and it is not clear where interested readers and policy makers will look for the information. Since it is possible that regional policy-makers will primarily seek regional information in Chapter 12, it is important to thrive towards maximizing consistency with other sources of information, and provide appropriate links in order to encourage the reader to read other information too. When possible, I have indicated links to SROCC subsection numbers (e.g. for snow and ice CIDs). [Samuel Morin, France]	TAKEN INTO ACCOUNT: an intense cross-chapter coordination has taken place in order to solve inconsistencies such as mentioned.
15767	0	0	0	0	I think the knowledge gap section could be strengthened and be made more specific, perhaps including tables highlighting where information on past changes in CIDs (including detection/attribution) and future changes in CIDs are available, missing, outdated, questionable etc. This would be a key information for the scientific community and policy-makers. At present, when the data is missing, either a generic/broad statement is made, or the corresponding information is simply dropped, which either indicates that the assessment didn't take place, or that no information was available. [Samuel Morin, France]	REJECTED: it was decided to make a very short final remarks section
15769	0	0	0	0	I think this chapter misses an assessment of existing regional climate change assessments (such as AMAP for the Arctic, National Assessments when they exist, etc.), because this is also a key source of regional climate change information which could be used not only to downscale IPCC information but also, conversely, inform IPCC assessments (and simplify it somehow by providing an intermediate digestion of regional climate information). I understand this is also partly covered in Chapter 10, but the divide is not so clear between the two chapters. [Samuel Morin, France]	REJECTED: this chapter uses several existing regional assessments (for US, Australia, Hindu-Kush, etc)

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106143	0	0	0	0	The world is going through this critical most COVID-19 situation in year 2020. I think AR6 in general should address some of the knowledge issues relating to climate change and COVID-19 issue. One of the chapters could include some of such impact issues is Chapter 12. Leaving this for IPCC AR6 to provide some useful information in this line (if possible) [Atiq Kainan Ahmed, Thailand]	TAKEN INTO ACCOUNT: A specific box on COVID19 is now in the report (not in ch12)
86213	0	0	0	0	Entire chapter: the authors might revisit the introductory sections of this chapter, and the various introductions to sections (E.g. 12.2, 12.4). They tend to merely explain how the information is arranged, or handled, and miss the opportunity to say something meaningful. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The introduction sections are meant to explain the methodology used in the chapter, and were revised, we hope focus is more clear.
99281	0	0	0	0	As the CLA of one of the regional chapters, I am concerned about the details in the impact section without discussion with the relevant people in the chapter. There are two ways to address this, either the WGI focusses on the enabling conditions but not the impact or draws more on WGII with references and CA to ensure that the assessment is drawing in their knowledge and expertise [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Each regional section (within Section 12.4) has a contributing author from the corresponding regional chapter in Working Group II. We have also attended all WGII Lead Author Meetings and established regular lines of communication to ensure coherence without infringing on Working Group II's remit. Working group I intends to provide regionally- and sectorally-relevant climate information but not assess impacts or risk, which are left for Working Group II.
63711	0	0	0	0	Avoid the use of abbreviations, as are confusing for the reader. Better use Climatic Impact Drivers instead of CIDs, Essential Climate Variables instead of ECV, etc. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: All acronyms are clearly defined and in view of space limitations it is necessary to resort to using acronyms
66033	0	0	0	0	Suggest shortening the chapter and removing information that has been repeated in other chapters (e.g. Chapter 9 Oceans and cryosphere). The redundancy also creates a version control problem: if information in one chapter (say mass balance of the East Antarctic ice sheet) is updated or corrected it would have to be corrected in this chapter as well. [Kushla Munro, Australia]	TAKEN INTO ACCOUNT: For the sake of completeness it is necessary to summarise some material reported in other chapters in order to have a complete assessment of all CIDs in Ch 12. As we are working very closely with the other WG1 chapters (for e.g. via thematic and regional cross chapter groups) there is no room for inconsistencies.
130569	0		0		This is total a new handshake chapter for WGI focusing on Climate impact drivers. However, we still need to avoid overlaps and inconsistency with other regional chapters and WGII. I believe that our BOG on regional assessment will solve the problem. [Panmao Zhai, China]	ACCEPTED: Overlaps and inconsistencies have been dealt with the cross-chapters groups
130571	0		0		There are assessments on CIDs for many regions. Please make sure messages deliver in this chapter are precise, objective and comprehensive. [Panmao Zhai, China]	TAKEN INTO ACCOUNT: We have reformulated our ES statements and hope they are now more clear. The assessments in Chapter 12 reflect the degree of accuracy that literature allows.
130581	0		0		Many figers are listed as placeholders! I am afraid we will have no chance for expert and government review. [Panmao Zhai, China]	TAKEN INTO ACCOUNT: Figures are now complete
38373	0		0		As an AR6 assessment, its future projections should be mainly based on CMIP6 simulations and SSP scenarios, but CMIP6 and SSP are only mentioned at the beginning of this chapter, while most of projections and future impact assessments are based on the previous RCP scenarios. It is suggested to be fully aligned with the above chapters by adopting, where possible, the CMIP6 future projections based on the SSP scenarios. In addition, Chapter 12 is a crucial one in IPCC AR6 WGI contribution. It is suggested to give a balanced assessment conclusion by adding an illustrated comparison with low and medium emission scenarios (SSP1-2.6/RCP2.6 and SSP2-4.5/RCP4.5), while emphasizing the changing climate impact factors under high-emission scenarios (SSP5-8.5/RCP8.5). [Yaming LIU, China]	TAKEN INTO ACCOUNT: We now give more focus on CMIP6 and on scenario differentiation

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110093	0				The ES needs substantive revision to acknowledge explicitly that the impacts we will experience depend upon the emissions pathway (mitigation options) we follow. Most regional assessment statements either assume we follow 8.5 (now deemed incredibly unlikely post -Paris Agreement) or that impacts are baked in regardless of our emissions choices. This is quite clearly not the case and the ES statements need to be recast to consistently and systematically highlight that our emissions pathway choices will yield large changes to impact futures so that the findings end up being actionable in a policymaking context. This applies to most ES points. You must explicitly show to policymakers that they have a choice otherwise these ES statements are hugely disenfranchising. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We have restructured the ES. The ES, the figures and the whole chapter now better reflect scenario differentiation. In particular, new figure 12.4 is now presenting two scenarios for the end of century.
110095	0				Many of the ES statements as written are not regional in focus and cross-cut with chapters 2 through 9. It would be important in redrafting these messages to stick to the regional aspects more rigorously to avoid overt overlaps and potential for conflicting findings. A few findings seem to be distinct from those reached by the earlier chapters and this would be very dangerous were it to persist to the FGD. The chapter ES should stick more rigorously to the chapter charge which is regional impacts and risk assessments and avoid repetition of findings arising from earlier chapters. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: ES statements have now been reformulated to better reflect regional aspects. However, there are signals which are present in all regions and this must also be emphasized.
110099	0				Chapter is overall lacking in making specific cross-references to the preceding chapters - the chapter should make a concerted effort to cross-reference back to earlier substantive assessments carried out earlier. It should not repeat these redundantly and often comes to inconsistent conclusions which risks discrediting the report. Chapter 12 needs to cite and build upon earlier chapters systematically in a way that it does not in the present draft. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The cross-chapter discussions now help in having consistency and avoid overlaps.
29979	0				Please note that while the definition of sector is provided on lines 45 through 53 of page 12-12, to many climate service providers the term sector would more likely be used to refer to industrial sectors such as mining or oil and gas. It may be worth making the distinction that these are key IPCC sectors as defined in WGII and then leave the detailed definition where it is (page 12-12 lines 45 to 53) [Janya Kelly, Canada]	TAKEN INTO ACCOUNT: we now better define sectors in the ES
110109	0				The focus upon RCP8.5 / SSP5-8.5 is unhelpful given the controversy over this scenario. The chapter would be well advised to always at a minimum counterbalance it with RCP2.6 / SSP1-2.6 and / or instead show the full range of scenarios. Otherwise there will be significant room for unwarranted accusations of alarmism. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: New figures and statements better balance among scenarios
110113	0				The concept of assets is never really properly introduced. I don't think it can be assumed reader knowledge - especially for WG1 - and suspect that a box or similar early in the chapter outlining what an asset is would be very useful given how much of the content rests upon a discussion of these assets. I am not entirely convinced it is the right term but if its the term used in WG2 I can live with it. Otherwise perhaps a more intuitive term could be used in its stead? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We define "assets (system components with socioeconomic, cultural, or intrinsic value)" early within Section 12.3 to ensure that the reader understands our intent here. We also discussed this topic with the AR6 glossary but determined that the term is used somewhat differently across each WG, with the final recommendation being to define its use directly within the chapter.
110133	0				I have got to the end of section 12.3 without, with the exception of the ES, having seen from recollection a single use of confidence or likelihood language to date. This means there is no trace between the sections and the ES and is inconsistent with all prior chapters. Sections and relevant sub-sections should end with an assessment statement couched in confidence / likelihood language that provides an assessment based upon the supporting text (the trace). Then I move to 12.4 and like chapter 9 now many of the assessment findings are embedded deeply within the text. Again, the issue here is that the trace is perhaps not as clear as it could / should be. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The goal of Section 12.3 is to establish a core element of the CID framework, which is to note connections between the CID changes and sectoral assets. Assessing the system mechanisms behind each of these connections is beyond the scope of Working Group I (it is covered in Working Group II). In this way Section 12.3 provides novel guidance about the sectors that are likely to be interested in information about a given CID changes, as well as the CID changes that are likely to be of interest to a given sector. The reader can then follow the references and cross-IPCC-chapter links to find specific assessments of these connections and the ramifications of CID changes on sectoral impacts and risk,

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110135	0				Section 12.4 should link across to the chapter 10 case studies where applicable for further details and also avoid undertaking a redundant assessment in such cases. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Several case studies were removed from the CH10, and we are now careful to not duplicate the assessments.
110137	0				Chapter 12, like chapter 8 prefers PDSI for a drought indicator in several places whereas chapter 11 preferred SPEI. Chapters 8,11 and 12 need to reconcile these divergent views. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Coordination has taken place among chapters to coordinate indices
67899	0				Not yet linking information on the impacts of climate change, risk assessment and climate resilience [Ruandha Agung Sugardiman, Indonesia]	Such links are not in the remits of WGI but can be found in WGII
110141	0				I like the assessment tables in 12.4 per region but they give no view as to sensitivity to scenario. Similar to the magic carpet model assessment diagrams each cell could be split diagonally with top left being an assessment for 8.5 and bottom left for 2.6. Is confidence the right metric or does it need to somehow be more quantitative to be actionable. Confidence in a change does not tell a policymaker what the practical consequence is after all. I may have high confidence in a change of little practical import but low confidence in a change that may be high impact. Are these tables getting the right risk message across? Could they be encoded explicitly as risk which would also then make more sense to encode as 8.5 / 2.6 so that the incremental risk change is the core message? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: While heat maps yet do not provide scenario differentiation, the text and the statements now better do.
110143	0				Chapter 12 feels like it misses getting at the risk component by an undue focus upon RCP8.5 / SSP5-8.5. If the purpose of the chapter is to handoff to WG2 it seems like the best way to do so would be to reorientate the assessment to explicitly look at how the risk of physical impacts at the regional level changes between RCP-2.6 / SSP1-2.6 through RCP8.5/SSP5-8.5 ideally considering both the additional scenarios between. The nice hand-off to WG2 would then be a consistent set of estimates of the variation in risk of physical climate system outcomes per scenario. Is there a logical reason why chapter 12 could not be reorientated in this manner? Even better would be to do so looking at mid-century and end of century. Focussing upon such a question may also serve to reduce propensity for gross overlap and redundancy of a number of assessments performed already elsewhere. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: While heat maps yet do not provide scenario differentiation, the text and the statements now better do.
110153	0				There are a quite large number of references to grey literature (national reports etc.) which may have not undergone rigorous peer review. Some care is likely required and such citations should be kept to an absolute minimum. [Peter Thorne, Ireland]	NOTED: the grey literature was carefully checked
110155	0				After reading through the 12.3 text I was okay with CO2 being included in the other category. However, after reading through a few of the regions it is formulaic as assessed and really only discussing global burdens which is grossly redundant with chapter 5. I would therefore drop CO2 and simplify the chapter. The alternative is to focus far more rigorously on the local variations from the global mean but given its long lifetime this is really a sub-regional predominantly urban scale feature so anyway probably does not fit. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: - We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2. - we have revised Section 12.4 to avoid the unnecessary region-by-region assessment of this well-mixed variable.
110159	0				The ordering of sections within 12.4.X series feels a bit random. It would surely make more sense to be ordered in a way that makes geographical sense so that proximal regions are assessed in turn and the reader can more easily draw comparisons? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The ordering follows the CID list
107859	0				Really great to see this chapter so well done. I think it really does act as a good bridge to WGII. [Linda Mearns, United States of America]	NOTED: We thank the reviewer
14949	0				From FOD to SOD, there was an increase of 34 pages, a factor that can lead the chapter to be above the official IPCC page limit [Juan Rivera, Argentina]	ACCEPTED: The chapter size is now reduced

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110193	0				Many observational analysis aspects in chapter 12 rely upon the Atlas which uses CRUTS without applying the data availability mask and therefore includes spurious climatologically infilled values with deleterious impacts upon trends and variability estimates. Those aspects will require fixing when the Atlas addresses the issues over the CRUTS data mask which it will have to. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: CH12 summarizes information from several chapters among which is the Atlas. Ch12 has followed changes made in the Atlas through various editing and trickle-back processes.
14963	0				Several statements are based on the Atlas. Do you intend to update this with peer-reviewed publications? [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: CH12 has updated statements coming from the Atlas in coordination with the Atlas
110197	0				Within 12.4 many of the sub-sections open effectively repeating what is said in 12.3 (e.g. repeating / paraphrasing definitions) this gets a bit repetitive for a reader reading the whole thing after a while although may be unavoidable to cater for readers who may rather dip in and out. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We now try to avoid repetition but at some point some consequences should be mentioned especially for readers that do not want to read the whole chapter
110217	0				There are some cases of egregious within chapter repetition. For example Arctic sea-ice is assessed redundantly across several subsections of 12.4. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: we have avoided repetitions now
132235	0				The CID "drought" needs to be subdivided in 3 categories: "meteorological drought/precipitation deficits", "agricultural drought/soil moisture deficits", and "hydrological drought/streamflow deficits". The reasons for this are as follows: 1) climate change signals are not the same for these 3 types of droughts, in particular not for the precipitation deficits vs the other types of droughts which are also affected by changes in evapotranspiration; 2) the impacts are very different for these 3 types of droughts. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: CID drought categories have been redefined from a specific drought group and the result is reflected here
132245	0				There is no CID category on "heavy precipitation", this is clearly missing. There are effects of heavy precipitation not covered by pluvial floods (e.g. damages to crops induced by the precipitation intensity, not necessarily the flooding). In addition, the general public will expect assessments on changes in heavy precipitation as a main output of the AR6. "Heavy precipitation" should be introduced as a separate CID or merged together with pluvial floods but mentioned explicitly there, i.e. "Heavy precipitation and pluvial floods". [Sonia Seneviratne, Switzerland]	ACCEPTED: the new category now includes "Heavy precipitation and pluvial flooding"
132247	0				The CID category "Severe wind storms" should be subdivided in a) Tropical cyclones and b) Other types of wind storms. Tropical cyclones have namely very recognizable impacts, which come from the compounding effects of extreme wind and very heavy precipitation. This is not the case for other types of severe wind storms (e.g. extratropical cyclones). They are thus not directly comparable. [Sonia Seneviratne, Switzerland]	ACCEPTED: the categories have been divided, based on the compounding effects
132249	0				There are substantial issues of coordination and inconsistencies between chapter 12 and 11. It has been agreed in the pre-LAM meetings that assessments on heat extremes, droughts, heavy precipitation and wind will be coordinated by chapter 11, with dedicated cross-chapter teams on these topics. Chapter 12 should refer to these assessments but not provide a separate assessment on these topics. On the other hand, some of the flood assessment in chapter 11 could possibly be moved to chapter 12. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: inconsistencies are resolved from the cross-chapter groups
96155	0				We are very disappointed that Ch12, in contrast to Ch4 is mostly limited to RCP8.5. We are strongly concerned that RCPs that are more relevant for the Paris Agreement and the warming resulting from current NDCs are omitted. Please provide policy relevant information, or if not possible, explain why, e.g. lack of literature. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: Note that in SOD CH12 has assessed all scenarios with existing literature, and regional figures also show RCP2.6; but global figures and tables only show 8.5; we have now included more global maps with SSP126

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132257	0				It is mentioned in the Chapter 12 ES that "Chapter 12 synthesizes knowledge from previous chapters". This is a significant challenge. The AR6 synthesis is actually supposed to happen in the TS and SPM. Timewise, it is difficult for a chapter working on its text in parallel to other chapters to provide synthesis material. A better mechanism needs to be put in place to ensure that material from other chapters can be correctly integrated in chapter 12. Chapter 11 authors did not feel that this process worked out sufficiently well in the preparation of the SOD. This resulted in a lot of the chapter 12 material on extremes being inconsistent with the chapter 11 assessment. Regarding the integration of chapter 11 material in the FGD version of chapter 12, we agreed to have joint teams working on respective extremes and CIDs. We expect from chapter 12 to provide us a framework on how chapter 11 can provide informed input and feedback on the chapter 12 assessment, not only at regional level but also and more importantly at CID level given the chapter 11 structure. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: cross chapter teams were formed to harmonize the flow of information. CH12 does not synthesize all information from other chapters, but synthesizes the necessary information which is relevant to impacts. TS and SPM indeed have this overall synthesis role.
132265	0				Much of the Chapter 12 ES focuses on the RCP8.5/SSP5-8.5 scenario. This might be a liability for the AR6 as this scenario has been described as not being realistic because of its underlying emissions assumptions (Hausfather and Peters, Nature, 577, 618-620). On the other hand, the global warming levels reached under this scenario could happen notwithstanding, even under scenarios with lower emissions, because of underestimated global feedbacks or if tail risks are investigated. The chapter 12 ES does not sufficiently discuss its rationale for this focus and the extent to which it might affect its assessment (or not). [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: Only global figures and Tables focused on RCP85, but regional satellite figures were using 2 extreme scenarios. The assessment was using all scenarios, with some imbalance also due to literature imbalance. In any case in the revised version, more balance is put on scenarios, and scenario differentiation is made more clear in the ES, figures, tables and text
132273	0				I have some trouble to understand the current focus of the chapter 12 ES. Except of the two first excellent paragraphs, much of the rest of the material seems to be just a 2nd extreme chapter focused on regional changes and RCP8.5/SSP5-8.5. This would seem redundant with chapter 11, in addition to the fact that many statements are inconsistent with the chapter 11 assessment. I mention other issues and suggestions for improvement in separate comments. [Sonia Seneviratne, Switzerland]	NOTED: The remits of each regional chapter have been clarified during the pre-LAM activities. Regarding CH12, focus is on climate conditions that are prone to induce impacts (CIDs), and to a region-by-region assessment, with focus on timing and scenario, while physical explanations are given in other chapters.
110257	0				Section 12.6 feels more the scope overall of chapter 10 than of chapter 12 and I would recommend consideration of moving this material there so that chapter 12 can focus upon other aspects. This would likely include moving the associated cross-chapter box. [Peter Thorne, Ireland]	REJECTED: CH12 has the mandate to link with impacts and climate services is quite natural in this perspective
132275	0				My understanding from the scoping for chapter 12 was that it would address the sectoral dimension of changes in CIDs. However, except in Europe, there is no explicit mention of any sectoral aspects (e.g. agriculture, health, etc) in the chapter 12 ES. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: this can only be done with parsimony due to impossibility to enter the impact assessment
132277	0				It would be very valuable if the Chapter 12 could introduce the rationale for the choice of CIDs since this is a main new contribution to WG1. Two to three paragraphs of the ES could focus on this description of CIDs: Each CID could be introduced and described, including their relation to sectoral impacts and why they are relevant for the IPCC assessment. [Sonia Seneviratne, Switzerland]	ACCEPTED: The ES now introduces the CID concept
70325	0				I think it is a pity that IPCC had not integrated the study on environmental journalism, as journalism has a big role in conceptualizing and embodying the abstract environmental issues to the public, including policy makers. There are already rich literature in this environmental journalism field (media), and I think IPCC need to consider to assess this field of study too. [Masako Konishi, Japan]	NOTED: However it is not in the remit of WGI which focuses of physical science
110261	0				All three FAQs are much shorter than the FAQs in other chapters are. Is there a need to provide a little more detail or two merge these down to two rather than three FAQs? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We are working with the TSU to provide FAQs that are richer in content and useful in presentation. We have combined these three FAQs into 2 and added 2 more: one on the definition and utility of climatic impact-drivers, and the other on climate services utility of RCP/time information versus global warming level information.

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110267	0				The figures are tending to try to pack a huge amount of information in and are very complicated. This makes them very hard to be used in a standalone context for outreach or education purposes. The Ar6 report should be aiming to produce self-describing figures that can be easily used in outreach. In general the figures in this chapter are too complicated with too many small and intricate panels which will be barely legible in final print version and would be challenging to use in an outreach or education context. [Peter Thorne, Ireland]	ACCEPTED: Figures have been simplified
114887	0				What is the purpose of Chapter 12. It acts as a bridge to the WG2 report as much of the material covered here might belong in this report. It downscales some climate issues, which I presume is considered useful for regional chapters and users. However, the boundaries in terms of issues considered are not as clear -- coastal erosion for example an issue linked more to risk. This needs a better justification. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	NOTED. CH12 assesses aspects of physical climate that induce potential impacts. Erosion is as linked to risk as is fluvial flooding or coastal flooding is. All remain in the physical domain. Impacts and adaptation is required for all of this which is where WG2 comes in.
114893	0				Although this may seem an unkind comment to the hard work of the writing team, parts of Chapter 12 are rather dull and repetitive in a way that would hinder anybody reading it as a chapter. Would much of the material in Section 12.4 be better as a series of appendices and a shorter Section 12.4 drawing out the key points? The main text could consider where do the regions differ in important and significant ways that influence climate risks. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Sections 12.4.X are shortened with CID/sectoral material now more emphasized
114895	0				There are also some conclusions in Chapter 12 (section 12.4) which could be debated, such as China's coast accreting or the UK not seeing a rise in sea level extremes -- if I understand correctly. They seem to be based on a few regional or global studies -- what are the uncertainties of these estimates? This does not seem to be considered. For example in the UK we are preparing for a large rise in extreme sea levels and in the Thames estuary have quite a sophisticated approach to deal with the uncertainties of future rise. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We checked that executive summary statements and specific examples are robust in our assessments.
132313	0				Chapter 12 does not address a key area for the communication of climate change information, namely legal frameworks. For instance an article by Lloyd et al. (in review in "Studies in History and Philosophy of Sciences", and submitted before the December 31 2019 cut-off date; I can share it with the chapter 12 authors) shows that the relevant confidence level in civil courts in the US is more or less equivalent to "more likely than not", i.e. >50%. This shows that a focus for IPCC assessment need not necessarily be for highest "signal to noise ratio", i.e. RCP8.5, but rather for most useful information with some acceptable level of confidence. [Sonia Seneviratne, Switzerland]	REJECTED: We agree this would be very interesting; however the team does not have expertise for this and the assessment of communication is a bit peripheral to our remit
114909	0				How do the numbers in Chapter 12 change if the numbers in earlier chapters are revised. Do the numbers in Chapter 12 also change, or this not such a hard coupling. This is not clear to me. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: WGI has organized regional teams to ensure consistency across chapters
32223	0				France has a major concern with the current division of Europe into geographic domains, especially for the Central Europe domain. Indeed, the current "Central Europe" covers a domain with completely different climates. We strongly recommend to choose a new division which makes it possible to separate the Western part of Europe, which has a maritime climate, from the Eastern part which has a continental climate. If it is not the case, all Tables and messages in the vol1 SOD SPM and Chapters referring to the current "Central Europe" would be completely meaningless and useless for France. We recommend to adopt for the Atlas the division mentioned in the first paragraph of 12.4.5. [Eric Brun, France]	REJECTED: The question has been passed to the Atlas who defined the regions. The proposition was rejected on the basis that Central/Eastern Europe climate is not so different from Western Europe at the scale at which the regions are built worldwide
132327	0				I am missing in the chapter an exact explanation of: 1) where the underlying physical material used in chapter 12 is coming from (e.g. acknowledge where material is (supposed to be) taken from chapters 11 or 9), 2) where specific basic assessments are done in chapter 12, 3) and where and how chapter 12 is merging/reassessing the existing material from the other chapters. This would need to be documented for each CID to allow traceability of the chapter 12 material to the other chapters it is building upon. [Sonia Seneviratne, Switzerland]	ACCEPTED: Text in 12.2 is modified to reflect all sources of information that has been used in the Ch 12 assessment

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
132335	0				I would strongly recommend Chapter 12 to provide lists of indices of most relevance under each CID and sector and how they can be computed from WG1 data. This list would provide a valuable extension compared to the ETCCDI indices. This information could be provided in tables that list relevant indices and how they are defined. The Atlas could then compute observed and projected changes in these indices. Chapter 11 could help with this selection of impact-relevant indices. [Sonia Seneviratne, Switzerland]	NOTED: Technical Annex VII provides such a list
132339	0				I was very surprised to see that Chapter 12 overlooked an important WMO activity which is fully aligned with its objectives, namely the "Expert team on sector-specific indices" (ET-SCI, https://climimpact-sci.org/about/project/). The ET-SCI has determined a list of relevant sector-specific indices and their definitions (https://climimpact-sci.org/indices/). Chapter 12 should document and assess this activity and use relevant material from it (e.g. choosing indices selected by ET-SCI to be computed by the Atlas for the AR6 WG1 assessment) [Sonia Seneviratne, Switzerland]	ACCEPTED: Section 12.3 actually builds partly upon ET-SCI work
88059	0				The various glacier sections in Ch12 are of very different quality but have basically all the problem of being rather decoupled from Ch9 where glaciers are assessed comprehensively and to a large extent also on regional scales. It is highly recommended to start and refer to respective Ch9 (also Ch8) material and only add material where it is explicitly region specific. There is also, with few exceptions, not sufficient reference made to AR4, AR5, and AR6 SROCC which would be appropriate in many occasions. My specific comments are probably not covering the full extent of the problem. Therefore, an overall revision of the glacier sections is recommended. [Georg Kaser, Austria]	ACCEPTED: Cryo CID sections are updated by new CAs from Ch 9
34957	1	1	1	1	Detailed Comments by SOD Chapter – Chapter 12: There is little point in commenting on regional impacts until the global impacts are correctly presented. See general comments #1 to #12 inclusive. [Jim O'Brien, Ireland]	NOTED: However, CH12 does not assess regional impacts neither global ones
87713	1	1	1	1	Take out the second "for" [Bonita Sharma, United States of America]	REJECTED: All chapter titles were decided at the scoping meeting prior to the commencement of work on AR6. These titles cannot be changed
7367	1	1	1	1	The title is grammatically incorrect. Delete the second "for". [Hans-Martin Füssel, Denmark]	REJECTED: All chapter titles were decided at the scoping meeting prior to the commencement of work on AR6. These titles cannot be changed
79519	1	1	120	20	The climate change fact is intensive among the Middle East countries and especially Iran. Iran will experience an increase of 2.6 °C in mean temperatures and a 35% decline in precipitation in the next decades (Mansouri Daneshvar et al., 2019). Iran is experiencing unprecedented climate-related problems such as drying of lakes and rivers, dust storms, record-breaking temperatures, droughts, and floods (Ashraf Vaghefi et al., 2019). (comment by: f_ansari44@yahoo.com) [Hanieh Zargarlollahi, Iran]	TAKEN INTO ACCOUNT: West Asia Assessment is carried out with a broad assessment using available peer-reviewed literature. We however missed this reference and apologize, this could be added in the final version.
67087	1	1	233	70	the parts of this chapter that report on glaciers appear not well researched and assessed. Often some seemingly 'random' paper is cited where there is a lot more available providing a more nuanced picture than provided here. Many statements are not correct. All glacier parts should be carefully checked for content. [Regine Hock, United States of America]	ACCEPTED: Cryo CID sections are updated by new CAs from Ch 9

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64029	1		140		All resources that are mentioned as reference for statistical data presented and future projection should be attached within an Annex to be revised and to be a source of verification. Again the basis upon which the projections were made should also be referred to either within the main report body or in an Annex, since it appears that projections are made on normal extrapolation to the actual and historical data available in literature. This makes the presented report an additional piece of literature and not a real guideline upon which governments could set their strategies and policies concerning industry, economy and relate them to the ecosystem, which should be the basic role of such report. Conclusions by the end of each region should be more precise with exact statistical numbers, not only reference to confidence levels, since each confidence level represents a wide array of probabilities, and when it comes to strategic decisions, level of confidence alone is not credible. No risk or contagious plan could be set based on confidence level only. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOTED: All data sources are indicated in Data Tables
63685	2	8	2	8	Climatic Impact Drivers are not described by "sectors" inside 12.3 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Section 12.3 is now organized by CID type and then describe sectors, but the scope is to link with sectors
63623	3	25	3	25	This is at introduction page of chapter 12 and the Cross-Chapter Box 12.1 is mentioned as "East Asia 2013 Heat Extreme Case Study". Even though, there is data from Central and South Africa to small islands. It would be better if the Cross-Chapter Box 12.1 is mentioned as "2013 Heat Extreme Case Studies According to Regions". [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: This is a misunderstanding. The Cross chapter box is a single item and not top level section
102601	5	32	58	32	also many spelling errors on this page; this line: what is the high-frequency season? [Philippe Tulkens, Belgium]	REJECTED: Comment does not relate to pages/lines indicated
96157	6	35	6	35	"para. #3": Replace reference to paragraph. [Nicole Wilke, Germany]	REJECTED: There is no line 35 on Page 6
63981	7	0			This is an introduction page of chapter 12 and the word "Sectors" have been mentioned multiple times. However, there is no further information regarding which sectors are referred to. Furthermore, when I read further, there are 7 sectors mentioned in section 12.2 under methodological approach. So if the sectors explained in section 12.2 and sectors in the introduction page are the same. Then, it would be better if the authors mention what are the sectors in the introduction page. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We list the sectors earlier in the chapter. Here we follow the sectoral organization established by Working Group II (as seen in Table 12.2, for example).
112783	7	1	7	1	The list of items here reads as a somewhat inconsistent and unclear start of what is otherwise a really strong chapter... Climate information is one element of assessing impacts (and risks -- I would add these) alongside vulnerability. Providing this information for decisions is climate services. That process of risk-informed decisions results in adaptation. [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: We ensure that our text is consistent with the overall AR6 risk assessment framework language. This includes assessing risk as the intersection of hazard, vulnerability, and exposure, with Climatic Impact-drivers providing sectoral impacts-relevant climate information that becomes a hazard when connected to detrimental impacts that put those sectors at risk.
52079	7	1	9	38	Social, economic impact as well as the risk will play a major role. At least reflecting some light into this aspect might be useful in case if it's not quantifiable. Since many political and administrative decisions might be driven based on these factors [Amarasinghage Tharindu Dasun Perera, Switzerland]	NOTED: Such reflections are not within the scope of Ch 12
55189	7	1	9	39	There are a number of things that appear in this Executive Summary that repeat material presented in earlier chapters. For example general statements about temperature increase, sea level rise, ocean acidification, marine heat waves, etc. It is not at all clear why this is repeated in Ch. 12, and it opens the possibility of inconsistencies. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: For the sake of completeness it is necessary to summarise some material reported in other chapters in order to have a complete assessment of all CIDs in Ch 12. As we are working very closely with the other WG1 chapters (for e.g. via thematic and regional cross chapter groups) there is no room for inconsistencies.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
32793	7	1	200	50	The climate change fact is intensive among the Middle East countries and especially Iran. Iran will experience an increase of 2.6 °C in mean temperatures and a 35% decline in precipitation in the next decades (Mansouri Daneshvar et al., 2019). Iran is experiencing unprecedented climate-related problems such as drying of lakes and rivers, dust storms, record-breaking temperatures, droughts, and floods (Ashraf Vaghefi et al., 2019) [sadegh zeyaeyan, Iran]	TAKEN INTO ACCOUNT: Mean temperature and precipitation changes in observations and climate model projections are assessed in the Atlas and summarized in Chapter 12. We note changes in aridity in Iran within 12.4.2.2 and literature for Iran is assessed as part of the West Central Asia (WCA) region CID change assessment in 12.4.2.
32795	7	1	200	50	Observations unequivocally show that Iran has been rapidly warming over recent decades, which in sequence has triggered a wide range of climatic impacts. Consequently, an increase in the frequency of heat extremes and a decrease in the frequency of cold extremes have been observed. (Choobari et al., 2018). [sadegh zeyaeyan, Iran]	REJECTED: CH11 is in charge of extremes while ch12 only provides a broad summary of extremes. Mean precipitation and temperature are assessed in detail in the Atlas
32797	7	1	200	50	The annual precipitation has decreased by 8 mm per decade, causing an expansion of Iran's dry zones (Choobari et al., 2018). Compared to the period of 1980–2004, in the period of 2025–2049, Iran is likely to experience more extended periods of extreme maximum temperatures in the southern part of the country, more extended periods of dry (for ≥ 120 days: precipitation < 2 mm, $T_{max} \geq 30$ °C) as well as wet (for ≤ 3 days: total precipitation ≥ 110 mm) conditions, and higher frequency of floods. Overall, the combination of these results projects a climate of extended dry periods interrupted by intermittent heavy rainfalls, which is a recipe for increasing the chances of floods. Without thoughtful adaptability measures, some parts of the country may face limited habitability in the future (Ashraf Vaghefi et al., 2019). [sadegh zeyaeyan, Iran]	TAKEN INTO ACCOUNT: Mean temperature and precipitation changes in observations and climate model projections are assessed in the Atlas and summarized in Chapter 12. We note changes in aridity in Iran within 12.4.2.2 and literature for Iran is assessed as part of the West Central Asia (WCA) region CID change assessment in 12.4.2.
32799	7	1	200	50	This condition (extrem rainfalls, higher frequency of floods together with human interference) have been also lead to higher risk of soil erosion and landslids. (GSI National Map for Landslide Potential, 2020. GSI National Map of Geological Units, 2020. National Map for Erodibility of Geological and Old Rock Units, 2020.) [sadegh zeyaeyan, Iran]	NOTED: however we do not find the reference as a peer-reviewed article
32801	7	1	200	50	The outbreak of the corona virus and its spread around the world have significantly reduced the production of carbon and greenhouse gases, which can be found in the form of climate change, before and after corona, in the kidneys. Scientific research on climate change should be considered. The global COVID-19 quarantine has meant less air pollution in cities and clearer skies. Animals are strolling through public spaces, and sound pollution has diminished, allowing us to hear the birds sing. (Larissa Basso, Postdoctoral Fellow, Environmental Research in the Human Sciences, Stockholm University, May, 2020). It would be a way to identify the factors reducing greenhouse gas emissions and their effects on the economy and the environment from the perspective of climate change for human society to be more precise subject matter. The amount of carbon dioxide humans are responsible for generating worldwide each day fell by 17 percent this April compared to the daily average for 2019 (Justine Calma, May 19, 2020, The COVID-19 pandemic cut carbon emissions down to 2006 levels) [sadegh zeyaeyan, Iran]	NOTED: A cross-chapter box is now devoted on COVID
33123	7	1	200	50	The climate change fact is intensive among the Middle East countries and especially Iran. Iran will experience an increase of 2.6 °C in mean temperatures and a 35% decline in precipitation in the next decades (Mansouri Daneshvar et al., 2019). Iran is experiencing unprecedented climate-related problems such as drying of lakes and rivers, dust storms, record-breaking temperatures, droughts, and floods (Ashraf Vaghefi et al., 2019) [Sahar Tajbakhsh Mosalman, Iran]	NOTED: we unfortunately missed this reference
33125	7	1	200	50	Observations unequivocally show that Iran has been rapidly warming over recent decades, which in sequence has triggered a wide range of climatic impacts. Consequently, an increase in the frequency of heat extremes and a decrease in the frequency of cold extremes have been observed. (Choobari et al., 2018). [Sahar Tajbakhsh Mosalman, Iran]	REJECTED: CH11 is in charge of extremes while ch12 only provides a broad summary of extremes.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33127	7	1	200	50	The annual precipitation has decreased by 8 mm per decade, causing an expansion of Iran's dry zones (Choozari et al., 2018). Compared to the period of 1980–2004, in the period of 2025–2049, Iran is likely to experience more extended periods of extreme maximum temperatures in the southern part of the country, more extended periods of dry (for ≥ 120 days: precipitation < 2 mm, $T_{max} \geq 30$ °C) as well as wet (for ≤ 3 days: total precipitation ≥ 110 mm) conditions, and higher frequency of floods. Overall, the combination of these results projects a climate of extended dry periods interrupted by intermittent heavy rainfalls, which is a recipe for increasing the chances of floods. Without thoughtful adaptability measures, some parts of the country may face limited habitability in the future (Ashraf Vaghefi et al., 2019). [Sahar Tajbakhsh Mosalman, Iran]	REJECTED: CH11 is in charge of extremes while ch12 only provides a broad summary of extremes. Mean precipitation and temperature are assessed in detail in the Atlas
33129	7	1	200	50	This condition (extrem rainfalls, higher frequency of floods together with human interference) have been also lead to higher risk of soil erosion and landslids. (GSI National Map for Landslide Potential, 2020. GSI National Map of Geological Units, 2020. National Map for Erodibility of Geological and Old Rock Units, 2020.) [Sahar Tajbakhsh Mosalman, Iran]	NOTED: however we do not find the reference as a peer-reviewed article
33131	7	1	200	50	The outbreak of the corona virus and its spread around the world have significantly reduced the production of carbon and greenhouse gases, which can be found in the form of climate change, before and after corona, in the kidneys. Scientific research on climate change should be considered. The global COVID-19 quarantine has meant less air pollution in cities and clearer skies. Animals are strolling through public spaces, and sound pollution has diminished, allowing us to hear the birds sing. (Larissa Basso, Postdoctoral Fellow, Environmental Research in the Human Sciences, Stockholm University, May, 2020). It would be a way to identify the factors reducing greenhouse gas emissions and their effects on the economy and the environment from the perspective of climate change for human society to be more precise subject matter. The amount of carbon dioxide humans are responsible for generating worldwide each day fell by 17 percent this April compared to the daily average for 2019 (Justine Calma, May 19, 2020, The COVID-19 pandemic cut carbon emissions down to 2006 levels) [Sahar Tajbakhsh Mosalman, Iran]	NOTED: A cross-chapter box is now devoted on COVID
86301	7	1			A lot of references to increase/decrease without specifying the magnitude. [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED: Magnitudes of CID changes are indicated in Figures and Text, but were not elevated to the ES in order to deliver clear and strong but qualitative messages in the ES
53549	7	1			There is no mention of changes in seasonality in the ES. Yet, a similar hazard may have contrasted impacts depending on the season when it occurs. I would therefore suggest a more careful assessment of potential changes in seasonality across the CIDs (e.g., expansion of wildfire season in multiple regions?) and to elevate related key findings in the ES. [Hervé Douville, France]	TAKEN INTO ACCOUNT: Revised CH12 does better account for changes in seasonality
64303	7	1			Executive Summary: Consider checking your uncertainty language when referring to locations and climate factors in one sentence as some of them read as if the confidence is associated with the location rather than the increase or decrease. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Uncertainty language usage in the ES is carefully re-assessed and updated

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115045	7	2	7	2	Suggest that neither of the words "sectoral" or "assessments" are appropriate. With reference to Table 12.2 (and thus the relevant WG II chapters) things such as ecosystems and poverty in column 1 are not "sectors" and "asset" does not seem the right word to describe the elements in column 2, e.g. deserts, streamflow. Suggest "system components" instead. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines). - The reviewer makes an excellent point about the lack of clarity in given examples of sectoral assets listed within Table 12.2. "Deserts" are now clarified as "desert ecosystems", for example, which is a particular type of terrestrial ecosystem that is an asset due to its many ecosystem services (in addition to intrinsic value as a natural environment). This matches the basic categorization of sub-sections within Working Group II Chapter 2. To reduce ambiguity, we refer to "Streamflow and surface water" as an
31353	7	3	7	3	Suggest "... information for vulnerability and impacts assessments, adaptation..." [Markku Rummukainen, Sweden]	NOT APPLICABLE: Sentence and para has been completely updated
88935	7	3	7	4	Climate information is useful at global, regional and local scale. Although this chapter focuses on regional context, adaptation and resilience building is also very important at the national or local/community level (project scale). It is recommended that this is reflected in the opening narrative before zooming in to the regional context. [Joseph Intsiful, Republic of Korea]	REJECTED: As the maximum level of granularity adopted in AR6 WG1 is the AR6 regions level we do not feel it is appropriate for us to comment on resolutions finer than this.
90563	7	3	7	4	"Useful climate information for vulnerability, impacts, adaptation, and climate service applications depends on the regional context and sectoral assets in focus." This statement needs an explanation of how and why this information depends on the regional context and sectoral assets in focus, it needs evidence and clarification. Hence it will be convincing and permitting the interaction between reader and text to keep the reader focusing and understanding continuously without getting lost. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: Sentence and para has been completely updated
90571	7	3	7	10	All in all, this executive summary should be reconsidered to be pointful and more relevant to the both content and title of the chapter. In addition, it deals with a continental scale which is different more enough from the regional scale as the scope of this very chapter. I think that regional-scale would be for a zone with homogenous climatic and ecological conditions [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The ES has been completely revised and now focusses on patterns of CID changes rather than a comprehensive summary of regional changes in all CIDs. While some statements are applicable regardless of scenario some are applicable for certain scenarios and time horizons. In the case of the latter, the applicability is clearly indicated.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55181	7	3	7	12	Given the importance of chapter executive summaries as sources of key assessed conclusions, it is important to be clear about whether or not the paragraphs describing assessed projected changes in regional climate indices are true as general statements, regardless of emission scenario. We think the authors have formulated these as general statements (unless stated specific to a single emission scenario) but this is not said explicitly other than in para 3. Recommend adding text to the preface to this executive summary to explain this (if it is too unwieldy to do in each para). [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: The revised ES focusses on patterns of CID changes rather than a comprehensive summary of regional changes in all CIDs. While some statements are applicable regardless of scenario some are applicable for certain scenarios and time horizons. In the case of the latter, the applicability is clearly indicated.
38439	7	3	7	13	Since this is the first occurrence of "Climate Impact Drivers" in the text, we request authors to give more description of this concept. It is not clear whether CID only represent Climate Hazard or also include socio-economic aspects (such as vulnerability, exposure, adaptive capacity etc). This is clarified later in the chapter on page 10 line 15-16. However, it will be useful to include it here. [Mansour Almazroui, Saudi Arabia]	ACCEPTED: the concept is now explained in the second ES paragraph
44097	7	3	7	13	For a better understanding, please include some examples of relevant Climatic Impact Drivers to clarify whether they fully absorb the context of climate hazards (floods, droughts, cyclones etc) or also include a vulnerability/resilience (socio-economic) angle as well. Information presented on page 10 line 15-16 can be included here. [Lamin Mai Touray, Gambia]	ACCEPTED: the concept is now explained in the first ES paragraph with an example
99159	7	3	7	13	The Summary, at least, seems to devote too little, if any attention to the risks of very significant sea level rise. Agreed, the earlier chapters don't either and they are mistaken in my view for not acknowledging the risk so that there can be better long-term planning, but just because the earlier chapters did not do enough is not an excuse for not devoting much more attention to this issue. It is a little like the difference between a hen and a pig in providing sustenance for people--the hen can provide eggs and survive to another day whereas the pig will not survive. There are technological ways to stay cool--expensive, perhaps, but they exist; for significant sea level rise, coastal cities will mainly need to be abandoned, requiring relocation of all services and residents. Though perhaps a lower near-term concern, the long-term risk is very, very high: the equilibrium sea level sensitivity to global warming based on paleo records is of order 15-20 METERS of sea level rise per degree C in global warming, and from 20,000 to 8,000 years ago sea level rose at an average rate of a meter per century while the temperature was going up on average 1 C per every 2000 years. The assurances in the earlier chapters that the greater warming rate likely for the 21st century will only lead to a meter of sea level rise and ultimately only a few meters is not at all convincing given the Earth's climatic history, and this chapter needs to address this. [Michael MacCracken, United States of America]	REJECTED: The first para of the ES has been re-written to better reflect what Ch 12 is about and how Ch 12 connects to other WG1 chapters and WG2. Moreover this comments is more about impact and adaptation and as such not directly applicable to WG1.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
29335	7	3	7	13	<p>This introductory paragraph of the Ch12 ES would seem to be the place to state the definition of climatic impact drivers. Most readers will have not come across the terminology of CID before and so it is vital that the definition is made here, otherwise its meaning will be lost and the readership will revert to referring to climate hazards.</p> <p>The only attempt at a definition given here appears in the sentence on lines 6-7 and is rather abstract and not a true definition: "These climatic impact drivers can take the form of hazards when they lead to negative impacts, or can lead to beneficial impacts, or both, depending on sector and/or region". Instead of suggesting what a CID can "take the form of", a succinct "glossary definition" is needed. I suspect this definition also needs to be stated in Chapter 1 to avoid misconceptions.</p> <p>For example, are "greenhouse gas", "solar forcing" and "the Pacific Decadal Oscillation" not examples of drivers of climatic impacts? There is nothing currently within the ES paragraph here that would exclude these aspects, yet they are not at all what Chapter 12 means by CIDs. This is the inherent danger of assigning new meaning to terms that are already understood in everyday language, and underlines the case for making sure that CID is defined extremely well here.</p> <p>I suggest a much more careful definition is needed. This is only a possibility:</p> <p>Climatic impact drivers are aspects of the physical climate system that drive impacts in various socioeconomic sectors at the global or regional scale. Such climatic impact drivers can be negative (formerly known as climate hazards, such as increased flooding, leading to infrastructure damage) or beneficial (such as reduced occurrence of frosts, leading to increased agricultural yield). [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]</p>	ACCEPTED: the CID concept is now explained in the 2nd ES paragraph
39335	7	3	7	13	<p>This being the ES, it is being suggested that the terms "climate impact drivers" and "tailored climate impact drivers" be defined/explained before its usage for readers who will choose to read this chapter only, not the science chapters. I suggest further that the word "climate" be inserted before "hazards" in line 6. [Lourdes Tibig, Philippines]</p>	ACCEPTED: the CID concept is now explained in the 2nd ES paragraph
86215	7	3	7	13	<p>This opening paragraph of the ES is unnecessarily technical and complicated, using multiple jargon terms in one sentence. Authors are requested to aim for clear, common English especially in the various summary sections, boxes, tables and figures, and the introductory and concluding sections of chapters. This is where the non-specialist readers will land. [Debra Roberts and the Durban WGII TSU, South Africa]</p>	TAKEN INTO ACCOUNT: Sentence and para has been completely updated
64293	7	3	7	21	<p>I couldn't find a definition of sector - are you referring to regions of the planet or fields of industry/research? It seemed that it could be interpreted both ways at times. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	NOTED: The sectors we allude to are the WG2 sectors. This is now indicated at the end of ES Para 1
132251	7	3	7	21	<p>Excellent text. [Sonia Seneviratne, Switzerland]</p>	NOTED: Noted with thanks.
52619	7	3			<p>I would add 'usable' after 'useful' [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]</p>	NOT APPLICABLE: Sentence and para has been completely updated. "Useful" does not appear in the revised text
110083	7	4	7	4	<p>sectoral assets in focus is a bit of odd phraseology - something like and sector under consideration may be a bit clearer to the reader? Either that or explicitly define what you mean by a sectoral asset by way of an example here as it isn't intuitively obvious to a reader like me what these are. For ES comprehension it would be important to define by way of an example on first use what you mean by the term sectoral asset. [Peter Thorne, Ireland]</p>	ACCEPTED: "Sectoral assets" do not appear in the revised ES
126243	7	4	7	4	<p>"... in focus should be considered." [Trigg Talley, United States of America]</p>	NOT APPLICABLE: the phrase does not appear in the revised ES

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126241	7	4	7	6	Unclear language in line 5. What do the authors mean by "tailored climate impact drivers"? Do the authors, or people who generate climate change information and risk assessments, have the power to tailor climatic impact drivers? They can tailor climate change information about the drivers. They can tailor the analyses that relate climate conditions to sectors. However, they cannot tailor the drivers. Suggest that the authors rewrite this sentence, to improve clarity. [Trigg Talley, United States of America]	ACCEPTED: "Tailored climate impact drivers" do not appear in the revised ES
90565	7	4	7	6	"Regional climate change information for impacts and for risk assessment requires an assessment of the changing profile of tailored climatic impact drivers that link climate conditions to sectors" This is not clear and not understood by the reader even though it is meant to clarify or to justify the former one. Also, it needs further logical convincing clear explanations and evidence. Moreover, words meaning like " profile, and tailored" should be succinctly reminded to know what they stand for in this stance of climate change. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: Sentence and para has been completely updated
45023	7	4	7	6	The sentence is overloaded, its logic and meaning are likely to be lost for a non-specialized reader. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Sentence and para have been completely updated
112785	7	5	7	5	The term "climate impact driver" is confusing. In WGII the word "impact" is reserved for observed/realised impacts, whereas the term "risk" would be used for potential future "impacts". I would strongly suggest reconsidering this -- either "climate impact/risk driver" or simply "climate driver". This also applies to the word (detrimental or beneficial) "impact" in this sentence -- this should also be conveying the difference between what is already observed and what could happen in the future (risks). Also applies elsewhere in the chapter [Maarten van Aalst, Netherlands]	REJECTED: introducing "risk" here implicitly means negative impacts, which we want to avoid. "Climate Driver" could be also interpreted as a driver of the climate, so this does not work either. However we have now revised this phrase to "Climatic impact-drivers"
45025	7	6	7	6	"These climatic impact drivers can take the form of hazards when they lead to negative impacts, or can lead to beneficial impacts, or both, depending on sector and/or region." ==> "These climatic impact drivers can have either negative or beneficial impacts, or both, depending on the sector and/or region concerned." [Christophe Deissenberg, Luxembourg]	ACCEPTED: Sentence has been updated to read "Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements, regions and society sectors."
15669	7	6	7	7	The sentence "These climatic impact drivers can take the form of hazards when they lead to negative impacts, or can lead to beneficial impacts, or both, depending on sector and/or region" seems in line with the novel take of IPCC on risk framing (Chapter 1). However, in many cases, assigning whether impacts are negative or beneficial depends on the corresponding system (and, potentially, with some judgment of value in some cases). With this apparently new definition of "hazard", I see several cases where the same change in climate conditions (climatic impacts drivers) can be referred to "hazards" or not. For example, more frequent and/or intense warm spells will probably referred to as a "hazard" from a human health point of view, although for some ecosystems, or at least some plants or animal species, it could be beneficial. I think that this new approach will greatly complicate the situation and, in contrast to what is probably intended, will not simplify the relationships between WG1 and WG2, because a lot of time will be wasted in deciding whether a change in climate conditions is a hazard or not (this requires a discussion between WG1 and WG2 on a case by case basis ...), without any added value for readers and policy-makers. Nevertheless, the use of the neutral term "climatic impact driver" is a potential way forward, along with reducing the use of the term "hazard" altogether. [Samuel Morin, France]	NOTED: The term hazard has not disappeared but the CID concept is broader and important for WGI to keep neutrality, and this is not a new definition of hazard. The propeller diagram in Chapter 1 now includes "hazard" while the CID concept is introduced outside the risk framework. See also: https://www.ipcc.ch/site/assets/uploads/2021/02/Risk-guidance-FINAL_15Feb2021.pdf .
63825	7	6	7	7	Reword - These climate impact drivers can be beneficial, negative, creating hazards, or both depending on the region and/or sector [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Sentence has been updated to read "Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements, regions and society sectors."

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90567	7	6	7	7	" These climatic impact drivers can take the form of hazards when they lead to negative impacts, or can lead to beneficial impacts, or both, depending on sector and/or region" this should have been shortened as follows " These climatic impact drivers can take the form of hazards or lead to beneficial impacts depending on sector and/or region" [Boubakeur Guesmi, Algeria]	ACCEPTED: Sentence has been updated to read "Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements, regions and society sectors."
63625	7	6	7	20	It has been touching upon sector/al several times in the paragraph. However, there is not much explanation about which sectors are really taking place? Thus, it would be better if authors give the general idea about which sectors are accentuated. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: The sectors we allude to are the WG2 sectors. This is now indicated at the end of ES Para 1
86209	7	7	7	7	"can lead to beneficial impacts" – suggest very careful wording re possible 'benefits' of climate change. Suggest rewording to "may sometimes lead to sector-specific, local and/or temporary perceived benefits". Sometimes we think it is a benefit, but only time will tell whether it is a true benefit in the long run, or after balancing everything. Alternatively avoid making judgment statements, and just stick to specific outcomes (e.g. reduced wind speeds would lead to reduced dust storms and related health issues). [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: Sentence has been updated to read "Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements, regions and society sectors."
16281	7	7	7	8	negative consequences are grouped under 'hazards' related to climate drivers. Positive impacts have no descriptor. Consider using 'opportunities' as the foil to 'hazards' in the latter part of the sentence to provide a grouping for those areas where intervention can produce valuable results. [Sarah Sutton, United States of America]	ACCEPTED: Sentence has been updated to read "Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements, regions and society sectors."
126245	7	7	7	10	It is important to note in the Executive Summary that ,while regional impact assessment has improved, there is unequal availability and application of these more advanced models across different regions and sectors. [Trigg Talley, United States of America]	REJECTED: We feel this is too much of a detail to mention in the ES
90569	7	8	7	10	the increased availability of coordinated ensemble regional climate model projections and improvements in the level of sophistication and resolution of global climate models have enabled the investigation of past and future evolution of a range of sector-relevant climatic impact drivers in many regions of the world." This is a too long confusing sentence mainly the description added to the subject of the sentence is too much and hence confusing. Less similarly, the object of this sentence is. This sentence should be reformulated and either shortened or subdivided. [Boubakeur Guesmi, Algeria]	ACCEPTED: Sentence has been reformulated, also mentioning the added value of attribution and vulnerability studies.
31355	7	9	7	9	Also regional climate models have experienced improvements in the level of sophistication and resolution, not only global climate models. [Markku Rummukainen, Sweden]	ACCEPTED: Sentence has been reformulated, and now specifically mentions the improvements in the level of sophistication and resolution of regional climate models.
132255	7	10	7	11	"Chapter 12 synthesizes knowledge from previous chapters". This is a significant challenge. The AR6 synthesis is actually supposed to happen in the TS and SPM. Timewise, it is difficult for a chapter working on its text in parallel to other chapters to provide synthesis material. A better mechanism needs to be put in place to ensure that material from other chapters can be correctly integrated in chapter 12. Chapter 11 authors did not feel that this process worked out sufficiently well in the preparation of the SOD. This resulted in a lot of the chapter 12 material on extremes being inconsistent with the chapter 11 assessment. Regarding the integration of chapter 11 material in the FGD version of chapter 12, we agreed to have joint teams working on respective extremes and CIDs. We expect from chapter 12 to provide us a framework on how chapter 11 can provide informed input and feedback on the chapter 12 assessment, not only at regional level but also and more importantly at CID level given the chapter 11 structure. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: This statement has been removed from CH 12 as it is not entirely a synthesis chapter as now highlighted in 12.2. While Ch 12 draws some information from other WGI chapters (notably Atlas, Ch 11 and Ch9) for assessments of a few of the 31 CIDs assessed in Ch 12, the vast majority of Ch 12 material has been drawn from published literature and model results analysed and assessed by Ch 12 authors. The thematic and regional groups established during the pre-LAM period have indeed ensured that there are no overlaps or inconsistencies between Ch 12 and other WG1 chapters.
126247	7	10	7	13	It would be helpful to list some climate impact drivers at the beginning of the document so the reader immediately understands what is meant by that term. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We now start mentioning specific CIDs from ES para 3 onwards
31357	7	12	7	12	As the regions have not been introduced yet in the text, "in each region" is ambiguous. Suggest "regionally" or "on regional scales". [Markku Rummukainen, Sweden]	ACCEPTED: Text has been modified (end of ES para 1) to indicate that here we are referring to AR6 regions as introduced in Ch1

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107861	7	13	7	13	It would be good to define 'climate impact driver' in this first paragraph of the executive summary. [Linda Mearns, United States of America]	ACCEPTED: the CID concept is now explained in the 2nd ES paragraph
55183	7	15	7	15	Surely the statement "Climate impact drivers affect a wide range of sectors (high confidence)" can be made as a statement of fact? "affect" is a non-directional verb. Nothing is said about magnitude of the affect. No specific sector is mentioned. This must be avoided as overuse of IPCC confidence language undermines its effectiveness. [Nancy Hamzawi, Canada]	ACCEPTED: This para has been significantly modified to ensure more clarity
90573	7	15	7	15	is this statement " Climatic impact drivers affect a wide range of sectors (high confidence)" written in bold as a title?. [Boubakeur Guesmi, Algeria]	ACCEPTED: This para has been significantly modified to ensure more clarity
112619	7	15	7	15	I'm really happy to see that this issue concerning hazards and risks has been resolved with some new wording describing the climate-related drivers, though I would add a hyphen to avoid any ambiguity: "climatic impact-drivers", to distinguish from "climatic-impact drivers" - see comment on SPM. I'm very sorry but ran out of time to review this chapter further (see time stamp on my excel file!) [Timothy Carter, Finland]	ACCEPTED: we have adopted this suggestion on using a hyphen. It has been propagated to all other WG1 chapters, TS and SPM.
41725	7	15	7	17	Definition of cross chapter box 1.3 was in Chp 12 consistent with Chp 1; minor comments you aggregated Climatic impact driver measurements in what so called of the Climatic impact driver's profile (magnitude, frequency, duration, timing, spatial extent) therefore it would be part of the definition in the box chap and glossary as well [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: we ensured consistency of all definitions
126249	7	15	7	21	The value of this finding is unclear. The key statement "Climate impact drivers affect a wide range of sectors" seems obvious; if these impact drivers did not affect many sectors, then there would be no rationale for writing this chapter. The language supporting the key statement is jargon-filled. On one hand, the message introduces some key terminology, such as indices and thresholds. On the other hand the language is vague. For example, the statement in lines 20-21, "These indices can use thresholds which can vary by specific sectoral system, region and asset" conveys what information exactly? Can an index use a threshold? How? Why? Plus, the language is imprecise - an index doesn't use a threshold, rather when an analyst combines index data with threshold data, then the analyst can make statements about exposure or risk. [Trigg Talley, United States of America]	ACCEPTED: This para has been significantly modified to ensure more clarity
77637	7	15	7	21	Very poorly written and confusing. States that the climate impact drivers can be measured by indices to represent thresholds ... but also that the indices USE thresholds; also that the climate impact drivers... can utilise proxies for climate impact drivers? Or is it the indices that utilise proxies. Extremely unclear. [Emer Griffin, Ireland]	ACCEPTED: This para has been significantly modified to ensure more clarity

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115047	7	15	7	21	Again suggest "systems" for "sectors" and "components" for "assets" in this statement. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
99263	7	15	7	21	I am not sure what the content of the entire paragraph is. The author team might want to consider the message again to make it more useful for the reader. This is a very vague starting paragraph for the chapter [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: This para has been significantly modified to ensure more clarity
45027	7	15	7	21	The whole paragraph needs reformulating. Here a suggestion: "They can be represented by a set of indices that are critical for the sectoral assets and may include the climatic impact driver's profile (magnitude, frequency, duration, timing, spatial extent). In many cases, however, it will be necessary to characterise the climate by other indices specifically tailored to the different assets within the sector considered. Climatic impact drivers that are difficult to directly observe or simulate can be replaced by proxies. Thresholds can be defined for the different indices, that lead when exceeded to specific risks or opportunities. These thresholds can vary depending on the sector, region and asset considered {12.3}. [Christophe Deissenberg, Luxembourg]	ACCEPTED: This para has been significantly modified to ensure more clarity
131431	7	17	7	18	Ambivalence. It is not clear what "They" in this sentence refers to. [Hans Poertner and WGII TSU, Germany]	ACCEPTED: This para has been significantly modified to ensure more clarity
87967	7	17			Rather than the word 'profile', could you say 'the relevant quantity of the climate impact driver such as magnitude, frequency, duration, timing, spatial extent' [Kathleen McInnes, Australia]	ACCEPTED: This para has been significantly modified to ensure more clarity. The word "profile" is not used anymore.
63827	7	18	7	18	Unclear what "They" refers to [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: This para has been significantly modified to ensure more clarity
131433	7	19	7	21	The second part of the paragraph uses vague language. It needs at least a follow-up sentence on what follows from these observations. [Hans Poertner and WGII TSU, Germany]	ACCEPTED: This para has been significantly modified to ensure more clarity

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
99267	7	21	7	22	this chapter needs to refer to WGII as they are doing an impact assessment here. Critical thresholds will depend on adaptation measures especially for sectors such as health and agriculture and hence this statement cannot be made without an assessment of adaptation options. it would be important that WG1 concentrates on describing the boundary conditions which make hazards more frequent and not assess the impact. [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The link to WG2 is now highlighted in ES para 1
15671	7	23	7	23	The use of "increased (decreased)" is misleading, I honestly don't understand what is meant there. If the intent is to say that "impacts are increasing and decreasing, depending on location, sector and context", then I think it is better to do so. The use of the parentheses here is quite unclear and could lead to strong misinterpretations. [Samuel Morin, France]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
115049	7	23	7	23	Suggest "changed" rather than "increased (decreased" and removing "almost" (to be consistent with SPM messages). [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
51651	7	23	7	24	The phrases 'increased (decreased)' and 'increasing (decreasing)' are confusing as it could be interpreted to mean a mixture of positive and negative impacts. Perhaps this could be simplified to 'There is high confidence that several climatic impact drivers have changed in almost all regions of the world in recent decades, and are expected to continue to change over the 21st century regardless of the climate scenario'? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
64295	7	23	7	25	I found the brackets used in saying that 'climate impact drivers increased (decreased)' very confusing. Are you suggesting that negative impacts are sometimes caused by an increase, but at others times a decrease? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
64057	7	23	7	25	Putting 'decreased' in brackets doesn't make the sentence really clear. In my opinion it would be better to say something on the lines of 'several climatic impact drivers have increased while others decreased in almost all regions of the world in recent decades, and are expected to continue increasing or decreasing over the 21st century regardless of the climate scenario' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
14945	7	23	7	25	While the format "increased (decreased)" reduces the number of words, also reduces the readability of the sentence. [Juan Rivera, Argentina]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
99265	7	23	7	25	This sentence basically just say things are changing. The message has been so strongly condensed that it is meaningless now. [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
16283	7	23	7	26	This would benefit from an introductory sentence so that readers understood 'increased (decreased)' means that primary drivers have changed with significance in many regions, but in different ways in different regions. Comments appearing later in the paragraph appear too late for the reader. [Sarah Sutton, United States of America]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
132253	7	23	7	30	Was this text coordinated and agreed upon with the underlying chapters? [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: Drafts of all WG1 Chapter ES's have been circulated among chapters several times and all comments received have been accommodated.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90575	7	23	7	33	In terms of expression, The statements " increased (decreased), increasing (decreasing) are contradictory, they should have been substituted by one verb like "vary or variate". Regarding the meaning, this conclusion of warming and ongoing warming would be generally valid and confirmed if there were not the recent ongoing quarantine of Coronavirus which has diminished the air pollution and subsequently the warming. Indeed industrial emissions would have drastically decreased due to this quarantine, and they nearly have quasi-totally stopped in some factories and industries. Consequently, warming would be mitigating, climate change decreases, and therefore impacts decrease.. In addition, the fact of the general temperature increase is not for all the months and season as my research revealed for the region of Djelfa where a slight cooling was in December and February (https://www.inderscience.com/info/inarticle.php?artid=84015) (https://www.researchgate.net/publication/316717713_Analysis_of_the_air_temperature_records_of_Djelfa's_meteorological_station_from_1975_to_2014_the_reality_of_Djelfa's_climate_warming) the CO2 increase should be verified in the recent context of Coronavirus quarantine. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable. Please note that here the warming we refer to is the long term trend.
55185	7	23	8	17	the formulation "increase (decrease)" and "increasing (decreasing)" is very opaque and will be misunderstood by many readers. Since this paragraph is refereced by several of the subsequent paragraphs, it has to be crystal clear. [Nancy Hamzawi, Canada]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
26431	7	23	8	20	The information given in the brackets is rather confusing and difficult to understand and should thus be expressed in a different way. See for example: "...decrease (increase) in mean wind speed in North Africa (Southern African regions)..."; "...to 10 (18)% and a decrease of 5 (11)% of peak flow..."; "...for mid-century (end-century)..." [Mare Sundström, Sweden]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
8653	7	23	8	32	I find absolutely necessary to homogenise the level of confidence for drought trends with Ch 11. In Ch 12 drought projections are stated to have high confidence but this is not assessed in Ch 11 (see pages 88-91). This comment is also valid for the assessment of the drought projections in the different continents. [Sergio Vicente-Serrano, Spain]	TAKEN INTO ACCOUNT: The thematic and regional groups established during the pre-LAM period have indeed ensured that there are no overlaps or inconsistencies between Ch 12 and other WG1 chapters.
114777	7	25	7	25	"regardless of scenario" is a bit too strong, and needs reformualtion. You may add "considered" or something like that. [Jan Fuglestedt, Norway]	NOTED: The para in question has been completely re-written. However, we have retained the phrase referred to here, as it is justified by the Ch 12 assessment - the boundaries of which are clearly indicated in 12.2 and 12.4.
108931	7	25	7	26	That's a very strong statement and it seems that it needs some time horizon. Are we really virtually certain that temperature raises EVERYWHERE on land in SSP1-1.9. I would expect that it could be masked at least for decades by internal variability. [Erich Fischer, Switzerland]	NOTED: The para in question has been completely re-written. The time horizons relevant to each statement in this para have now been defined.
110085	7	25	7	27	There is a slight concern here about recasting conclusions reached in the earlier chapters in such a manner. Also, what about the southern ocean which also may not warm as assessed in chapters 4 and 9? [Peter Thorne, Ireland]	NOT APPLICABLE: From ES para 3 onwards, the entire ES has been re-written. As such this comment is no longer applicable.
115051	7	26	7	26	Specify which "temperature". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: This refers to SST which is indicated as such in ES para 6.
115053	7	27	7	27	This is not the case for all of the North Atlantic, please correct the statement. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: Details of exceptions are provided in 12.4. It is not possible to mention exceptions in the ES for one CID and not for others.
31631	7	27	7	27	One policy relevant aspect on sea-level rise is the long term commitment beyond 2100 (e.g., Clark et al 2016). This aspect would be useful to remind at the level of the executive summary and in other sections related to relative sea level changes. Clark, P.U., Shakun, J.D., Marcott, S.A., Mix, A.C., Eby, M., Kulp, S., Levermann, A., Milne, G.A., Pfister, P.L., Santer, B.D. and Schrag, D.P., 2016. Consequences of twenty-first-century policy for multi-millennial climate and sea-level change. Nature climate change, 6(4), pp.360-369 [Gonéri Le Cozannet, France]	NOTED: The long term commitment in SLR does not fit within the remit of CH 12. It is discussed in detail in CH 9
87969	7	27			consider using 'during' or 'throughout' rather than 'along the21st Century' [Kathleen McInnes, Australia]	NOTED: Sorry we appear to have missed implementing this change in some places.

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5511	7	28		29	The recession does not concern only the sandy coast but also the rocky coast with cliffs [Benoit Laignel, France]	NOTED: We agree. However, due to availability of global scale assessment here we only assess shoreline retreat/progradation on sandy coasts. This has been made clear in 12.3 and throughout 12.4
64059	7	29	7	29	Including ocean acidification (OA) in this sentence makes it sound like OA is indeed a result of the rising sea surface temperatures and not CO2. It makes more sense to put this sentence in context/association with the next one (i.e. 'It is virtually certain that atmospheric CO2 will increase in all climate scenarios') [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Sentence has been reformulated to ensure more clarity
15125	7	30	7	30	The sentence "atmospheric CO2 will increase in all climate scenarios" reads odd to me. It creates confusion as CO2 seen as CID can be misinterpreted as that acting as GHG, and therefore being a driver of the warming itself, rather than a consequence. Also, the term 'climate scenario' can be confused with emission scenario; to this respect, the sentence 'under any emission scenario CO2 concentrations will increase' is not correct. My suggestion is to replace the term 'Atmospheric CO2 (concentration)' with a better one, in all chapter. After all, you speak about ocean acidification, not CO2 concentration in the ocean, which reads much better and does not lead to any misinterpretation. [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3
20771	7	30	7	30	Is atmospheric CO2 considered as a climatic impact driver? At any rate it does not belong to the same category as mean temperature or sea level. Unless you have in mind the effect on fertility of vegetation? [philippe waldteufel, France]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3. As this para refers to CIDs that are projected change in most regions of the world (with high confidence) we have however retained this CID in this para.
15673	7	30	7	30	The statement on "It is virtually certain that atmospheric CO2 will increase in all climate scenarios" should be positioned upfront in the paragraph or dropped. I don't see why it is mentioned in the middle of this paragraph. [Samuel Morin, France]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3. As this para refers to CIDs that are projected change in most regions of the world (with high confidence) we have however retained this CID in this para.
114775	7	30	7	30	"in all climate scenarios" needs, in my view, reformulation. Please specify which scenarios you have in mind here. In the 1.5 scenarios this is only valid up to a certain time [Jan Fuglestedt, Norway]	NOTED: The para in question has been completely re-written. However, we have retained the phrase referred to here, as it is justified by the Ch 12 assessment - the boundaries of which are clearly indicated in 12.2 and 12.4.
115055	7	30	7	30	Replace "climate" by "emissions". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: For the sake of consistency with assessments based on SSPs, we have retained the term climate scenarios here

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31359	7	30	7	30	The CO2 will increase in all climate scenarios is certain. Suggest referring to "during the 21st Century" or suchlike, i.e. refer to expected development in the climate system. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: we have now added "until net zero emissions are achieved" to the end of this statement.
55187	7	30	7	30	another example of inappropriate use of calibrated language. There are *NO* scenarios described anywhere in the report that do not have increasing CO2, so the 'virtually certain' qualifier is confusing and unnecessary. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3
132261	7	30	7	30	"It is virtually certain that atmospheric CO2 will increase in all climate scenarios": Not sure this sentence is very useful or even correct, would suggest to remove. First, atmospheric CO2 is alone not an intuitive "climate impact driver". In addition, some scenarios (RCP1.9) allow for a stabilization of global warming at 1.5°C, which by definition imply a stabilisation or even decrease in CO2 concentrations after the 2nd half of the 21st century. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3
15675	7	31	7	31	The statement "While the above projections are quasi universally valid" is ambiguous. I understand that "universally" refers here to "any location on Earth", but it could be understood differently ("universally" literally expands beyond the Earth, and is not specific to the geographical dimension). [Samuel Morin, France]	ACCEPTED: Sentence has been deleted. Regional variation is now mentioned in the first sentence of ES para 6.
107863	7	31	7	31	What does 'quasi universally valid' mean? Most abusive [Linda Mearns, United States of America]	ACCEPTED: Sentence has been deleted. Regional variation is now mentioned in the first sentence of ES para 6.
31361	7	31	7	31	Expression "quasi universally" would appear to be unnecessarily convoluted. Please consider a clearer expression. [Markku Rummukainen, Sweden]	ACCEPTED: Sentence has been deleted. Regional variation is now mentioned in the first sentence of ES para 6.
51653	7	31	7	31	suggest use of 'globally' instead of 'universally' here [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Sentence has been deleted. Regional variation is now mentioned in the first sentence of ES para 6.
132263	7	31	7	32	"it should be noted that these climatic impact drivers have regionally varying rates of change". This is not correct for CO2 concentrations, as they are well mixed. This is another good reason to remove the sentence on CO2 concentrations in this paragraph. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2 and also in 12.3
31363	7	32	7	33	The sentence "Climate impact drivers... per continent below." could be omitted (also sea level rise etc. vary regionally). [Markku Rummukainen, Sweden]	ACCEPTED: Sentence has been deleted.
45029	7	32	7	33	varying ==> different (both on line 32 and 33) [Christophe Deissenberg, Luxembourg]	ACCEPTED: Sentence has been deleted.
52621	7	32			I would add 'and magnitudes' after 'rates' [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Sentence has been deleted.
115057	7	33	7	33	If coasts (which are not everywhere) are included here, suggest adding ocean acidification (which is not captured in the other statements). [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110087	7	35	7	35	Given that paragraph 3 is not enumerated as such I would remove the text 'to changes described in para. #3'. Comment applies to all similar occurrences herein. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES
126251	7	35	7	35	"para. #3" is unclear. In the SOD, the paragraphs are not numbered, so this reference is not clear to the reader. Either number the paragraphs, or use some other description to refer to the paragraph. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
126253	7	35	7	35	Is it customary to refer to a paragraph of the document (i.e., in para. #3)? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
20275	7	35	7	35	So far, there is no numbered paragraph in this summary. [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
112973	7	35	7	35	"para. #3" need to refered specifically [Muhammad Amjad, Pakistan]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
114779	7	35	7	35	Check with TSU how to refer to previous paragraphs. I see the need, but not sure if this is the best way. Same comment apply to other places in ES [Jan Fuglestedt, Norway]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
115059	7	35	7	35	The phrase "in addition to ... #3" is awkward here and below, suggest replacing with "additionally" or similar. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
51645	7	35	7	35	Since the paragraphs aren't numbered, it seems unnecessarily confusing to refer to 'para #3' - would suggest referring to 'the paragraph above' or using a line reference instead. This applies to following paragraphs also referencing paragraph 3 or other paragraphs. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
38441	7	35	7	36	Please make sure if "Frequency of hot temperature (e.g., T _{max} > 40°C) is correct. Otherwise, please replace it with "Frequency of hot days" [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
38443	7	35	7	36	We suggest adding the following information in this statement "that extreme heat has increased in frequency and intensity in African regions according to the observed record" [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
110089	7	35	7	38	This must be would not will and should be counter-balanced by what would occur under a somewhat aggressive emissions scenario such as RCP2.6/SSP1-2.6 [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64061	7	35	7	38	I would clarify the sentence by including the word 'thus': 'will drastically increase by the end of the century under RCP8.5/SSP5-36 8.5, and thus increasing drought conditions are projected in North Africa, Southern African regions and 37 western part of West Africa (high confidence).' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
107865	7	35	7	38	This rather long sentence contains at least two main assertions. Do all these points really have the same confidence level? Also it seems odd to refer to a paragraph #3 (where is this?) in an exec summary statement. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
39339	7	35	7	38	Please do not use this form of sentence structure, especially in the ES-kindly revise. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
86283	7	35	7	41	Was atmospheric dust/dust emission assessed? Considering its health implications and strong linkage to mortality, this ought to be a point worth assessing even if there is low confidence in the assessment. [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED: Yes, one of our CID is "dust storm", but most evaluations are of low confidence
86285	7	35	7	41	Why is there nothing on cyclones in Africa in the ES? There is important information on page 37, lines 41-43 that could be elevated to the ES. Also, while the number of tropical cyclones is projected to decrease, it is also important to assess the intensity and duration. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. TC occurrence in Africa is encapsulated in the TC statement regarding tropical regions in ES para 7
38445	7	35	7	41	We suggest to also include the projections from a low emission scenario. It will indicate the benefits of an early climate action. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The ES now includes more low-emissions scenario statements
44099	7	35	7	41	High confidence statements about a significant decrease in African glaciers in the last decades (Page 38, line 30-31), as well as projected increases in coastal/ocean related hazards, sea-level rise, coastal recession, marine heatwave and ocean acidification (Page 39, line 45-49) should also be mentioned in this headline statement. [Lamin Mai Touray, Gambia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
100273	7	35	7	41	Please, refer to Africa subregions: WAF, SAH, NEAF, CEAF, SWAF, SEAF and CAF [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
20967	7	35	7	43	Not clear what is meant by Para.#3. We suggest the Author to be more descriptive [Ladislav Chang'a, United Republic of Tanzania]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
14947	7	35	8	17	"in addition to changes described in para. #3" seems redundant given that page 7, lines 23-24 indicate that the results are valid "in almost all the regions of the world". This is repeated in almost every region analyzed. [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
89349	7	35	8	25	I'm not sure why "in addition to para #3" is helpful here, isn't that assumed? This phrase would of course be deleted where the statement brought forward into the TS/SPM, which makes it dilute the key message intended. [Baylor Fox-Kemper, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES
132271	7	35	8	32	The text "beyond changes of para. #3" is extremely repetitive and makes the ES heavy. In addition, it is not clear why this text is not mentioned in North America: Are CO2 concentrations not projected to increase there, or is sea level not projected to increase there? It might be better to just mention all relevant changes in CIDs per continent, even if this implies a repetition of some of the material of para #3. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31365	7	35	9	4	Suggest using similar structure and expressions for all regions discussed, for lucidity and clarity. Now the structure changes starting from North America. Also, should avoid expressions like "para #3" which make the reading more difficult. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
31367	7	35	9	4	Projections should be provided for additional scenarios and or the full range or suchlike, not just the RCP8.5 or SSP5-8.5 which is an extreme case of the range of scenarios. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The ES now includes more low-emissions scenario statements
101633	7	35	38		RCP8.5 is very likely overestimating the climate change that will happen. It would thus be more relevant to have a statement for less extreme RCPs or for different warming levels (e.g. 2°C or 3°C) if possible. [Clemens Schwingshackl, Norway]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES
31369	7	36	7	36	The "e.g." is curious if there is a certain threshold for "hot temperatures". If the threshold varies with sub-region, the example should be left out as it becomes confusing. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
51655	7	36	7	36	will 'drastically increase' - it would be useful to quantify by how much and that RCP8.5 is a high emissions scenario. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
63627	7	36	7	37	It is talked about RCP8.5/SSP5-37 8.5 in the sentence, unfortunately it is not touched on rather RCP or SSP meaning on this chapter. Would be less misunderstanding if warming scenario is quickly mentioned right beforehand. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: RCPs and SSPs are described in detail in Chapter 1. Such basic descriptions do not fall within the remit of Ch 12
108933	7	36	7	38	What about the other SSPs? I recommend not limiting such a statement to an extreme SSP. [Erich Fischer, Switzerland]	TAKEN INTO ACCOUNT: The ES now includes more low-emissions scenario statements
126255	7	37	7	38	Grammar "... Southern African regions, and *the* western part of West Africa ..." [Trigg Talley, United States of America]	NOT APPLICABLE: Sentence does not exist in revised ES
132267	7	37	7	38	Chapter 11 is not projecting any increase in drought in West Africa (see table 11.4 and Section 11.6). I will not highlight all instances of such discrepancies, of which there are many. But this shows that the Chapter 12 text needs to be better coordinated with chapter 11. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: The thematic and regional groups established during the pre-LAM period have indeed ensured that there are no overlaps or inconsistencies between Ch 12 and other WG1 chapters.
100269	7	37	7	38	According to Chapter 11 (Table 11.4), increasing droughts conditions are projected in North Africa with medium confidence [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The thematic and regional groups established during the pre-LAM period have indeed ensured that there are no overlaps or inconsistencies between Ch 12 and other WG1 chapters.
100271	7	38	7	40	According to Chapter 11 (Table 11.4) increasing heavy precipitation are projected in North Africa with low confidence [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The thematic and regional groups established during the pre-LAM period have indeed ensured that there are no overlaps or inconsistencies between Ch 12 and other WG1 chapters.
126257	7	39	7	39	"Fluvial flooding" is not mentioned in the table of contents or in the figures. The figures all refer to "river flooding." Recommend consistent language. [Trigg Talley, United States of America]	ACCEPTED: Non uniform usage of terms and definitions have been corrected throughout
86217	7	39	7	40	"West, central, North and South Eastern Africa and Southern Sahara" – this seems to cover the entire continent. Perhaps turn it around and say "most of Africa except" Specifying where this is not true. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126259	7	40	7	40	Grammar "... South Eastern Africa and *the* Southern Sahara ..." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
131435	7	40	7	41	Too unpecific. What is meant by "wind energy consequences". Elaborate or provide example. Compare to "wind power potential" (page 8, line 13). [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The phrase in question is no longer present in the ES.
126261	7	41	7	41	"wind energy consequences" is a vague statement. What, precisely, do the authors mean by "consequences"? Recommend that the authors use more precise language, to describe consequences. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The phrase in question is no longer present in the ES.
64063	7	41	7	41	The term 'wind energy consequences' is really vague, even for a summary. It would be nice if a bit more info could be added to this expression (e.g. 'wind energy consequences such as...') [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The phrase in question is no longer present in the ES.
51657	7	41	7	41	what are the 'wind energy consequences'? Does this mean increased chances of dust/sand storms, drought, wind damage? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The phrase in question is no longer present in the ES.
126263	7	43	7	43	"para. #3" is unclear. In the SOD, the paragraphs are not numbered, so this reference is not clear to the reader. Either number the paragraphs, or use some other description to refer to the paragraph. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
38447	7	43	7	46	We suggest to revise this statement. The part "where they are currently exceptionally crossed such as Siberia" is unclear. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The phrase in question is no longer present in the ES.
38449	7	43	7	46	It reads strange that "Siberia" has been mentioned 3 times in this headline statement while the other regions have been ignored. We would like to draw the attention of the authors to "South Asian Region" which is the most vulnerable regions according to the "German Watch Global Climate Risk Index". This is the region which contains 4 Least Developed Countries which highlights the vulnerability and low adaptive capacity of the region as well. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. Specific countries or regions therein are no longer mentioned in the ES.
38451	7	43	7	46	In connection to the last comment, following is the very useful recent publication based on the CMIP6 GCMs which analyzed the different SSPs scenarios separately for each South Asian country by Almazroui et al. (2020) https://link.springer.com/article/10.1007/s41748-020-00157-7 A useful information can be drawn from this study to include in this headline statement. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: the reference has been added in the Asia section

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126265	7	43	7	46	Keeping in mind the previous comments about "para. #3," recommend the following rewrite, to improve grammar and clarity: "In Asia, in addition to changes described in para. #3, it is likely that throughout the 21st century, high heat thresholds (e.g., Tmax>40°C) will be crossed at least several days per year in regions, such as Siberia, where historic temperatures have rarely exceeded these thresholds, and tropical cyclones will increase in intensity and decrease in frequency (high confidence)." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
64065	7	43	7	46	It might be worth it to exchange the word 'exceptionally' either with the word 'barely' or assign a quantitative value to it to make the sentence clearer. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
44101	7	43	7	46	Asia is the most populated continent, however the reference to "Siberia" has been made 3 times in this headline statement. Please include the relevant messages for other regions especially the Asian LDCs (Least Developed Countries), which are the ones most at risk. [Lamin Mai Touray, Gambia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. Specific countries or regions therein are no longer mentioned in the ES.
39341	7	43	7	46	Same comment as above. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
51647	7	43	7	46	Please clarify here if the changes described are specific to SSP5-8.5/RCP8.5 or for all scenarios. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The ES now includes more low-emissions scenario statements
110091	7	43	7	51	Are these impacts irrespective of emissions scenario? Its really important in general tie impacts to policy choices and present the range of impacts dependent upon our collective mitigation actions or inactions. Presently this point presents such change as a fait accompli which would be disenfranchising policy makers of choice. This point stands for many other ES statements. [Peter Thorne, Ireland]	ACCEPTED: ES para 8 is devoted to assessment of what could be gained via mitigation
100275	7	43	7	51	Please, refer to Asia subregions: RAR, RFE, ESB, WSB, WCA, TIB, EAS, ARP, SAS and SEA [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
87971	7	43			consider using 'during' or 'throughout' rather than 'along the 21st Century' [Kathleen McInnes, Australia]	NOTED: Sorry we appear to have missed implementing this change in some places.
31371	7	44	7	44	The "e.g." is curious if there is a certain threshold for "hot temperatures". If the threshold varies with sub-region, the example should be left out as it becomes confusing. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126267	7	45	7	45	"rarely" may be a more appropriate word choice than "exceptionally". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
31373	7	46	7	46	The "despite" would seem to suggest that the expectation would be that frequency would increase with intensity. Suggest "but" or suchlike instead of "despite". [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
1525	7	46	7	46	Why is there 'high confidence' connected to increasing TC intensity and decreasing frequency? In chapter 11, there is 'low confidence' in the historical TC frequency trend analysis and 'medium confidence' in projected trends. There are also different key points in chapter 11 such as more frequent category 4-5 storms and the peak winds for the storms with different confidence. It's not clear how that connects with this message. [Rasmus Benestad, Norway]	TAKEN INTO ACCOUNT: Consistency has been checked with CH11. Furthermore, the presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
39343	7	46	7	48	"Future general increase of extreme precipitation"? Extreme precipitation amounts? Intensities? Events or frequencies? extreme daily precipitation? Please be specific. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126269	7	47	7	47	Vague and unclear language: "... general increase of extreme precipitation ..." What is a general increase? What, specifically, do authors mean by extreme precipitation? Extreme on what time scales -- hourly? daily? annual wettest day? driest day? top 5% of all daily precipitation? top 1%? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126271	7	47	7	47	Are "river floods" the same as "fluvial floods"? Recommend consistent language. [Trigg Talley, United States of America]	ACCEPTED: Non uniform usage of terms and definitions have been corrected throughout
126273	7	47	7	47	Vague and unclear language: "... increase in river floods ..." What, specifically, do authors mean by increase? Increase in the magnitude of floods? Increase in the frequency of floods? Increase in the duration of flood events? [Trigg Talley, United States of America]	ACCEPTED: Non uniform and vague usage of terms and definitions have been corrected throughout
126275	7	48	7	48	Unclear. What do the authors mean by "Together with extreme precipitation, glaciers will continue to melt ..."? Do authors mean that extreme precipitation is projected to contribute to glacier melt, in contributions of higher temperatures to glacier melt? Clarify and/or separate this into multiple sentences. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. Vague usage of terms and definitions have been corrected throughout
126277	7	49	7	51	Vague and unclear language, regarding changes to "droughts". Does a decrease in droughts in Siberia mean a decrease in drought area? Drought severity? Drought duration? Drought frequency? Recommend more precise language to describe changes to droughts in Asia. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. Vague usage of terms and definitions have been corrected throughout. Specific countries or regions therein are no longer mentioned in the ES.
126279	7	49	7	51	Unclear language: "Droughts will have contrasted patterns ..." Recommend the following: "Spatial patterns of drought change will vary across Asia, with projected decreases in drought in Siberia, and increases in drought in West Asia and East Asia (medium confidence)." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. Vague usage of terms and definitions have been corrected throughout. Specific countries or regions therein are no longer mentioned in the ES.
39345	7	49	7	51	Are the decrease/increase statistically significant? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
115061	7	50	7	50	Suggest "changes" in place of "patterns". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
112975	7	53	7	53	para. #3, need to be refered with section [Muhammad Amjad, Pakistan]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90577	7	53	7	53	" In Australia" instead of "In Australasia" as it is written in the begiini of this line (53rd line page 7 chapter 12) [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126281	7	53	7	55	Vague and unclear language, as follows: (a) "heat stress" is a vague term. How do authors define heat stress? Is it stress to humans? To organisms? To vegetation? How is it measured? Do authors mean an increase in the number of hot days? Increase in the magnitude of the hottest days? Increase in the duration and frequency of episodes of extreme heat? Be specific. (b) grammar - "... weather conditions conducive *to* wildfires ..." (c) What does it mean, when authors say that "droughts in southern Australia will increase"? Do authors mean an increase in severity or frequency or duration? Be specific. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT : (a) Heat stress assessment is made using several indices and how this assessed is now clearly described in 12.3 (b) now we call this CID simply as Fire weather throughout, and c) could be either or both. Drought assessments are directly taken from Ch 11. Also note that the presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
51649	7	53	8	1	Please clarify here if the changes described are specific to SSP5-8.5/RCP8.5 or for all scenarios. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
31375	7	55	8	1	Suggest omitting "while New Zealand... can be assigned." Readers are likely to miss that this explicitly refers to "high confidence" findings, not climate impact driver projects as such. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
64327	7		9		Executive summary: Climate change information from indigenous knowledge perspective which is very relevant within the African context is missing. Climate change information from the Local (non-expert) climate knowledge should also be incorporated. The chapter also did not assess how to deal with climate change information under uncertainty. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: IN WGI which focusses on the physical science basis, the only mandate is to assess published scientific literature.
64087	7		9		On page 9 line 19-22 the gloabl climate drivers are defined as Air Temperature (GSAT), CO2 concentration in the atmosphere (e.g., ocean pH), and global mean sea level rise (GMSLR). While the summary does include lots of specifics regarding temperature and sea level rise, the issue of CO2 and associated ocean acidification problems are barely mentioned. Especially the Artic and Antarctic as well as small island states will be struggling with the consequences of OA in their regions. Thus it might be worth it to mention the trend of OA for each respective continent/region. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The text does mention both CO2 in the atmosphere and ocean pH. This executive summary statement is being revised but remains severely constrained by space limitations such that we cannot go into greater detail about these concerns (the effects on ecosystems are assessed in Working Group II).
64067	8	5	8	5	I would exchange the term 'wildfire weather' to 'weather conditions favorable for wildfires' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: The CID name has been changed to Fire weather now
126283	8	5	8	5	Vague language: "wildfire weather". Do authors mean hot and dry weather? Do authors mean weather that is wet in one year, so it increases fuel loads, and then hot and dry in the next year, so that ignitions will result in widespread wildfires? Be specific. [Trigg Talley, United States of America]	ACCEPTED: The CID name has been changed to Fire weather now
38453	8	8	8	11	Please include a confidence statement. In addition, please also include the information for low emission scenario to indicate the avoided impacts of emission reductions. [Mansour Almazroui, Saudi Arabia]	ACCEPTED: ES para 8 is devoted to assessment of what could be gained via mitigation
86287	8	8	8	15	Too many acronyms in this paragraph detracts from engaging what is being communicated. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33571	8	8	8	15	Abbreviations of areas would be better if detailed. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
20965	8	8	8	17	Not clear what is meant by "beyond changes of para. #3", I suggest the Author to be more descriptive to enhance clarity and readability [Ladislaus Chang'a, United Republic of Tanzania]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The reference to earlier para #3 is no longer present in these new ES paras
31377	8	9	8	9	The "e.g." is curious if there is a certain threshold for "hot temperatures". If the threshold varies with sub-region, the example should be left out as it becomes confusing. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
3907	8	10	#REF!	#REF!	"North South-America" is confusing. Northern? [David Schoeman, Australia]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126285	8	10	8	10	Spell out the acronym "WBGT". [Trigg Talley, United States of America]	NOT APPLICABLE: We now use the NOAA Heat index as an index for Heat stress. WBGT is not mentioned in the revised ES
126287	8	10	8	10	Change "North South-America" to "Northern South America". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
115063	8	10	8	10	Expand acronym or remove e.g. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: We now use the NOAA Heat index as an index for Heat stress. WBGT is not mentioned in the revised ES
63977	8	10	8	10	Please see my chapter comments. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
100277	8	11	8	12	According to Chapter 11 (Table 11.7) increasing droughts conditions are projected in NCA and SCA with low confidence and over SAM and NES with medium confidence [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. All inconsistencies in drought assessments have been addressed through the cross-chapter thematic and regional working groups
38165	8	11	8	14	Acronyms for regions, SSA, NSA, SAM, NES, SES, and SWS appear for the first time and not defined here, whereas regions are listed with their full names in paragraphs for the other continents. [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
126289	8	12	8	12	NSA, SAM, NES (not previously defined in this chapter) [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31379	8	12	8	12	The NSA, SAM, NES should be explained, the acronyms are not evident for all readers. Or, perhaps, a more overall reference to South American regions might suffice. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
51661	8	12	8	12	Please spell out 'NSA, SAM, NES and SSA' acronyms. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
63829	8	12	8	13	Wind speeds increase in all parts of south and Central America? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
63973	8	12	8	13	I disagree with the uncertainty language in use. Please see my chapter comments. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We do not duplicate or form any inconsistencies with Chapter 11. This demonstrating of climatic impact driver signals of change is not currently presented elsewhere in Working Group I, and we have continued to work with the TSU to add clarity to the figure. The time axis here is not meant to be specific but rather to illustrate the signal that scientists look for in determining CID changes.
63629	8	12	8	14	The authors mentioned here as NSA, SAM, NES, as well as SES, SWS and NWS. Using many unknown abridgment may cause problem of understandability. Would be more clear to give general explanation to them. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
86187	8	12			The use of so many acronyms really hinders the ability of the reader to understand what is being said. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. We do not use region acronyms in the ES anymore
64297	8	13	8	13	You have made only one othe comment in the executive summary about the positivity or negativity of climate impacts. This line suggests that increased wind speeds will increase wind power potential which is only true to a certain extent (too windy and our technology can't convert it), but it is also phrased in a positive light seemingly going against the neutral other summaries. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
63975	8	13	8	14	Please see my chapter comments. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
100279	8	13	8	15	According to Chapter 11 (Table 11.7) increasing heavy precipitation is projected only over SES with medium confidence. All other regions with low confidence [Claudine Derczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. All inconsistencies in heavy precipitation assessments have been addressed through the cross-chapter thematic and regional working groups

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31381	8	15	8	15	Would it be fair to refer to "during the 21st Century" rather than "all climate scenarios"? [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. The climate scenarios and time horizons, and GWLs, relevant for the assessments have been clearly indicated in the revised ES
15677	8	17	8	17	I find it is a pity to focus on end of century and RCP8.5 only. Adaptation requires taking into account much earlier lead times (e.g. "near term" 2030-2050 in SROCC) and for depicting changes at the end of the 21st century, I think emphasis should be places on a broader range of scenarios. [Samuel Morin, France]	ACCEPTED: More ES statements on low emission scenarios have now been added. ES para 8 is devoted to assessment of what could be gained via mitigation
100281	8	17	8	18	According to Chapter 11 (Table 11.8) increasing in flooding with high confidence only over NEU [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras. All inconsistencies between Ch 11 and Ch 12 assessments have been addressed through the cross-chapter thematic and regional working groups
64069	8	17	8	21	I would rewrite the sentence to make it shorter and thus easier to read. Also, as of yet, it is not entirely clear which changes the % values belong to: 'In Europe, in addition to changes described in para. #3, there is high confidence that the frequency of extreme heat will increase by up to 10 (18)% , that flood frequency will increase in Western and central Europe with a decrease of 5 (11)% of peak flow and that droughts will increase in Mediterranean regions with a return period of 100 years, for the mid-century (end-century) in the RCP8.5 scenario. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
77639	8	17	8	21	Given that three phenomena - extreme heat, floods, and drought - are referred to at the start of the sentence, it is difficult to determine which two are being referred to 'respectively' in the two changes cited at the end of the sentence. [Emer Griffin, Ireland]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
112969	8	17	8	21	I suggest to put the change directly behind the mentioned change of the indicator to make the sentence easier readable, e.g., "...that the frequency of extreme heat will increase (with an increase up to 10 (18)%)" [Claas Teichmann, Germany]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
126291	8	17	8	21	The key message sentence is long, cumbersome, and exceedingly difficult to understand. Recommend that authors divide this into two sentences. One way to do it is to separate drought information from flood information. Another way to do it is to make general statements about flood and drought in the first sentence, and specific statements (with statistics) in the second sentence. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
96159	8	17	8	21	Peak flow changes differ a lot between different regions, subensembles and data processing schemes. Specific figures could be misleading. Please skip or add more studies (https://doi.org/10.1016/j.gloenvcha.2015.09.004 , DOI 10.1007/s00477-016-1296-5, ...). [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
96161	8	17	8	21	Please rephrase. This sentence addresses different regions (Western, Central Europe, Mediterranean), different times (mid, end century) and different impact drivers (flood, drought). Please split into two or three sentences. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.
96163	8	17	8	21	The sentence too long. In addition, there is an inconsistency in whether or not a percentage of change is given, and it is unclear what is meant by peak flow. Please revise. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: The presentation of regionally varying CID assessments has been completely reformulated in the revised ES. Region by region paras have been replaced with more CID-change patterns based paras.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
100283	8	17	8	25	Please refer to Europe regions: NEU, CEU, EEU and MED [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and Executive Summary text no longer refers to AR6 regions by their abbreviations.
1705	8	18	8	19	we have been witnessing flash floods for a couple of years in Jordan (East Mediterranean country), and it is getting more intense every year... I wonder if any model captured this. [Ruba Ajjour, Jordan]	NOTED: Section 12.4.2 assesses pluvial and river floods in the Arabian Peninsula based on recent literature, however there is not space in the assessment for this level or regional detail.
5515	8	18			About the flood frequency : is it the river flood only or the river flood + the coastal flood ? : need to specify [Benoit Laignel, France]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and we have distinguished between different flood types throughout the chapter.
90579	8	19	8	19	"drought will increase in Mediterranean regions" this overgeneralization is not accurate, because the drought variation depends on zones and seasons and even months in the occurrence OF August, September and October which recorded slight increases of precipitation and floods in Djelfa as a North-African and mediteranean region (my last research on climatic droughthttps://www.semanticscholar.org/paper/CLIMATIC-DROUGHT-IN-THE-SEMI-ARID-REGION-OF-DJELFA-Boubakeur/bb2df6227b351af54b56d1fe2729e1340040ae56) [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. Sections 12.4.1 and 12.4.5 assess drought in the Mediterranean and consider aspects of seasonality, but this level of detail is not presented in the ES.
51659	8	19	8	20	Drought increase is given as 10(18)%, with the meaning of the number in brackets explained afterwards. For comprehension it would be easier to explain what these numbers refer to in the text, as done on page 73 (line 31) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and this level of specific detail is no longer provided in the ES.
77641	8	21	8	21	Replace 'make more frequent excursions above' with 'more frequently exceed'. [Emer Griffin, Ireland]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs and this sentence is no longer used.
51663	8	21	8	21	RCP8.5 scenario' and 'RCP8.5/SSP5-8.5' seem to be used interchangeably in this chapter (and the exec summary) - are they the same thing? If so, it would be helpful and clearer to stick to one definition. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Differences between RCP8.5 and SSP5-8.5 are related to the climate model configuration within the CMIP5 or CMIP6 simulations, as described in Cross-chapter box 1.5.
52077	8	21	8	22	Impact on energy sector can be included as well [Amarasinghage Tharindu Dasun Perera, Switzerland]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and we do not specify regional sector impacts considering these are assessed in WGII. Instead CH12 focuses on the climate information that would be necessary to assess regional sectoral impacts such as the energy sector in Europe.
86189	8	21			The phrase "make more frequent excursions above critical thresholds" will not be easily understood by all. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs and this sentence is no longer used.
64299	8	22	8	22	You have used the phrase 'virtually disappear' which I took to mean that there was a 99-100% certainty that it would diasappear, but if that is what you mean then I believe it should include the word certainty, otherwise 'virtually' has other connotations [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, however our use of "virtually disappear" relates to the condition becoming exceedingly rare rather than the likelihood of the condition disappearing entirely.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115065	8	22	8	22	Suggest replacing "sectors" with "systems". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
126293	8	22	8	23	User-friendly language needed. Recommend "By the end of the century, based on the SSP5-8.5 assumptions, climate models project almost no cold spells." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs so this sentence is no longer included. We have improved the user-friendly presentation of material
63979	8	22	8	23	The text page 72 line 39-41 mentions "cold spells are LIKELY to disappear". In my opinion, the uncertainty language used in the executive summary contradicts the language used in the text. I would have expected "cold spells are virtually certain to disappear". [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs and ES statements have been checked for consistency with the main text.
20277	8	24	8	24	"medicane" to be included in the glossary [philippe waldteufel, France]	REJECTED: Medicane was not included in the Glossary because this is one of many atmospheric phenomenon terms that could be included, which would make the glossary too unwieldy. Section 12.4.5 defines Medicanes (Mediterranean Hurricanes)
64071	8	24	8	24	Instead of the word 'Medicanes' I would use the more common expression of 'Mediterranean tropical-like cyclones' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.4.5 defines Medicanes (Mediterranean Hurricanes) and there was substantial literature (e.g., Tous et al., Romero et al.) to indicate this being a common enough term.
126295	8	24	8	24	This is the first occurrence, in Chapter 12, of the term "Medicane." Define the term here, or refer the reader to the Glossary. [Trigg Talley, United States of America]	ACCEPTED: Section 12.4.5 defines Medicanes (Mediterranean Hurricanes)
126297	8	24	8	24	Even a majority of climate scientists are not familiar with the term "medicane". Suggest expanding it in the Executive Summary, at least. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Section 12.4.5 defines Medicanes (Mediterranean Hurricanes) and there was substantial literature (e.g., Tous et al., Romero et al.) to indicate this being a common enough term.
51665	8	24	8	24	Please briefly explain that the term 'medicanes' means a Mediterranean hurricane. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Section 12.4.5 defines Medicanes (Mediterranean Hurricanes)
7911	8	24	8	24	Here in the summary it will be good to clarify that Medicane refers to Mediterranean Hurricane. [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT: Medicanes are no longer mentioned in the ES, and Section 12.4.5 defines Medicanes (Mediterranean Hurricanes)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
96165	8	24			The reader not too familiar with climatology will probably not know the term 'medicanes'. Maybe, you could use 'Mediterranean tropical-like cyclones (medicanes)'. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: Section 12.4.5 defines Medicanes (Mediterranean Hurricanes) and there was substantial literature (e.g., Tous et al., Romero et al.) to indicate this being a common enough term.
63831	8	27	8	27	Are changes described in para. #3 not applicable to North America? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We more clearly indicate which CID changes are found in all regions and which are more variable across regions.
35083	8	27	8	28	Did you mean to exclude "in addition to changes described in para #3" from North America? I suspect this is an editorial mistake but it has very substantive consequences. [David Gutzler, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs
64073	8	27	8	28	Is it possible (for consistency purposes with previous sections) to assing a trend to the to climatic impact drivers over North America (increase or decrease?) instead of just saying 'changes'? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We now indicate increasing or decreasing CIDs whenever the direction of change is clear (e.g., in the Tables within Section 12.4)
131437	8	27	8	28	Retain structure of previous paragraphs for consistency. Start with "In North America, (...)" [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs
100285	8	27	8	32	Please refer to North America regions: NEC, CNA, ENA, NWN and WNA [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and Executive Summary text no longer refers to AR6 regions by their abbreviations.
51667	8	27	8	32	Please clarify if this paragraph is also related to RCP8.5 or applies to all scenarios. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The ES now distinguishes scenarios, although the continent by continent ES paragraphs are no longer included.
126299	8	28	8	31	The authors mix changes in drivers with projections. Recommend that authors rewrite the sentence and refer to either changes in drivers of wet and dry conditions, or projections of wetter or drier conditions. Mixing the two terms makes it difficult to interpret the message. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs and organized around CIDs rather than by continents.
100287	8	29	8	31	According to Chapter 11 (Table 11.9) increasing droughts conditions are projected in WNA and CNA with high confidence [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: Consistency has been checked with CH11 and text has been reformulated in ES to combine assessments by CID rather than by region
126301	8	31	8	31	What do the authors mean by "declines in snow season"? A decrease in the length of the snow season? A decline in the amount of snow received during the snow season? Be specific. [Trigg Talley, United States of America]	ACCEPTED: ES has been reformulated to combine assessments by CID rather than by region, and snow CID changes are described more precisely.
31383	8	31	8	31	What kind of ice? (glaciers? Permafrost? Sea ice?) What declines - extent, depth, length of season? [Markku Rummukainen, Sweden]	ACCEPTED: ES has been reformulated to combine assessments by CID rather than by region, and snow CID changes are described more precisely.
131439	8	31	8	32	Wording. Does it mean "Declines in seasonal snow and ice"? [Hans Poertner and WGII TSU, Germany]	ACCEPTED: ES has been reformulated to combine assessments by CID rather than by region, and snow CID changes are described more precisely.
64075	8	34	8	35	Is it possible (for consistency purposes with previous sections) to assing a trend to the to climatic impact drivers in small island states (increase or decrease?) instead of just saying 'modifies'? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We now indicate increasing or decreasing CIDs whenever the direction of change is clear (e.g., in the Tables within Section 12.4)
131441	8	34	8	35	Retain structure of previous paragraphs for consistency. Start with "In small islands, (...)" [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs

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87973	8	34	8	39	no mention of the role of swell waves on coastal extremes and inundation in small island especially in the Pacific and Indian Oceans [Kathleen McInnes, Australia]	TAKEN INTO ACCOUNT: We are constrained by space within the executive summary although the importance of waves is described throughout the coastal CID sections of CH12.
90581	8	35	8	35	"dryness", it is more accurate to use "DROUGHT" instead. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs and we avoid generic use of "dryness" (more specifically discuss aridity, fire weather and various drought types)
90583	8	35	8	36	"While warming and heat stress" in this statement what is the difference between "warming" and "heat". It would have been written "temperature" instead of both [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. CH12 distinguishes between pure temperature indices and those that relate to a system's ability to deal with extreme heat (e.g., temperature-humidity indices relevant for human and animal health)
63631	8	36	8	36	While it is "very likely" likelihood based upon "warming and heat stress" in the sentence, its continue low confidence regarding "future changes in precipitation" which is unbalance of the content. "Low confidence" can be changed as "unlikely" instead. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs
64077	8	37	8	37	The expression 'increasing extreme sea levels' is really vague if the word 'extreme' is not defined? What is considered 'extreme' in this context? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: In Section 12.2 we clarify that "extreme sea level" is a technical term including relative sea level, coastal surge, tides, and wave setup.
3909	8	41	#REF!	#REF!	The term "deep ocean" usually means the bathypelagic and below. In this sense, very few of the impacts listed here can happen in this environment. Unclear/confusing. None of the non-bolded text refers to the deep ocean, either...? [David Schoeman, Australia]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We are more precise with our use of deep ocean in the chapter.
64079	8	41	8	42	Is it possible (for consistency purposes with previous sections) to assign a trend to the climatic impact drivers in the deep and open ocean (increase or decrease?) instead of just saying 'changes'? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We now indicate increasing or decreasing CIDs whenever the direction of change is clear (e.g., in the Tables within Section 12.4)
126303	8	41	8	42	The key message contains no useful information. It seems obvious that there will be changes. To make the statement useful, recommend that authors indicate the direction of change and/or the way that interactions among changes in these factors may lead to impacts. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs with consideration of the most useful information to be presented
90585	8	41	8	43	"In the open and deep ocean, changes are projected for sea surface temperature,.....marine ecosystems" in this statement there a paradox between the undelined words. In fact, the surface temperature has low impact on the ocean depth and its ecosystems with are far deep for some of them. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We are more precise with our use of deep ocean in the chapter.
64081	8	42	8	42	The acidity will change but even more important is the change in the saturation state of carbonate. So it might be worth it, to just generalise this statement and say 'changes in seawater (carbonate) chemistry'. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 describes the additional indices (such as carbonate saturation levels) that are relevant within the broader ocean acidity CID category. The changes in acidity are assessed in CH12 and will be further extended toward ecosystem impacts in WGII CH3.
63633	8	42	8	42	This is first time the author has mentioned the SST. It is better to write "Sea Surface Temperature" earlier on. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We define SST at its first use in the main text of the chapter.

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126305	8	45	8	45	Unclear phrase: "upper ocean stratification". Stratification of what? Temperature? Salinity? Other parameters? Be specific. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We note stratification related to both temperature and salinity within Section 12.2.
63983	8	45	8	46	Please Change the sentence "Upper ocean stratification will continue to increase in the tropical and North Atlantic, Southern, North Pacific oceans" becomes "Upper ocean stratification will continue to increase in both tropical and North Atlantic as well as in southern and North Pacific Ocean" so it would be easier to read [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: completely reformulated in different paragraphs
63833	8	46	8	46	Unclear which Southern Ocean is being referred to [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, and the ES no longer refers to the Southern Ocean, although it is mentioned in association with specific continents in Section 12.4.
51669	8	46	8	46	leading to less vertical mixing' doesn't sound particularly important until you realise it's about oxygenation of deep waters - it would be helpful to explain that a reduction in this is not good for ocean ecosystems. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. Section 12.3 and Section 12.2 also note the importance of ocean stratification and ocean oxygen, with stratification also examined in WGII in relation to access to ocean nutrients.
31385	8	47	8	47	Sea ice extent will reduce also during other seasons. Perhaps "Arctic sea ice extent is projected to reduce, which in summer may lead to opening..." [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: We have removed reference to maritime trade routes in the ES and discuss seasonality of ice changes in Section 12.4.
64301	8	47	8	48	You have made only one othe comment in the executive summary about the positivity or negativity of climate impacts. Referring to opening maritime routes has connotations for industry rather than only saying that there will be more open water/less sea ice. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We now indicate increasing or decreasing CIDs whenever the direction of change is clear (e.g., in the Tables within Section 12.4). Maritime routes becoming open is no longer mentioned in the ES
115067	8	47	8	48	Suggest removing reference to transport route as not WG I material. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: This reference is removed from the ES.
126307	8	47	8	49	Recommend the following rewrite: "Arctic sea ice extent is projected to decline during summer and open new maritime transport routes between North America, Europe, Russia and China; also reduced Arctic sea ice extent could affect marine ecosystems (medium confidence)." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs
63863	8	47	8	49	The opening of new maritime transport routes is not only dependent on the presence of sea ice but also on the predictability of sea ice throughout the year to inform transportation planning. Melia et al., 2017 discusses this in light of the current state of seasonal sea ice predictability. It therefore may be worth discussing seasonal sea ice predictability in one of the chapter's sea ice sections. Bushuk et al., 2018 discussed the potential versus operational forecast skill with regards to GFDL's model and could be a useful touchstone to assess the current state and potential future state of regional seasonal sea ice predictability. Further, Sigmond et al., 2016 appears to be the most recent publication considering the prediction of advance and retreat dates which are extensively used in planning Arctic shipping routes. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This reference is removed from the ES.
87975	8	47	8	49	Arctic sea ice reduction will also lead to greater coastal erosion [Kathleen McInnes, Australia]	TAKEN INTO ACCOUNT: This dynamic is discussed in Section 12.4.9 and Section 12.4.10
99269	8	47	12	49	The example assessed transport routes and ecosystem impacts. Do they have the same confidence for both? If we are loosing sea ice we will loose ecosystems linked to these conditions. This is certain and not medium confidence [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: We have removed this example from the ES.

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31387	8	48	8	48	"could affect" sound vague. Could this be made more explicit? [Markku Rummukainen, Sweden]	NOT APPLICABLE: We have removed this example from the ES.
63837	8	49	8	49	Confidence in ocean deoxygenation not stated [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We mention ocean oxygenation in the ES as part of the emergence discussion (with confidence statements).
31389	8	49	8	49	"will assist the development" sounds strange. "drives"? "contributes to?", "is accompanied by"? [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We mention ocean oxygenation in the ES as part of the emergence discussion (with confidence statements).
63835	8	49	8	50	Reword - Future ocean warming will create hypoxic or minimal oxygen zones [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: We have removed this example from the ES.
18049	8	49	8	50	suggest "Future ocean warming will exacerbate the development of hypoxia and expansion of oxygen minimum zones" as it is not clear that new one will be created. [Lisa Levin, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We mention ocean oxygenation in the ES as part of the emergence discussion (with confidence statements).
51671	8	49	8	50	Suggested edit: 'minimal oxygen zones, disrupting ocean ecosystems.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We mention ocean oxygenation in the ES as part of the emergence discussion (with confidence statements).
20279	8	50	8	50	"and with" to be corrected [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. We mention ocean oxygenation in the ES as part of the emergence discussion (with confidence statements).
64083	8	51	8	52	Rephrase to make it easier to read: ' Future projections also indicate freshening of the Pacific, Southern and Indian oceans while the Atlantic Ocean might become saltier (medium confidence)' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs. Salinity is no longer explicitly mentioned in the ES but is discussed in Section 12.4.8
15679	8	53	8	53	Permafrost thaw should probably be mentioned too for the Arctic. [Samuel Morin, France]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs, with permafrost thaw mentioned elsewhere.
90587	8	53	8	53	"enhanced warming trends" the adjective "enhanced" is subjective and hence goes against the objectivity of academic and scientific writing. it is, in fact, as if the author tells his opinion or impression about this warming. Besides, it goes against the accuracy as one of the academic features. Indeed the adjective "enhanced" does not fit the noun warming because this latter, the warming is purely natural and it varies naturally and not enhanced as it is something made by humans. So, it would have been better to use "significant " " considerable" warming trends instead of "enhanced warming trends". [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: We no longer use the word "enhanced warming trends" in the ES. We do still mention "enhanced convective conditions" elsewhere in the ES, and understand that this is a proper use of the term. A quick look at common dictionary definitions suggests that this is not necessarily subjective, but indicates that something (anthropogenic climate change, in our case) has caused an increase or intensification.
51673	8	53	8	54	Suggest for clarity the regions of the world this is focused on are referred to at the start here, i.e. 'In polar regions: climate change has caused and continue...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.
126309	8	53	8	55	Recommend the following rewrite: "In the Arctic, climate change has caused and will continue to induce enhanced warming trends, heat-related extremes, and reductions in snow, glaciers, and sea ice (high confidence). These impacts will occur later in the Antarctic than in the Arctic (medium confidence); there is greater uncertainty regarding impacts in East Antarctica than in the rest of Antarctica." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115069	8	53	8	55	This sentence is awkward, suggest splitting into one for each pole. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.
83339	8	53	9	4	It is unclear in the text whether the discussion on sea ice refers to the Arctic only here. If so, what about Antarctic sea ice? [Robert Massom, Australia]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.
31391	8	54	8	54	"later" is unclear and ambiguous. Please clarify. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES. We also avoid ambiguous uses of 'later' in the revision
86289	8	55	8	55	Please specify the confidence associated with the assessment of East Antarctica [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.
126311	9	2	9	3	Are these projected changes, or is this a statement of fact about observed changes? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES. The updated ES clarifies whether assessments are for observations, emergence, or projections.
90589	9	3	9	4	"There is high confidence in decreasing permafrost and seasonal duration and extent of snow cover" the meaning is there but not appropriately expressed. It would have been written like this "There is high confidence in the decreasing of seasonal duration and extent of the permafrost". permafrost instead of snow cover because permafrost is more scientific, and technical than snow cover and it fits the scientific and academic aspect of this report writing. It reflects the specificity of the writing and indicates that it was written by specialists in the field. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES. The updated ES provides more clarity about changes in snow, glaciers, permafrost and ice and Section 12.3 and 12.4 note several metrics that we use to describe these changes (including seasonal snow duration)
71189	9	4			what is decreasing permafrost? Do the authors mean permafrost degradation, or permafrost temperature warming? [Lukas Arenson, Canada]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES. The updated ES discusses permafrost thawing, and Sections 12.3 and 12.4 assess changes in active layer thickness, extent of near-surface permafrost, and permafrost temperature.
15681	9	6	9	6	The term "zones of interest" is unclear and one wonders what "interest" refers to and what are the criteria to be considered "of interest" (population ? i.e. exposure ?). Maybe better to drop the term "of interest" altogether. Also "a few" could also be misleading ("a few" in comparison to what ? what would be "several" or "many" ?). It seems to me that these "places of interest" refer simply to anything different from temperature continental lowlands (mountains, coasts, arid regions). I don't think a proper common wording for lumping them together is possible. I suggest listing these "regions" explicitly, like : "Coastal cities and settlements, desert and semi-arid areas, mountain areas and tropical forests are exposed to specific climatic impact drivers affected by climate change". If these zones of interest refer to WG2 Cross-chapter papers, then it should be explicitly stated so. [Samuel Morin, France]	TAKEN INTO ACCOUNT: the statement is reformulated to match the cross-cutting papers of WGII. This is no longer a focus of the ES, but is described within Section 12.4.10.
131443	9	6	9	6	Elaborate what is meant by "zones of interest" - given that this is the Executive Summary, this needs clarification. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
51675	9	6	9	6	a few zones of interest' - it would be useful to explain what defines these - are they particularly sensitive to climate change? If so this could say 'a few particularly climate-sensitive zones on Earth are...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
89351	9	6	9	7	This statement could be improved, so as to be useful in the TS/SPM, "specific" and "interest" are too generic to highlight what is meant in the following list of specifics. "Threatened" "high risk" "valuable" would be preferred, I'd think. [Baylor Fox-Kemper, United States of America]	NOTED: CH12 no longer has an ES statement devoted to the "Specific Zones" section (12.4.10). The suggested alternative names for these regions are not sufficient for various reasons (e.g., are mountains more valuable than non-mountainous areas?). At the beginning of this section we tie these topics to the Cross-chapter papers of WGII, which were motivated largely around their cross-cutting regional appeal.
107867	9	6	9	7	This is a strangely generic first sentence for an executive summary statement. Please improve it. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
31393	9	6	9	7	All zones on Earth are of interest, and all zones are exposed to such drivers. Suggest finding some other formulation here. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
39347	9	6	9	7	"a few zones of interest on Earth? [Lourdes Tibig, Philippines]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
90591	9	6	9	7	"specific climatic impact drivers affected by climate change ." this would have been " specific climate change impact drivers" because the climatic impact affected by climate change is likely to be with non-sense and the climate impact is inevitably a consequence of a climate change [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
67071	9	6	9	7	First sentence seems odd: seems like this is valid for anywhere on Earth. Can this be specified or clarified what is actually meant here. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
86291	9	6	9	9	Was drought assessed for cities? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: CH12 notes the connection between drought and city assets within Section 12.3, and Section 12.4.10 mentions AR5 findings on cities and drought. Cities largely experience similar drought conditions to the surrounding areas, and differences in impacts are largely due to their exposure and vulnerability (assessed in WGII Chapter 6). The direct city influences on drought CIDs is not directly assessed in CH12, although there is mention of these effects in Chapter 10 given the importance of scale and the TS.
77645	9	6	9	16	Very poorly written section, leading to confusion: needs to be completely revised. Very inconsistent with scientific accuracy in other chapters e.g. 'increased fire weather and CO2.' Presumably atmospheric carbon dioxide concentration? Could refer to the root zone. [Emer Griffin, Ireland]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
71455	9	6			I find the bold statement too weak. "A few zones of interest" sounds like there are some zones which are of interest, but they are only a few, so it is all not so dramatic. But a large fraction of our species lives in coastal areas, these are not just "a few zones of interest". [Douglas Maraun, Austria]	NOTED: CH12 no longer has an ES statement devoted to the "Specific Zones" section (12.4.10). At the beginning of this section we tie these topics to the Cross-chapter papers of WGII, which were motivated largely around their cross-cutting regional appeal. Enhanced population in these regions is discussed as the exposure component of risk in WGII.
99271	9	6			a few zones of interest is a very odd expression. Please clarify [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
114873	9	7	9	8	"Coastal cities and settlements are exposed to a high number of changes including extreme heat, coastal erosion, coastal flooding, potentially confounding with heavy rainfalls, and cyclones" -- these effects are all essentially universal to varying degrees but cyclones are not universal -- this should be indicated and what about extratropical storms which are also of concern in all mid latitudes? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.

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5517	9	7	9	9	The coastal flooding is not only confounding with heavy rainfalls and cyclones, but also with sea level rise, storm surges and coastal river flood. The coastal zones are multi-hazards and multi-risks areas where there are simultaneous several processes, particularly for the coastal flooding [Benoit Laignel, France]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Section 12.3 includes discussion of connected and compound hazards/CIDs.
126313	9	8	9	8	Unclear language: "potentially confounding" What does potentially confounding mean -- for example, coastal flooding can be caused by multiple interacting factors, such as heavy rainfall, cyclones, cyclone-generated storm surges, etc.? The only thing "confounded" is the ability of scientists to attribute the flood impact to a single factor. Recommend that you drop the word "confounding" and insert "interacting." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Section 12.3 includes discussion of connected and compound hazards/CIDs.
115071	9	8	9	8	Do you mean "conflating" rather than "confounding"? [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Section 12.3 includes discussion of connected and compound hazards/CIDs.
90593	9	8	9	8	"confounding": problem of accuracy and word appropriateness. This word would have been replaced by a more accurate word such as "accompanied" to be "floods accompanied with heavy rains" which more meaningful and understandable. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Section 12.3 includes discussion of connected and compound hazards/CIDs.
31395	9	9	9	10	Could this be made to refer to "the 21st Century" rather than "all future climate scenarios", as this would seem to be the meaning? [Markku Rummukainen, Sweden]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
31397	9	10	9	10	The "other drivers" would be useful to explain. Also, what is the significance of mentioning it here? Are these drivers more significant than climate change? [Markku Rummukainen, Sweden]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
80211	9	12	9	12	Maybe it should be used "flash floods" instead as next to mountains it is the phenomena. [Lilian Fejes, Hungary]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
90595	9	12	9	12	"amplify" not accurate in this stance, it would have been substituted by "increase" [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
126315	9	12	9	13	Vague language: "most parts of major mountain ranges" How are authors defining "most parts"? 90% of the mountain range? More than 50% of the mountain range? What are the characteristics of a "major mountain range"? Altitude? Topographic relief, from mountain top to valley bottom? Slope? [Trigg Talley, United States of America]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
126317	9	12	9	36	The term "complementary information" needs to be defined. Is this downscaled climate information or communication that is tailored to the local culture/language/etc.? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: "Complementary information" is no longer a term used in the ES, but it is discussed within Section 12.6.1 as an indication that climate information is not the only information needed to assess risk and make adaptation decisions.
39349	9	13	9	14	What are "fire weather"? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: fire weather is now defined within Section 12.2 and in the glossary (Weather conditions conducive to triggering and sustaining wildfires, usually based on a set of indicators and combinations of indicators including temperature, soil moisture, humidity, and wind. Fire weather does not include the presence or absence of fuel load.)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63675	9	13	9	14	In relation to tropical forests, one impact mentioned is "increased fire weather and CO2". Are these intended to be together as they are currently written or separate? It is not clear how these are related. If atmospheric CO2 concentrations increase presumably all vegetation will be exposed to increased CO2. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Discussion of multiple CIDs have been clarified to ensure clear communication of key findings.
81173	9	14	9	14	'...increased fire weather and CO2' - What does "increased CO2" mean specifically here? [Dmitry Kovalevsky, Germany]	TAKEN INTO ACCOUNT: this originally referred to atmospheric carbon dioxide concentration at the surface (a CID now defined within Section 12.2), but the sentence has been rephrased
20773	9	14	9	14	What is the meaning of "exposed to increase in CO2" when applied to tropical forests? [philippe waldteufel, France]	TAKEN INTO ACCOUNT: this originally referred to atmospheric carbon dioxide concentration at the surface (a CID now defined within Section 12.2), but the sentence has been rephrased
90597	9	14	9	14	"increase in heat" , the term "temperature" is more accurate and specific than the term " heat" unless for waves of heat where it is more suitable. [Boubakeur Guesmi, Algeria]	REJECTED: Heat is a broader category that can include high temperatures but also combinations of high temperatures and high humidity that can stress people and animals.
90599	9	14	9	14	"drought and lengthening of dry seasons " this would have been more appropriately in the following way : " drought and extension of the dry season". [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
90601	9	14	9	14	"increased fire weather and CO2." an unclear statement, and mainly, the relation between fire weather, which in its turn, and CO2. The meaning is not clear. It may mean an increase of weather which favor forest fire and increase of CO2. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10. Discussion of multiple CIDs have been clarified to ensure clear communication of key findings.
4587	9	14	9	14	Exposed to increase in "CO2" - CO2 per se is not a hazard, unlike heat, drought, fire weather etc. [Rita Yu, China]	TAKEN INTO ACCOUNT: We have revised this CID to be "Atmospheric CO2 at surface", which has clear connections to impacts and risk for many sectoral assets (see Section 12.3). Just within the agricultural sector, these include benefits for plant growth but also hazards for nutritional content, which is why we distinguish CIDs from a universal statement of "hazard". We also distinguish atmospheric CO2 at surface from the global radiative imbalance caused by the overall role of CO2 as a greenhouse gas. We have further clarified this in defining this CID within Section 12.2
11779	9	15	9	15	this needs to be reworded to clarify that biodiversity hotspots "are therefore not exposed to only one set of specific drivers". As currently worded, it sounds like those areas wouldn't experience any of the specific CIDs. [Amy East, United States of America]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
64281	9	15	9	15	Although I am confident that this was not the authors' intention, this line almost seems to imply that it is not instructive or important to consider the individual climate drivers to which biodiversity hotspots are exposed. Individual hotspots are surely exposed to specific drivers. I believe that the authors' meaning would be clarified if they added "collectively" before "not exposed to specific drivers" (or something to that effect). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
63839	9	15	9	15	Very unsure what this is trying to say about biodiversity - that coastal zones aren't specifically impacted? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126319	9	15	9	15	The statement about biodiversity hotspots and drivers doesn't ring true. They are exposed to very specific drivers, or combinations of drivers, that relate to regional and local characteristics. This statement gives a reader the impression that biodiversity is not exposed to climate-related drivers of change. Suspect that the problem is in trying to sort out the many and complex relationships between drivers and biodiversity impacts. Recommend the following rewrite: "Biodiversity hotspots are dispersed around the world, embedded in many regionally-specific climates, affected by a variety of climate changes, and are therefore exposed to many drivers, that interact in complex ways, to impact local and regional biodiversity." [Trigg Talley, United States of America]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
31399	9	15	9	15	This risks miscomprehension. The idea here is, assumedly that biodiversity hotspots are exposed to (specific) drivers, but these may vary across regions. Suggest "Biodiversity hotspots are found around the world, and they will be exposed to specific drivers depending on the location." [Markku Rummukainen, Sweden]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
51677	9	15	9	15	Biodiversity hotspots are located around the world, and are therefore not exposed to specific drivers' - please explain here why biodiversity hotspots are not exposed to specific drivers, i.e. does this mean they are exposed to all CIDs? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
90603	9	15	9	15	"Biodiversity hotspots are located around the world" the preposition "around" is not appropriate for the intended meaning. Therefore, it should have been used " worldwide" or "everywhere in the world" instead. Namely, it would have been written " Biodiversity hotspots are located worldwide" or " Biodiversity hotspots are located everywhere in the world". [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
90605	9	15	9	15	"and are therefore not exposed to specific drivers" this is not always and generally true. Since climate changes are regionally different, impacts and drivers are accordingly regionally specific. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
41727	9	15	9	16	I suggested that biodiversity hotspots to be a new paragraph start with : Regarding Specific zones and hotspots the biodiversity ----- [Sawsan Mustafa, Sudan]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
87977	9	15			consider reversing the statement to say 'therefore exposed to a range of drivers' [Kathleen McInnes, Australia]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
39351	9	15			Biodiversity hotspots are not exposed to specific drivers? [Lourdes Tibig, Philippines]	NOT APPLICABLE: This section has been reformulated and Specific Zones are no longer a focus of the ES even as their cross-cutting CID changes are described within Section 12.4.10.
51679	9	18	9	19	Reasons for Concern' - the capitalisation of the words suggests that this stems from another area of work not referred to directly here. A short summary of the definition would be useful. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This level of detail is too much for the ES. Chapter 12 now includes Cross-Chapter Box 12.1 which furthers these cross-chapter connections by noting the relationship between Climatic impact-drivers and global warming levels, while also strengthening relevance for WGII by linking to its Representative Key Risks (RKR) and Reasons for Concern (RFC) Frameworks.
79623	9	18	9	22	The headlines statement does not include confidence measure which is inconsistent with the practice in the IPCC 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Wilfran MOUFOUMA OKIA, Switzerland]	ACCEPTED: We have added appropriate confidence statements throughout the ES.
79625	9	18	9	22	The headlines statement needs further clarification. Are climate services posing challenge to communication of climate information? [Wilfran MOUFOUMA OKIA, Switzerland]	NOT APPLICABLE: This sentence has been eliminated in a reformulation of the Climate Service ES Statements.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55191	9	18	9	22	This sentence is virtually unreadable given how many different technical terms are included that are all related to each other in some way (indices, climate impact drivers, reasons for concern, global climate drivers.) The non-bolded text in sentence 2 is very clear in communicating results and could be used as the main conclusion for this paragraph as an alternative to the current bolded text. [Nancy Hamzawi, Canada]	NOT APPLICABLE: This section of the ES has been reformulated to improve clarity.
63985	9	18	9	22	I think the phrasing here is quite confusing because all of climatic impact drivers that are described in this report are the one who have "reason for concern" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This section of the ES has been reformulated to improve clarity.
15127	9	18	9	24	I have some problems with how this ES is formulatd. First it is not clear if the the first sentence deals with CIDs at regional or global scale. Second, what are 'global climate drivers'? Have they been defined in the glossary and/or used by other chapters? Third the sentence is not really clear to me. GSAT is supposed to be a CID or a global climate driver? And the 'metric describing heat hazards'? What is the relation between the indices within brackets and the preceding words? In general I am not so keen on defining GSAT and GMSLR as 'climate drivers' because to me they ae a consequence of the changing climate, not a cause (as the word driver may suggest). [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT: The ES has been largely rewritten based on the result of a collaborative approach to consolidate information across WGI chapters (around the CID framework) as described in Sections 12.1-12.3. Chapter 12 now includes Cross-Chapter Box 12.1 which furthers these cross-chapter connections by noting the relationship between Climatic impact-drivers and global warming levels, while also strengthening relevance for WGII by linking to its Representative Key Risks and Reasons for Concern Frameworks.
18777	9	18	9	25	The "pattern scaling" concept discussed in Chapter 4 connects the global mean temperature change to regional change in climate variables. This concept may be briefly discussed here. [Govindasamy Bala, India]	NOT APPLICABLE: This section has been reformulated and pattern scaling is no longer a focus of the ES.
63635	9	18	9	25	When the whole paragraph is readed, according to indices, traceable accounts regarding confidence, confuses the language. In terms of likelihood statements, confidence points may be checked again to be changed to likelihood. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have added appropriate confidence statements throughout the ES.
90607	9	18	9	25	This is likely to be with high confidence. because almost all the climate change history came with pollution, CO2, and the subsequent global warming. Although there still is the natural climate change. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: This section of the ES has been reformulated to improve clarity.
132309	9	19	9	20	No need for an acronym for global warming here. Can just mention "global warming" instead of "Global Surface Air Temperature (GSAT)" [Sonia Seneviratne, Switzerland]	NOT APPLICABLE: This section of the ES has been reformulated to improve clarity.
15129	9	22	9	22	If in ch12 the use of CID instead of 'hazard' has been agreed, then 'climate hazard' should be replacd by CID. [Alessandro Dosio, Italy]	REJECTED: The use of the term hazard in Cross-Chapter Box 12.1 rather than climatic impact-drivers seems appropriate because of the clear framing in support of RKR and RFCs within this Cross-chapter box (and associated ES statements) as the RKR and RFC frameworks focus on the detrimental sides of climate change.
6811	9	22	9	22	"GSAT increase" would be more appropriate than "GSAT warming". GSAT is a measure that increases or decreases. Air warms, temperature increases. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity.
126321	9	22	9	25	The sentence that begins "For a majority ..." is laden with scientific jargon (e.g., "time/scenario dimension"; "threshold behaviors"). If climate service intermediaries, decisionmakers, and other stakeholders are the audience for this chapter, then recommend more explicit and simpler language. Otherwise the point, as important as it is, remains unclear. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
131445	9	22	9	25	Languange might be too complex for an Executive Summary, e.g. "time/scenario dimension" / " threshold behaviours". [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
39353	9	22	9	25	Please explain further "for other indices, the time/scenario remains a determinant" and also "threshold behaviors can not be excluded". Examples could add clarity. Is there a limit to the number of pages allotted to the ES? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
132311	9	22	9	25	"For a majority of these climate hazard indices a direct relationship with GSAT warming can be identified (medium confidence), while for other indices the time/scenario dimension remains a determinant (medium confidence), and in some cases threshold behaviours cannot be excluded (medium confidence)." This text does not seem to rely on the assessment of chapter 12 and needs to be carefully coordinated with the chapters providing the underlying assessments. For instance in the case of climate extremes, the confidence levels in these sentences are not consistent with the chapter 11 assessment. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels. This cross-chapter box includes contributions from many WGI authors/chapters.
112791	9	23	9	24	The words "while for other indices the time/scenario dimension remains a determinant (medium confidence), and in some cases threshold behaviours cannot be excluded (medium confidence)." capture critical information but are really difficult to interpret for non-experts reading the ES. I would add a few more words to explain. I would also avoid the double negative (cannot be excluded). [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
31401	9	23	9	24	The "while for other indices... a determinant" is cryptic. Please clarify. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
51681	9	23	9	24	...the time/scenario dimension remains a determinant and in some cases threshold behaviours' - Can the threshold behaviours be defined? Does this refer to the threshold for CIDs as mentioned on page 10? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
126323	9	23	9	25	The use of the word "decreasing" in the parentheses is confusing. It is not clear if the intent is to use the words increasing and decreasing interchangeably, which doesn't make any sense, or if the intent is to suggest one or the other. Clarify. [Trigg Talley, United States of America]	NOT APPLICABLE: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels.
86219	9	24	9	24	"some cases threshold behaviours cannot be excluded" this is a very important concept, perhaps elaborate slightly, in plain English. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: This section of the ES has been reformulated to improve clarity and connections to the new Cross-Chapter Box 12.2 which connects Climatic impact-drivers to global warming levels and potential tipping points in the climate system
11781	9	27	9	27	"challenges" should be "challenge", for subject-verb agreement. Providing a brief definition of climate services here would be worthwhile. [Amy East, United States of America]	EDITORIAL: clarified
20281	9	27	9	27	Do we need a "s" at the end of "challenge"? [philippe waldteufel, France]	EDITORIAL: clarified
15685	9	27	9	27	"Climate services challenges communication of climate information". I don't understand what is meant here, it could be highly misleading. Climate services in general do challenge communication of climate information, it is in fact quite the opposite, because climate services increase and diversify the delivery of climate information, but this is challenging of course. Written as it is currently the case, the sentences gives the impression that climate services are "bad" for communication of climate information. I think this needs to be clarified. [Samuel Morin, France]	ACCEPTED: this sentence has been simplified and re-worded
115073	9	27	9	27	Opening phrase is not clear and as the bold statement is about approaches and methods of communication it is probably more relevant in Ch 10 or the Atlas. A Ch 12 statement could then start with the first non-bold sentence. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: this sentence has been simplified and re-worded. Climate services are not more distinctly discussed across WGI chapters, with information coming together in Cross-chapter Box 12.2.
6813	9	27	9	27	"challenges" should be "challenge" [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: this sentence has been simplified and re-worded

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
16285	9	27	9	27	comma required after 'climate information' AND should 'challenges' be 'challenge'? See next comment and page 128 line 38. [Sarah Sutton, United States of America]	NOT APPLICABLE: this sentence has been simplified and re-worded
51683	9	27	9	28	Suggest that 'Climate services challenges' and 'as a fluid understanding' could be removed from this sentence without losing the key message and improve sentence clarity. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
81693	9	27	9	29	Please reconsider this sentence – it is overloaded and the message not clear. Do you mean something like this? The communication of climate information and how scientists produce and transfer their knowledge is a challenge for climate services. For a fluent understanding between academic and non-academic experts, co-design and co-productions proved to be useful information and tools relevant to decision-making (high confidence). [Swantje Preuschmann, Germany]	ACCEPTED: this sentence has been simplified and re-worded
126327	9	27	9	29	This is awkward and unclear, but it gets right to the point that communication is difficult, though! "Climate services challenges communication of climate information and the mode of knowledge production and transfer by scientists as a fluid understanding is required between academic and non academic professionals to co-design and co-produce useful decision-relevant information and tools." Suggest rewording to something like "It is challenging to effectively communicate technical climate information from academic to resource manager and decisionmaking professionals; however, innovative climate services that embrace strategies such as co-production of decision-relevant information and tools can increase uptake." [Trigg Talley, United States of America]	ACCEPTED: this sentence has been simplified and re-worded
126333	9	27	9	29	This sentence, ironically, is very convoluted in how it's written, compounded by minor grammatical errors, a run-on sentence, and excessive passive voice. Recommended revision: "Climate services present challenges when communicating information to scientific and non-scientific audiences. Academic and non-academic professionals must maintain open lines of understanding and communication in order to collaborate on the effective and efficient design and production of useful and relevant information and tools." [Trigg Talley, United States of America]	ACCEPTED: this sentence has been simplified and re-worded
96167	9	27	9	29	Please rephrase: The key message is simple, but the sentence is complicated. [Nicole Wilke, Germany]	ACCEPTED: this sentence has been simplified and re-worded across several ES statements and confidence statements only applied to assess progress and common limitations of climate services.
31403	9	27	9	29	This does not say very much. It sounds like there being profound problems in climate services. This may be true in some cases, but not in others. Suggest omitting this sentence, and starting the paragraph with the sentence that follows. [Markku Rummukainen, Sweden]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded in three ES statements (the first including a simple definition of climate services)
86191	9	27	9	29	The way this is written makes the point hard to understand. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
57529	9	27	9	29	Is there a way of writing this in plain English? In particular I'm not clear on what is meant by "mode of knowledge production and transfer by scientists as a fluid understanding is required" [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: this sentence has been simplified and re-worded in three ES statements (the first including a simple definition of climate services)
45031	9	27	9	29	Climate services challenges communication of climate information and the mode of knowledge pro-duction and transfer by scientists as a fluid understanding is required between academic and non-academic professionals to co-design and co-produce useful decision-relevant information and tools ==> As a fluid understanding between academic and non-academic professionals is required to co-design and co-produce useful decision-relevant information and tools, climate services face considerable challenges with regard to the communication of climate information and the ways knowledge is pro-duced and transferred by scientists. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90609	9	27	9	29	"Climate services challenges communication of climate information and the mode of knowledge production and transfer by scientists as a fluid understanding is required between academic and non academic professionals to co-design and co-produce useful decision-relevant information and tools " this is too long and confusing sentence. It would have been written in two or three sentences to appropriately convey the intended meaning. Indeed, it would have been written like this "Climate services challenge communication of climate information, the mode of knowledge production, and its transfer by scientists as a fluid understanding. This is required between academic and non academic professionals to co-design and co-produce useful information and tools relevant to the decision making. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
126325	9	27	9	30	The sentence starting with "Climate services challenges ..." is substantially flawed, in at least the following ways: (a) lack of punctuation makes the sentence cumbersome and difficult to understand, and (b) it is unclear what the authors mean by "as a fluid understanding." [Trigg Talley, United States of America]	ACCEPTED: this sentence has been simplified and re-worded
126329	9	27	9	30	How do climate services "challenge communications"? [Trigg Talley, United States of America]	ACCEPTED: this sentence has been simplified and re-worded
55193	9	27	9	30	This bolded text for the last para in the Chapter 12 ExSumm is also very jargon heavy. Recommend simpler phrasing be used and that confidence language is not necessarily required here and should not be used if a more straightforward statement of fact can be expressed. The main message seems to be simply that providing robust and relevant climate information for climate services is challenging. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded across several ES statements and confidence statements only applied to assess progress and common limitations of climate services.
39355	9	27	9	30	Climate services challenge communication of climate information and the mode of knowledge production and transfer by scientists? How so? What do scientists transfer? Isn't it that these are challenges climate services face? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
89791	9	27	9	30	Do you mean to put colon after Climate services challenges ? It reads funny. [Bonita Sharma, United States of America]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
1527	9	27	9	30	I find the following sentence quite incomprehensible: "Climate services challenges communication of climate information and the mode of knowledge production and transfer by scientists as a fluid understanding is required between academic and non-academic professionals to co-design and co-produce useful decision-relevant information and tools (high confidence)" [Rasmus Benestad, Norway]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
110097	9	27	9	37	Chapter 10 also covered substantively climate services. I wonder whether the inclusion in both chapters requires further coordination to ensure against redundancy of assessment. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Ch12 and ch10 have coordinated their coverage of climate services, with more clear distinctions in treatments across chapters and that information coming together in cross-chapter Box 12.2.
15687	9	27	9	37	Overall, this is the only paragraph which is clearly not redundant with the other chapters of WG1 SOD. All the material introduced above is to some extent already covered in the regional aspects of the various topics of the 11 previous chapters. I would therefore suggest to expand this paragraph a great deal, and ensure to give it full prominence (the current bold sentence at the beginning certainly requires some more work). In fact, this paragraph is probably the most original and policy-relevant of the chapter, it deserves a more visible message. [Samuel Morin, France]	TAKEN INTO ACCOUNT: the paragraph has been expanded by having three paragraphs. The above material has also been further distinguished from previous IPCC WGI Chapters through the use of the CID framework, CID indices, regional detail, and the assessment of additional CIDs not covered elsewhere (e.g., hail, coastal erosion).
77647	9	27	9	37	Rephrase. Climate services don't challenge. The challenge is to provide useful climate services. [Emer Griffin, Ireland]	ACCEPTED: this sentence has been simplified and re-worded
126331	9	27	9	37	[CONFIDENCE] It is unclear why or how confidence levels are assigned in the paragraph. Science co-production is not measured by confidence levels. Assigning a confidence level is arbitrary here, so it seems to undermine other sections of the report that assign confidence levels on the basis of scientific methods. [Trigg Talley, United States of America]	ACCEPTED: excellent point. Confidence levels have been removed from statements of facts and instead applied to an assessment of progress and common limitations of climate services.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63637	9	27	9	37	Climate services has been many times mentioned in this paragraph. There are the challenges, development parameters, but unhappily no clue about what climate services are. It would be clear and match with the sentence, if there is idea about climate services written. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: this sentence has been simplified and re-worded in three ES statements (the first including a simple definition of climate services)
15683	9	28	9	28	"is required" is prescriptive. The sentence could easily be turned around to state that "Co-design and co-production of decision-relevant information and tools, fosters the development of meaningful climate services, bringing together academic, non-academic professionals and all relevant parties". I add "all relevant parties" here because climate services do not only operate by and for professionals, but targets also the general population and benefits to all spheres of governance. [Samuel Morin, France]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
87979	9	28			the sentence is difficult to follow 'transfer by scientists as a fluid understanding is required between academic and nonacademic professionals to co-design and co-produce useful decision-relevant information and tools'. Are you talking about two-way communication between academics and non-academics? [Kathleen McInnes, Australia]	TAKEN INTO ACCOUNT: this sentence has been simplified and re-worded
64085	9	30	9	30	First time the term 'sector' is defined (e.g. 'sectors (e.g., agriculture, water, energy, health)') even though the word is already used on page 7 line 6. It would be great if those general terms could be defined/specified during the first use of the word. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: ES no longer lists sectors in relation to Climate Services. We define our use of Sectors in Section 12.3 (as being consistent with the WGII Chapters)
126335	9	30	9	31	Poor sentence construction obscures clear interpretation of message. Recommend the following rewrite: "Services that encompass climate phenomena on many timescales (from sub-seasonal to multi-decadal) are being developed to address the needs of regions and sectors (e.g., agriculture, water, energy, health), and to target users (high confidence)." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We discuss the combination of observation, attribution and projection as multiple lines of evidence within Cross-Chapter Box 10.3, but this is no longer a focus of the CH12 ES discussion of climate services.
112787	9	30	9	31	add disaster management as a sector (where there are relatively many examples of climate services) [Maarten van Aalst, Netherlands]	NOT APPLICABLE: ES no longer lists sectors in relation to Climate Services.
112789	9	31	9	31	Note that also the interpretation of current conditions, and analysis of trends (e.g. changing return periods of extreme events) is part of climate services -- not just forecasting (from subseasonal to multi-decadal, as suggested now). [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: We discuss the combination of observation, attribution and projection as multiple lines of evidence within Cross-Chapter Box 10.3, but this is no longer a focus of the CH12 ES discussion of climate services.
90611	9	31	9	31	timescales (from sub-seasonal to multi-decadal). The time scale must consider daily and weekly scales because they are very meaningful for the plant vegetative cycle and its critical phases such as germination and blooming which would be damaged if they coincide with climatic hazards as well for animals particularly insects. Indeed, we have the ancestral agricultural calendar which determines all the days of climatic hazards during the year. therefore this very ancestral agricultural calendar in the context of the recent climate change is one of my ongoing researches. I am trying to update it and to keep it valid for all times. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: IPCC WG1 AR6 is largely focused on climate timescales (Ch 1) Section 12.3 underscores how changes to seasonality and short-lived extreme events can also affect sectoral assets, and these seasonal indices are assessed within 12.4.
90613	9	32	9	32	"climate services landscape" this would have been substituted by "widespread of climate services over lands" to convey the intended meaning [Boubakeur Guesmi, Algeria]	REJECTED: this is not the intended meaning
126337	9	33	9	34	Poor sentence construction obscures clear interpretation of message. First, authors present climate services as a problem that requires a solution, rather than a solution that requires best practices and guidelines. Recommend the following rewrite: "User needs and decisionmaking contexts are very diverse; thus, "one size fits all" guidelines are inadequate to address the diversity of climate services that are needed (very high confidence)." [Trigg Talley, United States of America]	ACCEPTED: sentence improved
39357	9	33	9	35	One-size fits all solution to climate services? Please revise how it is worded. [Lourdes Tibig, Philippines]	ACCEPTED: sentence improved
6815	9	34	9	34	"solution to climate services" makes it appear that climate service are a problem, not part of the solution. "solution for climate services" would be better. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: sentence improved

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126341	9	35	9	35	Not sure what authors mean here, need to rephrase. "While the role of IPCC is clearly felt as a reference, authoritative, starting point ..." Perhaps "... is clearly used as a reference and as an authoritative starting point, there is a need ..."? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We no longer discuss the IPCC as a climate service within the ES, although the IPCC's context within climate services is discussed in Section 12.6.
126339	9	35	9	36	Poor sentence construction obscures clear interpretation of message. Recommend the following rewrite: "The IPCC assessments provide an important reference and authoritative starting point for the information needed to provide climate services; however, complementary information that translates the assessments at the local or sectoral level is necessary for successful climate services (high confidence)." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We no longer discuss the IPCC as a climate service within the ES, although the IPCC's context within climate services is discussed in Section 12.6.
45033	9	35	9	36	Please consider: While the IPCC is univocally recognized as reference and starting point, complementary information is needed to translate the assessments at the local or sectoral level (high confidence). [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: We no longer discuss the IPCC as a climate service within the ES, although the IPCC's context within climate services is discussed in Section 12.6.
73989	9	35	9	37	The presented report still has the problems to transfer the scientific information into level necessary for politicians and decision makers. The chapter is mainly discussing trends, but not variability of indexes around these trends. [Elena Kozlovskaya, Finland]	NOTED: the report is not a ready made climate service but it provides starting points for other to develop climate services. The use of confidence language and the presentation of uncertainty helps in the robust communication of scientific findings.
20775	9	37	9	37	Why not? So let us have a look at Section 12.6. On page 130 line 48 it is stated that climate services are needed "to be proactive in determining priorities for basic research in applied climate science". To this reader, this is gibberish [philippe waldteufel, France]	TAKEN INTO ACCOUNT: We have clarified this statement to underscore the useful feedbacks between the climate services community and the basic research community whereby application needs elucidate basic research challenges. In other words, climate services identifies basic research topics whose advancement would, in turn, open new doors for climate services.
126343	9	37	9	37	Poor grammar. Suggest the following rewrite: "The process of providing climate services often uncovers and presents new research challenges to the scientific community." [Trigg Talley, United States of America]	ACCEPTED: sentence improved
16287	9	37	9	37	Climate services also 'sets' or 'set'? See above for agreement. [Sarah Sutton, United States of America]	ACCEPTED: Word removed and sentence improved.
31405	9	37	9	37	The "Climate services also set new scientific challenges to research" does not say anything much, and could be omitted. [Markku Rummukainen, Sweden]	REJECTED: sentence improved
63677	9	37	9	37	This sentence is unclear. The word "set" seems out of place. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Word removed and sentence improved.
51685	9	37	9	37	Climate services also set new scientific challenges to research (high confidence). - It would be helpful here to expand a little on what the 'new scientific challenges to research' posed by climate services are. This would be useful for decision-makers working in this space. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: There is not sufficient space in the ES for this discussion but the Section 12.6 expands on new scientific challenges to research posed by climate services.
39359	9	37			Indeed, climate services set new challenges for research. The framing of AR6 reports which considers novel approaches to how these findings can be used to guide policy makers and practitioners is to be commended, even as research challenges have just been increased. [Lourdes Tibig, Philippines]	NOTED: thank you
81265	9		9		Some headlines does not include confidence statements [Fatima Driouech, Morocco]	TAKEN INTO ACCOUNT: The presentation of these results has been completely reformulated in different paragraphs such that there is no longer an Polar specific section of the CH12 ES.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90615	9		9		"Climate services also set new scientific challenges to research" Indeed, researchers in the field of monitoring climate and climate change must be deeply aware of how climatic data are measured and collected, as well as they have to collect the needed data themselves. Indeed, this allows them to deeply understand the climate evolution and its eventual impacts on sectors. Accordingly, climatic services should be research laboratories and centers where researchers in this field of climate evolution and projection. I personally had and I still have the intention and ambition to set such a center and climate change observatory in the region of Djelfa a central region for both Algeria and North Africa. Of course, this will be subordinating and in coordination to IPCC to be efficient. I really count on your high collaboration [Boubakeur Guesmi, Algeria]	NOTED: These important points are consistent with the text we provide in the ES and Section 12.6.
126345	10	1	11	45	[PRECISION] The term "climate change driver" is not adequately defined or described despite being widely used throughout the document. While the language seems to suggest there is a definition in earlier chapters, repeating that definition here and providing an example would be useful. There are people who are going to refer just to this chapter so they will need to be able to fully understand the language used. [Trigg Talley, United States of America]	ACCEPTED: we assumed the reviewer meant "climatic impact-drivers" and the definition is repeated here
110665	10	1	12	15	Perhaps some mention needs to be made about the implications of Ch1's shift in assessing global temperature change between AR5 and AR6 (from 0.85 to 1.1) and what this means for climate information at the regional scale. [Bruce HEWITSON, South Africa]	REJECTED: this is a bit out of the scope here ; however, the Chapter is assessing how climatic impact drivers have emerged and this is in part since AR5
69257	10	1	12	31	The focus of Chapter 12 is unclear: if it focuses only on physical processes, or other processes such as biological processes are also included. According to Table 12.1, precipitation and soil moisture are identified as the ECV of landslide. This could be misleading because biological aspects such as forest cover also give significant impacts on landslide. The inclusion of a more clear description in 12.1 about the focus of this chapter is suggested. [Kaoru Magosaki, Japan]	Table 12.1 has been removed and replaced by a simpler table describing the CID categories
24423	10	1	136	39	General Comments: (1) It should be noted that the AR6 mainly assess the literatures published after AR5. However, in this chapter, many literatures published before 2013 are cited. (2) High confidence is given for some assessment conclusions which are only based on one literature. It is thus not convinced. (3) Chapter 11 shows the conclusion for the secular changes in regional temperature extremes, precipitation extremes, drought and flood. This chapter may cite these conclusions to make them concise when taking about the same topic. (4) Since this chapter focus on the regional climate change information, the attribution may be considered to be excluded in this Chapter. [Zhou Botao, China]	TAKEN INTO ACCOUNT: (1) This is now specified in 12.1; (2) Confidence levels have been revised and made consistent with previous chapters; (3) Same response; (4) There is not a large focus on attribution; however regional attribution is part of the broad view on regional climate information
114847	10	1			This framing section reads very well, it's a good introduction to the chapter. One minor thing: I would frame the chapter not only as a handshake with WGII, but also the assessment it produces is going to be useful to the wider climate change community. I made a similar comment on the RFC section. There is tailoring to WGII needs which is definitely a goal and benefit of this chapter, but don't forget about its independent value! (That said, I also like figure 1.) [Brian O'Neill, United States of America]	NOTED: We thank the reviewer. We do not find that the chapter is particularly framed as the handshake, as it also includes more general framing
15689	10	3	10	3	I think future past reports go further than simply state that future climate change "has the potential to induce major damages in the future". This this an euphemism at best. See e.g. section C4.7 of SROCC SPM for a starting point. [Samuel Morin, France]	ACCEPTED: we have changed the sentence to go further
51689	10	4	10	4	Suggested edit: induce major socioeconomic damages.. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
110581	10	4	10	6	The grammar for this sentece really confused the meaning. I think you meant to say "Sociate, at large, benefits ..." [Rachel McCrary, United States of America]	TAKEN INTO ACCOUNT : this is rephrased
90617	10	4	10	6	The society at large benefits from information related to climate change and its impacts enabling the development of options to protect lives, preserve nature, build resilience and prevent avoidable damage" . Problem of verb conjugation. It should have been written "enables" instead of "enabling" to fit the subject (society)and then be correct like this "societyenables the development..." [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT : this is rephrased

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112793	10	5	10	5	add risks rather than just impacts (impacts are realised risks, risk are in the future and can include a probabilistic element) [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT : this is rephrased
115075	10	6	10	6	Suggest adding "and identifying unavoidable loss and damage" after "avoidable damage". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT : this is rephrased
90619	10	6	10	6	"prevent avoidable damage" it is better to say "avoid damages" instead [Boubakeur Guesmi, Algeria]	REJECTED: this would change the meaning
90621	10	6	10	6	"adaptation strategies" I propose an extension for this to be "adaptation strategies in the context of sustainable development" [Boubakeur Guesmi, Algeria]	REJECTED: Adding this would require a development which is not the purpose of this section
51691	10	7	10	7	Suggested edit: be considered as complementary to adaptation strategies' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: we meant also that adaptation strategies should include also beneficial effect
90623	10	9	10	10	"This chapter assesses climate information relevant to regional impact and risk assessment with a focus on climate hazards and other aspects of climate that influence society and ecosystems" the underlined statement is a redundancy because it repeats the same meaning with "impact" formerly mentioned in the same sentence. Redundancy and wordiness are usually confusing for the reader by making him be thinking about these other climate aspects which influence society and the ecosystem other than the impact. Also, the reader's attention is inevitably interrupted by thinking about the difference between impact and these other climate aspects though they are the same. one of the features of academic and scientific writing is being concise and precise. provide words as much as required to convey the meaning in the shortest way. Hence, digression is avoided, and the sequence of thinking is maintained from the beginning to the end to come up with an efficient conclusion and the intended message. therefore, there would be an interplay between the reader and the text allowing him to discuss, to argue, and to whether agree or disagree with the author and thence serve the science progress. [Boubakeur Guesmi, Algeria]	ACCEPTED: We removed the second part of the sentence
86193	10	10			Surely this should be "climate hazards and opportunities" to link to the climate impact drivers framing? [Debra Roberts and the Durban WGII TSU, South Africa]	REJECTED: we actually shortened the sentence as CIDs are defined in the later paragraph
115077	10	11	10	11	Change "previous" for "other" as Ch 12 is followed by the Atlas which is relevant here. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
45037	10	12	10	12	On line 12 you say that the chapter largely focusses on hazards, on line 43 you also speak of opportuni-ties, raising the appearance of contradiction and insufficient interconnectedness. [Christophe Deissenberg, Luxembourg]	ACCEPTED: We removed the second part of the sentence
80213	10	14	10	15	Exposure, in the Hungarian point of view (in harmony with the CIVAS and other impact-chain models) means exactly the changes in local climate conditions (what IPCC calls hazards). The aspects which the text we believe wants to refer to, are rather sensitivity, adaptability and vulnerability. Our suggested new text for line 14-15 is the following: "Impacts of climate change are driven not only by changes in climate conditions (exposure), but also by changes in sensitivity, adaptability and as a consequence of these, vulnerability". [Lilian Fejes, Hungary]	REJECTED: This is not the IPCC definition of exposure
112795	10	14	10	16	as noted earlier, this refers only to impacts, rather than also to risks (impacts are observed/realised, risks are potential future impacts). Eg. Line 32 does specify "impact and risk assessment" [Maarten van Aalst, Netherlands]	REJECTED: risks refer to negative impacts and in this paragraph we need to stay at a neutral level
63687	10	14	10	35	These lines includes 3 paragraphs that are not clear enough, with no sense. Those paragraphs does not contain relevant information (and the information that might be relevant appear in other paragraphs), can be perfectly removed and the text can continue perfectly in line 37. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: These paragraphs contain the specific framing of the chapter. We have tried to improve the style
51687	10	16	10	16	Refers back to chapter 1 for definition of climate impact drivers, however it would be easier for the reader if the definition was included here too. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115079	10	17	10	17	Suggest replacing " hazards and opportunities" with "positive or negative impacts" and "sectors" with "systems" [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: - this has been rephrased - Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
16289	10	17	10	17	Here "hazards and opportunities" describes drivers. This suggests that the comment for page 7 lines 7 and 8 is a strong recommendation. Since climate services is treated as plural in 12.6.1, it should be treated as such throughout. [Sarah Sutton, United States of America]	NOTED: but the sentence is rephrased
86221	10	17	10	43	"Opportunities" also in line 43 see comment on pg 7 line 7 re "beneficial impacts". If opportunities here refer to positive societal and behavioural changes, then that should be clarified. I.e. does it refer to possibly beneficial impacts of climate change or beneficial responses? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT - Sentence rephrased to clarify
112799	10	19	10	21	I would cite SREX and AR5 WGII. Sentence also needs an edit [Maarten van Aalst, Netherlands]	REJECTED: It is difficult to tie these reports to the statement here.
90627	10	23	10	24	"An assessment of the evolution of such drivers over the 21st century is given, with the aid of information" the comma between the two underlined words "given, with", this comma is inappropriate and useless and should be omitted to do not interrupt the meaning [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: the paragraph has been removed because it was redundant with another paragraph
90629	10	25	10	25	"related recent literature." this should be substituted by the statement " recent related literature" which more appropriate. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: the paragraph has been removed because it was redundant with another paragraph
115081	10	25	10	25	Remove "the regional". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the paragraph has been removed because it was redundant with another paragraph
126347	10	27	10	27	It may be useful to clarify "some applications" (which, when, why?). [Trigg Talley, United States of America]	ACCEPTED: "some applications was replaced by "in some cases, risk assessments"
90631	10	27	10	30	this passage is not clear and its meaning is vague. Therefore, It should be appropriately rewritten to convey the intended meaning. In the citation (e.g., (Ruane et al., 2015)), this "e.g." is not understood for what purpose is written. Does it mean examples are found in this reference?!. [Boubakeur Guesmi, Algeria]	NOTED: "e.g." used here to emphasize that the reference provided is an example rather than a comprehensive look at a larger area of study

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299	10	27	10	35	This seems the right place to acknowledge the shortcomings of focusing only on CLIMATE impact drivers, perhaps by incorporating some mention of other non-climate hazards and explaining that people's experience of IMPACT and perceptions of RISK rarely equate with those of climate (and other) scientists. What prompts this comment is the experience of coastal change on small islands where tsunamis are at least equally as important as other types of extreme wave, and coastal communities rarely distinguish the two. [Patrick Nunn, Australia]	REJECTED: While it is clear that there are also non-climate hazards, we prefer not to mention it here
112971	10	28	10	28	In most other chapters the "-" is omitted: "bias-adjusted" -> "bias adjusted" [Claas Teichmann, Germany]	TAKEN INTO ACCOUNT: we removed "bias adjusted" as this is a technical detail here
15131	10	28	10	29	driven by bias-adjusted historical forcing datasets and full climate scenario time series'. It is not clear why bias-adjustment is considered only for the historical simulations (what about the future projections?), and what is a 'full' climate scenario time series? I also do not like the word climate 'scenario' (which is usually related to the emission scenario) and I would rather use 'projection' instead. I would rephrase the sentence as 'driven by bias adjusted historical and future time series' [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT: we removed "bias adjusted" as this is a technical detail here
11783	10	29	10	29	remove inner set of parentheses [Amy East, United States of America]	ACCEPTED
41827	10	29	10	29	Please instead of writing "(e.g., (Ruane et al., 2015))", write "(e.g., Ruane et al., 2015)". There is an excess of brackets or parenthesis [JACQUES ANDRE NDIONE, Senegal]	ACCEPTED
43455	10	29		30	Read "(Lange, 2019a)" rather than "(e.g., (Lange, 2019a))" [Cyrilique Rufin Nguimalet, Central African Republic]	ACCEPTED
90633	10	30	10	30	".....described in Chapter 10. This chapter focuses....." the capital letter "C" in the word "Chapter 10" is unnecessary. After that, the word "this chapter" may mean chapter 10. So, it should be written "this present chapter" or "this twelfth chapter" [Boubakeur Guesmi, Algeria]	ACCEPTED: but Chapter keeps a capital letter
38167	10	30	10	30	Missing parenthesis after (e.g., Lange, 2019a))" [Junhee Lee, Republic of Korea]	ACCEPTED
126349	10	31	10	31	It may be useful to explain why these "finite number of drivers" were selected and, as a result, the potential benefits/gaps of this choice. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: this is for the sake of conciseness and synthesis
90635	10	32	10	33	"It is also important to note that compound or concurrent hazards, whose effects are different from the sum of each individual hazard" the intended meaning of this sentence is not clear, whether it means that the effect of compound hazards is different from the sum of effects of hazards?? [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this sentence has been rephrased
132315	10	33	10	33	On compound events/hazards: Also refer to chapter 11, Section 11.8, since we have a dedicated chapter on this topic. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: this sentence has been rephrased
45035	10	34	10	35	The logic of the sentence is obscure. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: this sentence has been rephrased

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90637	10	35	10	35	"Despite the fact that the evolution of some hazards has been attributed to climate change, it is also important to realize that hazards may have changed differently in the past than they will in the future." in this context of climate change impacts on climatic hazards, I am holding a very relevant and interesting research. Because in the region of Algerian steppe particularly in Djelfa, we have the ancestral agricultural calendar which is very reliable and valid in determining the periods and days of climatic hazards during the year in order to avoid them or to take the necessary measures to protect the crop from damages. Indeed, my research purpose is to update this agricultural calendar to suit and remain reliable and valid in the new context of the recent climate changes in this region which I discovered in my previous researches such as climate warming (https://www.inderscience.com/info/inarticle.php?artid=84015) and the climatic drought (http://larhyss.net/ojs/index.php/larhyss/article/view/574). As primary observations in my research, the hazards are likely to be resistant to climate change, and they barely have been affected. because they almost still have the same timing in the year. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: the paragraph has been shortened to remove too detailed statements at this place
51693	10	35	10	35	Suggested edit: 'may have changed differently in the past to how they will do so in the future' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: sentence has been removed as it was a weak statement and space is constrained
15691	10	37	10	39	I think it would be appropriate to state that the risk framework was also considerably refined and put to practice through the production of the 3 AR6 Special Reports, which all involved WG1 and WG2. [Samuel Morin, France]	NOT APPLICABLE: sentence has been removed as it id duplicating part of Ch 1 and space is constrained
112801	10	40	10	40	I would add an explicit link not to "WGII needs" but to "the assessment of key risks related to climate change by WGII (chapter 16, forthcoming), also informed by changes in vulnerability and exposure, as well as development pathways and adaptation options" [Maarten van Aalst, Netherlands]	ACCEPTED: A sentence has been added
90639	10	40	10	42	"Within this framework, climate-related impacts and risks are determined through a complex interplay between the occurrence of climate hazards and their consequences depending on the exposure of the affected human or natural system and its vulnerability to the hazardous conditions" this passage limited the climate change impacts and risks to only hazards and vulnerability, however the as already mentionned "climate-related impacts and risks" are also due to the climate change itself, because any change in the climate system is inevitab [Boubakeur Guesmi, Algeria]	REJECTED: the meaning of the comment is not fully clear
87981	10	41	10	42	climate hazards and their consequences depending on the exposure of the affected human or natural system and its vulnerability to the hazardous conditions. Replace ' [Kathleen McInnes, Australia]	REJECTED: the proposition of replacement is truncated
102603	10	42	10	46	try integrate these important lines with the first paragraph lines 14-20 [Philippe Tulkens, Belgium]	REJECTED: the risk framework is not presented in this paragraph
90641	10	43	10	43	"climatic impact drivers that could lead to hazards or to opportunities". In this statement, instead of "hazards" which is purely climatic term in this report, it would have been written "damages or risks and opportunities" to show the discrepancy between the impacts of climate change. [Boubakeur Guesmi, Algeria]	REJECTED: Damages are not at the same level as "risks" which is a potential impact
112797	10	43	10	43	impacts (last word of the sentence) -> impacts and risks [Maarten van Aalst, Netherlands]	NOT APPLICABLE: this sentence has been removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90643	10	43	10	44	"Despite the fact that impacts may also be induced by climate adaptation and mitigation policies themselves" it would have been written "opportunities" instead of "impacts" in this passage. Because it is more appropriate with adaptation and mitigation whose purpose is to get the benefit of climate change as what I did with my previous research in the Algerian steppe region of Djelfa (climate warming (https://www.inderscience.com/info/inarticle.php?artid=84015) and the climatic drought (http://larhyss.net/ojs/index.php/larhyss/article/view/574). Indeed I am continuously trying to get the benefit from these climate changes to adapt the agricultural calendar and dates to increase the crop by for example making two vegetative cycles in the year to let the agriculture provide the crop and the harvest twice or more per year. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this sentence has been removed
126351	10	43	10	46	[GAPS] This phrase could be clarified: "... impacts may be induced by climate adaptation and mitigation policies ..." Is this saying that the report does not take into consideration policies/infrastructure/social support or other mitigating measures/policies that change climate impacts, vulnerability, and risk? This needs an explanation -- that is, why those are not considered in the report and the potential gaps as a result. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: this sentence has been removed
89793	10	43	10	46	Policies, and socio-economics are the main source of climate drivers; how did you account for disruptors in the system (i.e. COVID-19) in your models? Should you mention that here? Impacts and risks do not occur in a vacuum. [Bonita Sharma, United States of America]	NOTED: Emission scenarios and natural forcings are taken into account. Of course other unpredictable events can occur. COVID could not be considered in simulations given its timing relative to the CMIP simulations. A more complete consideration of COVID is provided within the COVID cross-chapter box 6.1.
90645	10	44	10	44	"as well by as socioeconomic" the correction of this is "as well as by socioeconomic" [Boubakeur Guesmi, Algeria]	ACCEPTED
90647	10	44	10	44	"(WBG; (Lemke and Kjellstrom, 2012))" this style of citation seem strange for me, I mean this "WBG;" inside the parenthesis . What style is this : MLA, SLA. I understood that the author wanted to say that the citation is only for ""WBG"". [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: We do not use WBG here but the HI index
51695	10	44	10	44	induced' > 'reduced'? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Induced is the intended word here
112803	10	45	10	45	I think you could add a reference to the forthcoming chapter 16 of WGII AR6 [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: this sentence has been rephrased
115083	10	46	10	46	Suggest "natural systems" rather than "ecosystems". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: We finally say "human and ecological systems"
41729	10	48	10	48	for easy reference put full title: Cross-Chapter Box 1.2: Baseline and reference periods in AR6 [Sawsan Mustafa, Sudan]	ACCEPTED
63689	10	48	10	48	Change "Box 1.2" by "Box 1.3" (as Framing is Box 1.3) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	This is now Cross-Chapter Box 1.2
63987	10	51	11	3	The authors mentioned two basic terminologies. It would be better if it is explained in the beginning of the chapter. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: we find it better suited after the general framing
15133	10	51	11	8	Before defining indices and threshold of a CID I would define what you mean by CID and why this term is used, instead of hazard. I understand this is partly explained on lines 10-21 (without explicitly define CIDs, though), but as said, this should come before the definitions of indices and threshold. [Alessandro Dosio, Italy]	ACCEPTED: the definition is now given in the introduction

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115085	10	52	10	52	Suggest removing "essential" as "Essential Climate Variables" have specific GCOS-defined meanings which I am not sure are appropriate here and could be confusing. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: we now simply have "climate variables"
41829	10	54	10	54	Please instead of writing "(WBGT; Lemke and Kjellstrom, 2012)", write "(WBGT; Lemke and Kjellstrom, 2012)". There an excess of brackets or parenthesis [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: We now use the HI index across the chapter
43457	10	54			Read "(WBGT; Lemke and Kjellstrom, 2012)" rather than "(WBGT; Lemke and Kjellstrom, 2012)" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: We now use the HI index across the chapter
3653	10	55	10	55	Wind speed is an important aspect in WBGT. It is therefore suggested that wind speed be added to the definition of WBGT to read "which combines temperature, wind speed, radiation and humidity" [Dhunraj Danny, South Africa]	NOT APPLICABLE: We now use the HI index across the chapter
90649	11	2	11	2	"spatial extent" how this can be calculated via indices using one or a combination of essential climate variables designed to measure the intensity of the climatic impact driver as written in page 10 lines 51-52?!! .Logically talking, such climatic variables can not allow the calculation of the impact spacial extent. [Boubakeur Guesmi, Algeria]	NOTED: Spatial extent can be measured in things like glacier or permafrost area as well as the geography affected by a particular CID threshold (e.g., Category 5 tropical cyclones). Further information and examples are provided in FAQ12.3 as well as FAQ11.2 ("new locations").
63841	11	4	11	5	Unclear can something interact with vulnerability? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: this is the very essence of the risk framework
115087	11	5	11	5	Delete "opportunity" as this is already covered by "impact". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Opportunity is at the same level as risk, in a positive sense
107869	11	6	11	8	This statement could use a reference . [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: A reference is added but the index is now the HI index
41831	11	6	11	8	Authors wrote "For instance, a threshold of WBGT=31°C is commonly used as a threshold for protecting workers against heat stress." I'm not sure that the "threshold of 31°C" will be relevant in the Sahel trip or in Tropical area in general... 31°C is so common in daily temperatures! [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: We now used another index
90651	11	11	11	11	"(including," including what ???! This should followed by a noun of the thing included. [Boubakeur Guesmi, Algeria]	REJECTED: the sentence means including climate disasters, but not only
115089	11	13	11	13	Suggest deleting "climate impacts and" [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
90653	11	14	11	14	"Hazards and increases thereof that are attributable to....." this should be written " Hazards and their increases which are attributable to...." [Boubakeur Guesmi, Algeria]	ACCEPTED
1529	11	14	11	14	Stress testing is a useful way of preparing against natural disasters and hence exploring exposure or vulnerability in ways that can help building society more resilient. E.g. Benestad et al. (2019; DOI: 10.1029/2019EO113311) showed how recent analog storms from regions where they are more frequent can be used in such stress testing to provide a representation of potential hazards. In this example, very violent storms are "transported" to cities with little data in cities like Kulnha in Bangladesh or for small island states. This is another approach to return-value analysis and strictly not scientific, but nevertheless can be a practical way to prepare for extremes where there is little data and it's too expensive to run heavy model simulations (and where it's uncertain whether the GCMs are able to represent e.g. TCs). Based on such stress tests it may be possible to explore the capacity of critical infrastructure to withstand severe weather. This type of analysis is scenario based and complements statistical analyses such as return-values. [Rasmus Benestad, Norway]	TAKEN INTO ACCOUNT: This paragraph was rephrased

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
80215	11	14	11	17	Following the terminology of IPCC it is true but following some impact models and for instance in Hungary it is not the case that exposure can be reduced. As for our definition, it is an endowment, depending on the geographical location and the climate. So there is no "exposure reduction" as the text says. See also lines 40-42. [Lilian Fejes, Hungary]	REJECTED: we use the IPCC definition of these terms
39361	11	14	11	17	Correct, hazards and increases thereof that are attributable to human influence on climate can only be addressed by mitigation actions, as in the case of slow onset events associated with impacts of climate change, making it much more difficult for highly vulnerable countries to address and manage such risks. [Lourdes Tibig, Philippines]	NOTED: This paragraph was rephrased
90655	11	17	11	18	"The first priority mentioned in the Sendai Framework is, however, "understanding disaster risk" as a necessary step for action." in this statement, the word ",however," as well as the inverted commas ("...") in "understanding disaster risk" are unnecessary. This means this would have been written " The first priority mentioned in the Sendai Framework is understanding disaster-risk as a necessary step for action." [Boubakeur Guesmi, Algeria]	ACCEPTED: this has been rephrased
90657	11	17	11	18	"Facilitating such an understanding is a clear goal of this chapter, which, as part of the WGI report, is confined to assessing climatic impact drivers." Regarding the preceding sentence, this sentence seems to continue in the same context, but there is here a problem of both coherence and cohesion because it misses the linkage to its preceding text. therefore this should be reformulated as follow " So, despite the fact that the report is devoted to the assessment of climatic impact drivers, facilitating such an understanding is a clear goal of this twelfth chapter". [Boubakeur Guesmi, Algeria]	REJECTED: we do not see how this would improve the reading
90659	11	19	11	21	"It is important to recognize that exposure and vulnerability can also change over space and time, and in many cases may have a more of an effect on changing impacts and risks than climate hazard changes alone" this sentence should be introduced by a suitable transition from the preceding one, and it should be reformulated as well to be as follow : " Moreover, it is worthwhile to note that exposure and vulnerability are changing over space and time, and their effects on changing impacts and risks can exceed the effect of hazards" [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
39363	11	19	11	21	Some words may be missing in the statement. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
63691	11	19	11	21	The sentence is too long and complex. The final part of the sentence is very confusing, so should be rewritten for clarity. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
301	11	20	11	20	delete the word a [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
20283	11	20	11	20	The "a" before "more" to be removed [philippe waldteufel, France]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
28251	11	20	11	21	"may have a more of an effect" appears like erroneous language [Sebastian Bathiany, Germany]	TAKEN INTO ACCOUNT: this has been rephrased, but the paragraph has been remodelled
63843	11	20	11	21	I would add a comment on how exposure and vulnerability are somewhat dependant on how effective adaptation and mitigation are e.g. "exposure and vulnerability are dependent upon adaptation and mitigation and will vary in time in space. In many cases they have more of an effect on... [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: this statement probably belongs to WGII
15693	11	21	11	21	I think "may have a more of an effect" could be replaced by "may have more effect" [Samuel Morin, France]	TAKEN INTO ACCOUNT: this has been rephrased

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90661	11	23	11	23	"The chapter adopts a regional perspective (regions as defined in Chapter 1, see Figure 1.15)": Contrarily to what is adopted in this report by opting what is found the relevant literature and adopting a continental and subcontinental scale for the regional studies (Chapter 1 as referred to in this present statement of chapter 12), the regional scale and region dimensions for the study of climate change and its impact should be logically and judiciously determined in order to really make the change and variation in both the climatic system and the ecosystem easily detectable. Indeed, this region must be limited to a specific space where there is only one homogenous climate to permit the climate change being outstanding and easily observable, and also one homogenous ecosystem to reveal the changes due to the impacts of climate change. Effectively, the homogeneity makes the changes outstanding and obviously seen. So, the continent space can never be homogenous in terms of climate and ecosystem. [Boubakeur Guesmi, Algeria]	NOTED: The assessment is made at the scale of regions and not continents, and do not take into account exposure
63693	11	23	11	23	In order to be more coherent with the whole report, please include the word "Continental" as follows: "...perspective (Continental regions as defined..." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED
110101	11	23	11	27	Should this be expanded to note at paragraph end that many systems (both natural and human) are not adapted to present-day conditions? [Peter Thorne, Ireland]	REJECTED: such assessment belongs to WGII
63695	11	24	11	25	Change the word "government" inside the brackets, as follows: "regional stakeholders (e.g., governments, non-governmental and..." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: we emphasize governments as the IPCC is primarily mandated by governments
41731	11	25	11	25	delete non-governmental. since civil society organizations include NGOs [Sawsan Mustafa, Sudan]	ACCEPTED
90663	11	25	11	25	"governments (e.g., non-governmental and civil society organizations" this seems paradoxal governments is not non-governmental and civil society organizations ??? [Boubakeur Guesmi, Algeria]	ACCEPTED
131447	11	25	11	26	Non-governmental organisations are typically part of civil society, though not exclusively. Civil society is commonly considered the (non-profit) 'third sector' alongside the public and private (i.e. business) sectors. [Hans Poertner and WGII TSU, Germany]	ACCEPTED
41733	11	26	11	26	add: and financial institutions [Sawsan Mustafa, Sudan]	REJECTED: the list encompasses financial institutions already
303	11	26	11	27	suggest change clumsy sentence to "While the focus is on future changes, it also described the current status of climatic impact drivers (levels and trends) as a baseline for developing informed adaptation strategies" [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT; This has been rephrased
63697	11	29	11	36	Remove this paragraph. This paragraph talks about methods, and this information is not relevant in this section, which is Framing. Further: the paragraph is not really informative and self-explanatory as it is written. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: A large part of this paragraph has moved to 12.2 (first \$)
90665	11	30	11	30	"to identify risks at the sectoral level and those climate hazards relevant to them." This should have been written as follow " to identify risks relevant to climate hazards at the sectoral level" [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this has been rephrased but paragraph has moved to 12.2
51697	11	30	11	30	Suggested edit: 'to identify present and future risks at the...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: but paragraph has moved to 12.2

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90667	11	30	11	32	"Quantitative values of changes in corresponding climatic impact drivers indices are then obtained from existing literature on changes in the physical climate system, results of other AR6 WGI chapters...." the values here do not mean all the values in general, but some specific and characteristic values like for example thresholds, critical values. because these are the values that literature can determine, however the general values are calculated when needed in research for example [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this has been rephrased but paragraph has moved to 12.2
110583	11	33	11	34	You state here that in some cases hazard indices are recalculated - do you actually mean just that Hazard incidies are calculated in the Atals because they didn't exist elsewhere (or were inconsistent). I found this statmenet confusing. [Rachel McCrary, United States of America]	NOT APPLICABLE: the sentence has been removed
115091	11	33	11	36	Suggest "... are calculated in collaboration with the Atlas" and then ending with "tailored thresholds, some of which can be explored in the Atlas chapter's Interactive Atlas". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the sentence has been removed
90669	11	34	11	36	"Figures based on general or example thresholds (e.g., figures in Section 12.4) illustrate the types of analyses that can be performed using additional, tailored thresholds drawing upon information from the Atlas." this sentence is outlying from its paragraph to cause a problem of cohesion by missing the linking word (conjunction), and another one of coherence by having an irrelevant idea to the paragraph where it belongs. in fact, there should have been a logical transition inside the paragraph between ideas to keep the reader's attention , and not a jump which confuses the reader and makes the meaning and focus lost. [Boubakeur Guesmi, Algeria]	NOT APPLICABLE: the sentence has been removed
15695	11	38	11	38	In the post-COVID situation maybe the term "handshake" could be considered to not be appropriate anymore. [Samuel Morin, France]	NOTED: however we did not change because this was the mandate given to CH12
126353	11	38	11	45	The text could be clearer if it were written for a general audience that is not familiar with WGI and WGII. [Trigg Talley, United States of America]	NOT APPLICABLE: the sentence has been removed
131449	11	40	11	42	"Implementation of policy shifts" is imprecise. Reconsider what you want to say here. It is possible to shift towards / implement mitigation/adaptation policies. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: this has been rephrased
98845	11	41	11	42	"Implementation of policy shifts may modulate hazard probability changes (i.e., by reducing emissions to limit global warming) as well as regional vulnerability and exposure." in this statement, there is a hint to the notion of sustainable development which should have been mentioned as the most appropriate overarching term to fitfully cover the intended idea. Indeed this sustainable development is a policy and strategy relying on both hazards, vulnerability, and exposure of territories in order to find a midway and a compromise such as adaptation in order to simultaneously use and protect the durability of natural sources. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: this has been rephrased
51699	11	42	11	42	Suggested edit: '...as well as regional vulnerability and exposure, which are considered in the WGII report' (if this is the case) and "The assessment herein (i.e. confined to the WGI report) is organised...'. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: this has been rephrased
63991	11	48			Figure 12.1. Please give dash line to catagorize "Exposure" and "Vulnerability" as one box because they both are determined from climate change information assessed in the collection of WGI chapters and changing profile risk. Not only Vulnerability [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: All are separated context and assessed in WGII
108307	11	50	11	54	The title of the figure one is too long and vague. it would be better if it was written as following "Schematic diagram showing the use of climate change information (WGI chapters) for typical impacts or risk assessment (conducted in WGII) with illustration by the property damage or loss in a particular region caused by flooding due to high sea level overtopping a dike." or too simply " Complementarity between working groups (WGI, WGII)" [Boubakeur Guesmi, Algeria]	ACCEPTED

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63699	11	50	11	54	Figure 12.1: Better begin with WGI instead of WGII. For this, change the order of the sentence: Schematic diagram showing how climate change information assessed in the collection of WGI chapters contributes to the risk assessment conducted in WGII. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: in the logical order we are first assessing WGII papers on their physical aspects
108309	11		12		Figures 12-1 and 12-2 are put successively which makes them condensed in one place in the text which is against the homogeneous view of the text. I think it would be better to put figure 12-2 at the very beginning or within the summary as it summarizes the structure of the narrative in Chapter 12. [Boubakeur Guesmi, Algeria]	NOTED: placement of figures will be discussed at a editorial stage
108311	11		12		It is noted that figures 12-1 and 12-2 were introduced by two paragraphs whose aim is to explain these very figures. However, we commonly and logically use figures as a compliment and illustration of the main text for further clarification and deep understanding, and not the opposite as what is here a text introduces the figure. hence a figure must always be relevant to the main topic and idea of the text wherein included and it should be appropriately referred to nearby the most relevant idea and sentence. therefore, the figures 12-1 and 12-2 should be hence reconsidered. [Boubakeur Guesmi, Algeria]	REJECTED: figures 12.1 and 12.2 are framing figures necessary to the chapter
52623	11				Figure 12.1 is a nice figure because it is possible to 'start' in any box. It is a good WGI/II handshake figure. [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: We thank the reviewer
115093	12	5	12	6	Change "sectoral" to "system" and remove "essential". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
63701	12	6	12	6	Change "hazard indices" by "climate impact drivers" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: we now use CIDs and their relevant indices
112805	12	12	12	12	after the RFC framework, you could also add a reference to chapter 16 of WGII AR6. [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: we rephrased
112807	12	14	12	14	after the sentence on climate services, you could also add a reference to chapter 17 of WGII AR6 [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: we rephrased
63703	12	18	12	22	Figure 12.2: Remove "Narrative and". It is enough if the text is as follows: "Figure 12.2: Structure of Chapter 12" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: The right panel is the narrative

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112983	12	25	12	26	"how regional climate information can be used for impact and for risk assessment". Actually, the universal or global impact is merely the sum of the same regional impacts in many worldwide regions which together have a general global aspect. So the impact is, in fact, regional and zonal and could be heterogeneous (regional) or homogenous (global). So, a study of the global impact of climate change seems to be senseless and impossible unless theoretically as suggestion to be proved by forthcoming facts. fit not useful to discuss global impacts or discuss differences between it and regional impact. [Boubakeur Guesmi, Algeria]	TAKEN INTO ACCOUNT: Section 12.5 now discusses global and less global patterns, as well as clusters of CID changes.
39365	12	25	12	31	in [Lourdes Tibig, Philippines]	ACCEPTED
63705	12	25	12	31	Rewrite the paragraph. Here an example: "The chapter includes two Cross-Chapter boxes: one includes a heat extreme case study in East China (Cross-Chapter Box 12.1) that provides a detailed assessment of the consequences of a climate hazard. The other (Cross-Chapter Box 12.2) focus on public climate services and illustrate how climate change information is generated and provided in two different contexts." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: this paragraph has been rephrased as proposed
110585	12	25	12	31	This paragraph is awkwardly placed. Does not follow the previous paragraph well or lead into the next section. [Rachel McCrary, United States of America]	REJECTED: This small paragraph is an extension of the description of the chapter content found above
110663	12	34	16	4	As this chapter seeks to handshake with WG2, and is expressly focused on the regional scale, it seems that uncertainty is only weakly addressed. At the regional scale one has the intersection of multiple factors: compound effects, thresholds, climate impact drivers operating on different temporal and spatial scales, unresolved bias correction, differential climate model sensitivity, and the host of associated that we all know (downscaling, model selection, feedbacks, etc, etc). It would seem that in light of the purpose of this chapter more could be said about integrated uncertainty in developing an understanding of defensible climate information at the regional-scales (or preferable "decision-scales"). The topic is lightly touched on in some places, e.g. in citing Shepherd (pg128; 47) but it would seem that a more substantive assessment of the importance of integrating uncertainty in relation to the robustness of regional information warrants attention in 12.2, the cross chapter box linking to this, and in 12.6. [Bruce HEWITSON, South Africa]	TAKEN INTO ACCOUNT: Uncertainty in the generation of regional climate information and in terms of information for decision-making or impact assessment is discussed in several sections in chapter 10, which we now refer to accordingly in section 12.2.
71457	12	34			This section should establish a much stronger link with Chapter 10. It is not only bias adjustment which is relevant for you. We are amply discussing different (modelling) setups used to create regional information, performance of different model types in providing regional information, managing uncertainties, and pulling together multiple lines of evidence. All this provides the basis for any confidence we have in risk assessment at the regional scale. Please have a look at the relevant sections in Chapter 10, and refer to these at least here in your framing part. [Douglas Maraun, Austria]	ACCEPTED: Links to Chapter 10 are made where appropriate.
112809	12	35	17	15	I would avoid the acronym ECV -- it is not widely known, and only used on 4 pages in this chapter -- but in places (e.g. table 12.1 and 12.2) where readers unfamiliar with the term will need to search for it deep in the tekst on page 12. [Maarten van Aalst, Netherlands]	ACCEPTED: We have spelled out "essential climate variables" alongside the acronym in the table caption and other relevant places in the text.
115101	12	38	12	53	Suggest referring to the Interactive Atlas here where options and effects of bias adjustment are shown. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: this cross-reference to the Atlas has now been included in the respective paragraph on bias-adjustment.
86293	12	40	12	43	Even though the introductory part of the chapter noted the chapter assesses only physical changes and not their impacts on human and natural system, reading through the chapter (particularly section 12.3) gives a sense that this is what was done in the chapter. This will need discussions with WGII to rationalise. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Text adjusted to reflect focus of Ch12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102605	12	40	12	43	as previous statement. It is important to use these lines right in the beginning to make clear this chapter bridges WGI and WGII, and focuses on hazard while WGII focuses on vuln. And exposure [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We agree with the comment, and the point on Ch12 focusing on the physical aspect (i.e. hazards) is emphasised in the first 2 paragraphs of the framing section 12.1 already.
115095	12	45	12	45	Change "sectors" to "systems". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
99273	12	45	12	53	Given that this chapter assesses regional impacts, it would be mandatory that the authors also assess the regional information in these chapters and invite CA from those chapters to ensure that the assessment has the same outcomes. As impact assessment is not the responsibility of this WGI, knowledge from WGII is fundamental to ensure that both WG reach the same result [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: CH12 does not assess impacts. As strongly emphasised in both section 12.1 and 12.2, Ch12 assesses the physical aspects (i.e. hazards or climatic impact drivers) that have been found in the assessed literature to be associated with certain impacts.
67069	12	48	12	48	Glacier always melt (even if they grow). I guess what is meant here is "glaciers will continue to lose mass' (or shrink or decline) [Regine Hock, United States of America]	REJECTED: This wording was not found in section 12.2, so couldn't be modified.
66035	12	50	13	6	Suggest simplifying this and the corresponding regional tables by omitting Atmospheric CO2, since this is increasing everywhere with only limited regionality (other than hemispheric gradients). Similarly, suggest omitting sea-level rise from the tables since it can be discussed in the text. [Kushla Munro, Australia]	REJECTED: We now specify "Atmospheric CO2 at surface". Just like acidification, atmospheric CO2 induces impacts on the biosphere and ecosystems. This is important to keep it as a CID

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115097	12	55	12	55	Change "sectors" to "systems". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
64329	12		16		Insurance and financial services should be part of the sector of interest. For each of the sector, there should be discussions on climate change information for mitigation, key stakeholders and communicating climate change information for policy making [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: the figure would be too loaded
96169	13	1	13	2	Please specify the IPBES assessment report this para refers to. [Nicole Wilke, Germany]	REJECTED: We are not referring to a specific IPBES report but the introduction of IPBES in Chapter 1 of this IPCC AR WGI report)
13845	13	2	13	2	Complete the sentence: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Sentence completed with spelling out the IPCC Special report on land.
32945	13	5	13	5	lightning strike is rather meteorological impact driver . "Meteorological and climatic impact drivers..." Moreover, lightning strike is not included in the table 12.1. [Tomasz Walczykiewicz, Poland]	TAKEN INTO ACCOUNT: Text adjusted, the climatic impact-driver framework includes weather and climate related phenomena, so the distinction in the term is not necessary. Lightning strike not included in the CID categories listed in revised table 12.1
33227	13	5	13	5	"milliseconds" instead of "seconds" [Janus Willem Schipper, Germany]	NOT APPLICABLE: the sentence was removed for the sake of conciseness
114889	13	5			"Climatic impact drivers can occur from seconds (e.g., a lightning strike) to century scale (e.g., sea level rise)" -- and even longer in the case of sea-level rise -- millenia [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the sentence was removed for the sake of conciseness
110103	13	7	13	9	At the moment this text implies all this can be found in chapter 9 which is clearly not the case. Ideally cross-references should be given per aspect. At a minimum the range of chapters should be cited here. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: sentence reformulated to refer to correct chapter
115099	13	8	13	8	Add "(Atlas)" after "precipitation". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been included.
110105	13	9	13	12	Changes in growing season length are assessed in chapter 2. Why is this not cross-linked here? [Peter Thorne, Ireland]	ACCEPTED: Reference to Ch2 is made.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
20777	13	9	13	12	Most of all, such potential changes have an intrinsic importance. For tourism, summer and often spring are critical. Will chapter 12 hopefully offer an opportunity to discuss the impact of climate change on cloud cover? For a very large number of users, cloud cover is a major aspect of climate; however, in this SOD it never seems considered for its own sake (only in relation with cloud roles in precipitation or radiative exchanges). Note that cloud cover is not listed in table 12.1 [philippe waldteufel, France]	TAKEN INTO ACCOUNT: Solar radiation is a CID, and is noted as being important for tourism in 12.3.
126355	13	13	13	13	"In some situations, phenomena causing severe impacts go well beyond a single extreme event or a single climate variable, but include complex interaction of climatic ..." Should "but" be "and"? [Trigg Talley, United States of America]	ACCEPTED: text has been changed.
126357	13	14	13	15	Add reference: "... 2015a), precipitation ... 2016), or flooding quickly followed by a heat wave (Wang et al. 2019). Citation: Wang, S.-Y., H. Kim, D. Coumou, J.-H. Yoon, L. Zhao, and R. R. Gillies, 2019: Consecutive extreme flooding and heat wave in Japan: Are they becoming a norm? Atmospheric Science Letters, DOI:10.1002/asl.933 [Trigg Talley, United States of America]	ACCEPTED: Text and reference included.
51701	13	15	13	15	Suggested addition for clarity: 'In other words: the chaos of weather and its day to day variability will occur against a backdrop of longer-term incremental climate change' or words to that effect. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Unclear to what text this comment refers. The suggested text would not fit to the content of the sentence that the page and line number refers to.
51703	13	18	13	18	severe impacts' - providing some examples could be useful here, such as 'electricity outage leading to reduced ability to pump water' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: The example provided does not fit to the general statement we try to make here.
126359	13	20	13	23	This could be rewritten for clarity. Something like: "The temporal dimension of hazards has been described as ranging between chronic (happening over long time periods, such as sea level rise) and acute or "episodic" (short-term occurrence, such as a hailstorm or a single heatwave event; e.g., Faas and Barrios, 2015), and associated with financial risk, particularly in the grey literature." The last phrase is not really necessary. [Trigg Talley, United States of America]	ACCEPTED: Sentence has been revised.
126361	13	20	13	27	This paragraph is really hard to understand. Suggest starting the paragraph with the main point, which is a definition of climate impact drivers for this chapter. This definition should be direct. Then can add something like "Published literature also distinguishes the temporal dimension of hazards a chronic ... and acute ..." And why is the reference to grey literature important? Maybe this needs to be a separate sentence to showcase how the financial sector is also taking climate impact drivers into account? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The paragraph has been rewritten and restructured, the reference to grey literature has been removed.
33229	13	20	13	27	Switch this paragraph with the one above, because here general hazards are described, whereas the previous paragraph already focusses on the climate impact drivers. Latter are classified in the following paragraph. [Janus Willem Schipper, Germany]	TAKEN INTO ACCOUNT: The paragraph has been rewritten and restructured, the reference to grey literature has been removed.
86223	13	20	13	27	It might be useful to include a schematic here that paints different hazards on a 2-dimensional space with time frame and spatial extent on the x- and y-axis. This could give a quick overview of hazards like extreme rainfall, hurricane, heat wave, drought, sea level rise etc, and show how these phenomena act over different ranges, from the short-long term and the local-widespread area. [Debra Roberts and the Durban WGII TSU, South Africa]	REJECTED: Not enough space for another figure.
41735	13	22	13	22	its better to explore example rather than mentioning the reference only [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: The paragraph has been rewritten and restructured, the reference to grey literature has been removed.
13847	13	22	13	22	Change (e.g., (Faas and Barrios, 2015)) by (e.g., Faas and Barrios, (2015)) Standardize the citation format in this type of cases. [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: reference has been changed.
41833	13	22	13	22	Plesase, there is no need to write "(e.g., (Faas and Barrios, 2015))"; write "(Faas and Barrios, 2015)" [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: the paragraph was shortened and the reference was removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126363	13	22	13	22	Define "grey literature". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The paragraph has been rewritten and restructured, the reference to grey literature has been removed.
126365	13	23			Change "financial" to "economic", as the risk goes beyond the actual fiduciary implications. "Financial" ignores trends. [Trigg Talley, United States of America]	REJECTED: We refer in this context explicitly to the financial sector, not to economic impacts in general.
41737	13	29	13	36	can you merge this paragraph with paragraph 2 page11- line 10- to line21 for me it will be complete approach towards utilization of UNISDR and to avoid duplication [Sawsan Mustafa, Sudan]	ACCEPTED: Text moved to section 12.1.
6817	13	32	13	32	Volcanoes are related to climate, as discussed in other chapters of the SOD. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Volcanoes affect the climate, but are not caused by climate (change).
86225	13	38	13	38	Perhaps mentioning that occurrence cannot be predicted, but the frequency can? [Debra Roberts and the Durban WGII TSU, South Africa]	REJECTED: Unclear to what text this comment refers. The suggested text would not fit to the content of the sentence that the page and line number refers to.
51705	13	38	13	38	Suggested edit: '...that are based on critical thresholds have to date rarely been estimated..' - otherwise it sounds like this issue will never be resolved in the future. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Based on the comment, the sentence seems misleading. Indicators based on critical thresholds are often estimated, but not from raw climate model output, but bias adjusted model data. We rephrased the sentence to make that point more clear.
45039	13	38	13	41	It might be useful to formulate this important sentence in a less jargon way, such as "Models that have been estimated over a large area may provide wrong results when applied locally." [Christophe Deissenberg, Luxembourg]	REJECTED: Suggested text does not express what we try to say, and sounds even more "jargon".
112491	13	38	13	53	I think it is also important to point out in this paragraph the potential pitfalls of bias correction (e.g. may alter water balance, causal relationships may be affected, etc.). I would also like to mention our paper in Journal of Hydrology (Roy, T., J. B. Valdés, B. Lyon, E. M. C. Demaria, A. Serran-Capdevila, H. V. Gupta, R. Valdés-Pineda, and M. Durcik (2018), Assessing hydrological impacts of short-term climate change in the Mara River basin of East Africa, Journal of Hydrology, 566, 818–829, doi:10.1016/j.jhydrol.2018.08.051) which addresses natural variability, bias correction, AgMERRA data, hydrologic modeling, among others, to assess the hydrologic impacts of short-term climate change in a basin in East Africa. I think it's worth pointing out how predictability alters depending on the time period of analysis. [Tirthankar Roy, United States of America]	TAKEN INTO ACCOUNT: Suggestion of text addition is forwarded to Chapter 10, which deals with the details and challenges of bias adjustment. In Chapter 12 we only reference to the content of Chapter 10.
112059	13	38	13	53	There are some overlaps with Chapter 10 (10.3.3.3 and CCBox 10.2). It would be good to coordinate this and keep the main description of Bias Adjustment in Ch10 and further comment on applications to relevant indices to Ch12 here. Ch10 already mentions "the use of bias-adjusted model outputs is also particularly beneficial when threshold-based climate indices are required (Dosio, 2016)", so Ch12 should build on that and provide further assessment/references of applications to indices relevant for climatic impact drivers used in Ch12. Two relevant references are https://doi.org/10.1007/s10584-018-2167-5 (adjusting components vs adjusting the index) and a paper under revision assessing the plausibility (and added value) of BA projections for threshold-dependent indices (2020_turbide_underReview, https://github.com/SantanderMetGroup/notebooks). A similar comment has been submitted for Ch10. [jose manuel gutierrez, Spain]	TAKEN INTO ACCOUNT: Suggestion of text addition is forwarded to Chapter 10, which deals with the details and challenges of bias adjustment. In Chapter 12 we only reference to the content of Chapter 10.
126367	13	39	13	39	"... where sensible, these need ..." Unclear if "these" refers to indicators or climate models. [Trigg Talley, United States of America]	ACCEPTED: Sentence is rephrased.
51707	13	39	13	39	model biases - please briefly explain what these are/provide some examples. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Added some explanation of "bias" and referred to Chapter 10 for more details.
71459	13	41	13	43	In chapter 10, we have a discussion of bias adjustment in the main chapter: types of methods in 10.3.1.4 and their performance in 10.3.3.3. This should be referred to as well. The Cross Chapter box is only on issues, i.e., an in-depth discussion of challenges. [Douglas Maraun, Austria]	ACCEPTED: References to respective sections in Ch10 have been made.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
71461	13	42	13	53	I am not sure it is necessary to discuss these points here as they are discussed in depth in Chapter 10 already, covering essentially the same topics. We need to discuss how to handle this overlap and how to avoid possible inconsistencies. A suggestion would be to merge relevant references which are not yet listed there into Chapter 10, and shorten this paragraph here to specific issues relevant for the Chapter which are not yet covered in Chapter 10. Happy to discuss this. [Douglas Maraun, Austria]	TAKEN INTO ACCOUNT: Text and references have been updated and moved to Chapter 10 where relevant.
52081	13	43	13	44	Better to formulate is as energy sector in general (both renewable energy as well as cooling demand of the buildings) Ref.: A.T.D. Perera, Vahid Nik, Deliang Chen, J.-L. Scartezzini, Tianzhen Hong, "Quantifying the impacts of climate change and extreme climate events on energy systems" Nature Energy, 2020 [Amarasinghage Tharindu Dasun Perera, Switzerland]	NOT APPLICABLE: Energy sector discussion was removed to match the WGII sectors
11785	13	46	13	47	remove inner set of parentheses [Amy East, United States of America]	EDITORIAL- professional copy-editing to be undertaken prior to publication, this kind of issues will be fixed then at the latest.
41739	13	50	13	50	delete e.g since example, already mentioned [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: Text has been deleted.
126369	13	51	13	51	Add reference: ""... 2017) or model initial condition corrections (Li et al. 2015)."" Citation: Li, R., S.-Y. Wang, R. R. Gillies, 2015: A combined dynamical and statistical downscaling technique to reduce biases in climate projections: An example for winter precipitation and snowpack in the western United States. Theoretical and Applied Climatology, DOI: 10.1007/s00704-015-1415-0 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text and references have been moved to Chapter 10 for inclusion there where relevant.
110659	13	51	13	53	I do not completely agree with the assertion made based on Casanueva et al. 2019, where different biases for different indices and a different impact on the climate change signal by two bias correction methods are shown. Maybe it should be added "comparable results from applying different methods compared to other sources of uncertainty", as e.g. the model (GCM vs RCM or RCM at different resolutions). As we also showed in the following paper, the effect of different BC methods is especially noticeable for climate change projections of precipitation indices (see also Cross-Chapter Box 10.2, Figure 1): Casanueva, A, Herrera, S, Iturbide, M, et al. Testing bias adjustment methods for regional climate change applications under observational uncertainty and resolution mismatch. Atmos Sci Lett. 2020;e978. https://doi.org/10.1002/asl.978 . [Ana Casanueva, Spain]	NOT APPLICABLE: Text has been deleted.
15135	13	52	13	52	Casanueva et al (2019) should be Casanueva et al (2020) https://rsmets.onlinelibrary.wiley.com/doi/full/10.1002/asl.978 [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT: Respective text and reference has been deleted (as it is already covered in Ch10).
15137	13	52	13	52	Impact on bias-adjustment on future indices of climate changes has been also investigated by e.g. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015JD024411 who explicitly distinguished between threshold based and percentile based indices. [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT: Respective text and reference updated.
39367	13	55			I suggest that "ECVs" should be spelled out first before the acronym s this is introducing Table 12.1. [Lourdes Tibig, Philippines]	ACCEPTED: Text has been added.
41741	14	3	14	3	replace recorded by documented make more sense [Sawsan Mustafa, Sudan]	ACCEPTED: Text has been changed.
35353	14	3	14	6	Table 12.1 (and elsewhere in Ch12) what is the reason for combining snow and land ice (does that include ice sheets?) into one variable,there is a lack of temporal, spatial and physical coherence in this definition. Suggest to separate Snow from land ice (that would include glaciers and ice sheets in two CID [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: Table 12.1 has been revised.
35355	14	3	14	6	Table 12.1, suggest to reconsider impact of surface radiation budget on CIDs snow and land ice (see comment above, suggest to separate) and lake, river and sea ice, as the surface radiation budget controls the surface melt and mass balance of glaciers. lake river and sea ice, and snow, suggest to put dark green box [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: Table 12.1 has been revised.
35357	14	3	14	6	Table 12.1, suggest to reconsider impact of sea level, ocean T, heat content and currents on (marine terminating) glaciers and ice sheets (assume they are included in CID snow and land ice), suggest to put dark green box [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: Table 12.1 has been revised.
35359	14	3	14	6	Table 12.1 suggest to reconsider impact of snow cover, ocean T, salinity and heat content on CID lake, river and SEA ICE [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: Table 12.1 has been revised.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
41743	14	5	14	5	delete coma and insert of [Sawsan Mustafa, Sudan]	REJECTED: This change would not make sense in the context of this sentence.
115103	14	5	14	5	Change "sectors" to "systems". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
51709	14	5	14	5	Suggested edit for clarity: '...impact drivers, sectors, and regions but haven't been extensively assessed yet.' - just to be clear [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Text has been added.
105785	14	7	15	6	storm surge is one of the primary coastal impacts of concern to users - there's one mention that indicates it is part of coastal flooding (and presumably on the rows it's under Sea state - wave height although it also interacts with Sea level as frequency and severity increase with SLR) - it would be helpful if the reader interested in storm surge could more easily make these connections [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and text for explanation has been added.
27459	14	9	14	10	Is there a reason why you have not also included changes in for example Growing Degree Days (GDD) or Cold Degree Days (CDD) that are important for e.g. agriculture ? Such diagnostics can be categorized as Climatic Impact Drivers and are characteristics of seasonal and longer term changes. [Eric Brun, France]	TAKEN INTO ACCOUNT: These indicators are described as elements of mean temperature within 12.3
15697	14	11	14	11	In "wet and dry", "water resources" seem to be missing, although many items revolve around it. I did not see any other location where it could be found (some would fit in "snow and ice", but not all). Where is groundwater covered ? Lake and other storages ? I think this is missing, or needs to be framed differently, in relationship with the "Water" WG2 chapter and more generally the water resources/climate nexus. [Samuel Morin, France]	REJECTED: Here we describe mean precipitation, river floods, and aridity, which can result in changes in water resources. Water resources are further described in WGII CH4.
126371	14	11	14	11	Add "... including seasonal patterns and monsoon lifecycle), ..." [Trigg Talley, United States of America]	ACCEPTED: Text included.
126373	14	11	14	13	Why are authors accounting only for pluvial flooding? Flooding or fluvial flooding could occur to other stressors or sources of inundation (e.g., sea level rise, permafrost melt). Additionally, state that that coastal flooding is included separately within this context. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Better explanation is given in the text. And distinction between fluvial and pluvial flood is made in the revised Table 12.1
11787	14	14	14	14	add a colon after "Wind", for consistency with other bullet points [Amy East, United States of America]	ACCEPTED: colon added.
126375	14	14			Include a colon after the first word ("wind"). [Trigg Talley, United States of America]	ACCEPTED: colon added.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
15699	14	17	14	17	I think it would be appropriate to refer here to the term "cryosphere", which was introduced as a title of an IPCC SR recently (2019). In fact, here and in the tables for CIDs, I think "Snow and land ice" could be replaced by "snow cover and glaciers" (and perhaps "Snow cover" and "Glaciers" could be handled in different columns), and "Snow and ice" could be replaced by "Cryosphere" (e.g., permafrost is included in the tables, but it is neither snow or ice). [Samuel Morin, France]	TAKEN INTO ACCOUNT: Text has been revised, the new CID category is "Snow and Ice".
5519	14	23	14	24	teh coastal flooding from a comination of storm surge, extreme waves and tides : not only, add sea level rise and coastal river flood [Benoit Laignel, France]	ACCEPTED: Text partly included.
126377	14	23	14	24	The text reads: "coastal flooding (from a combination of storm surge, extreme waves, and tides)," Wave impacts do not need to be extreme when coupled with surge and/or tides to cause flooding. Recommend removing "extreme" and just say "waves". [Trigg Talley, United States of America]	ACCEPTED: Text changed.
114891	14	23	14	24	What assumptions are made about adaptation for these hazards e.g., for coastal flooding existing flood defences are fundamnental in certain locations such as North West Europe or China? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: No assumptions are made about adaptation in this chapter, as adaptation (and its relevance for climate impacts) is part of WGII, and we only assess changes in the physical variable that can lead to an impact.
114897	14	24	14	25	For coastal erosion, sediment supply is noted explicitly as a parameter -- what assumptions are made about future sediment supply which is highly uncertain, but overall likely to be a decline (e.g. Dunn et al., 2019; see https://doi.org/10.1088/1748-9326/ab304e) [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Text has been shortened and this reference is not included
115105	14	26	14	26	Add "and lake" after "ocean". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: new CID category is "open ocean", lake aspects are covered in other CID categories (e.g. snow and ice)
115107	14	28	14	36	Include here (or somewhere in this section" a reference to river temperatures which are relevant to ecosystems, thermal power plant cooling etc. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: These aspects are addressed in 12.3.
86227	14	29	14	29	Also mention dust and fire specifically. [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: Text added.
126379	14	30	14	30	Add "... CO2 and PM concentrations ..." [Trigg Talley, United States of America]	REJECTED: particulate Matter (PM) has been mentioned already in that sentence.
63865	14	32	14	36	The handling of geophysical hazards in this chapter is unclear from this sentence as well as in other sections where glacial melt is discussed in this chapter. Are these hazards specifically being excluded? If they are, it would make more sense to mention this in Table 12.1 next to the related CID (ie. the treatment of geophysical hazards as a result of glacial isostatic adjustment should be discussed in the snow and ice section of the table). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Table 12.1 is revised.
51711	14	34	14	34	Could a box be added, explaining some of the more recent and less widely known about links between processes - e.g. earthquakes caused by snow and water changes? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Not enough space for another box. And suggested topic is outside of Ch12 scope.
112499	14	38	13	38	The acronym "CID" appears here for the first time but it is not defined. [Tirthankar Roy, United States of America]	ACCEPTED: Acronym has been spelled out.
11789	14	38	14	38	spell out Climate Impact Drivers (CID), since I think this is the first time in the chapter this acronym is used [Amy East, United States of America]	ACCEPTED: Acronym has been spelled out.
5711	14	38	14	38	Abbreviation CID has not been introduced prior to ist first appearance in the text, please amend. [Joachim Rock, Germany]	ACCEPTED: Acronym has been spelled out.
126381	14	38	14	38	This is the first time the acronym CID is used. Need to spell out climate impact driver before doing so. If this acronym is going to be used, introduce it in the beginning of the framing section rather than four pages later. [Trigg Talley, United States of America]	ACCEPTED: Acronym has been spelled out.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63707	14	38	14	38	What is CID? Substitute "CIDs" by "Climatic Impact Drivers (form now on: CIDs)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Acronym has been spelled out.
63989	14	38	14	38	CIDs was mentioned for the first time in this line. Please put "Climatic Impact Drivers (CIDs)" instead of only CIDs [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Acronym has been spelled out.
38455	14	38	14	47	The acronym "CID" is used twice in this paragraph but explained later. Please define it here. [Mansour Almazroui, Saudi Arabia]	ACCEPTED: Acronym has been spelled out.
33573	14	38			Describe when first cited: "CID". [Guiomar Rotllant, Spain]	ACCEPTED: Acronym has been spelled out.
14951	14	38			CID is first mentioned here but defined in page 16 line 17 [Juan Rivera, Argentina]	ACCEPTED: Acronym has been spelled out.
29337	14	38			The acronym CID does not appear to have been defined up to this point. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Acronym has been spelled out.
114875	14	38			CIDs -- first use not defined [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Acronym has been spelled out.
63709	14	40	14	40	Will be more clear if in the text appear "Essential Climate Variables" instead ECV. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Acronym has been spelled out.
11791	14	41	14	41	the semicolon should be a period [Amy East, United States of America]	TAKEN INTO ACCOUNT: Text has changed.
13849	14	45	14	45	Change Ch12 by Chapter 12 [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Text is changed.
38169	14	45	14	45	Ch12 --> Chapter 12 [Junhee Lee, Republic of Korea]	ACCEPTED: Text is changed.
29981	14	50	15	6	Table 12.1 provides an excellent summary of the key ECVs and climate impact drivers. With the large number of categories under each, the table would benefit from additional bold lines to separate the ECV families and the climate impact driver groups. [Janya Kelly, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
5521	14	50	15	6	In the table 12.1 why does not have a relationship between the precipitation and the coastal flood and erosion : The precipitation can lead to the landslide and erosion of the rocky coast with cliffs and also coastal flooding from the coastal river flood combined or not with the storm surges. Moreover, there is also a relationship between the coastal erosion of the rocky coast with cliffs and the temperature : alternate freeze and thaw. There is also a relationship between the coastal flood and the groundwater. In the deltas and estuaries (which are in the coastal zone), the flooding can be generated by groundwater. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
7371	14	50	15	6	Box SPM.3, Table 1 groups CIDs into six categories whereas Table 12.1 groups them into 7 categories (by separating "Coastal" from "Oceans"). Please ensure consistency across the report. [Hans-Martin Füsse, Denmark]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
132317	14	50	15	6	This table does not include the latest list of GCOS ECVs (https://www.ncdc.noaa.gov/gosic/gcos-essential-climate-variable-ecv-data-access-matrix): For instance sensible and latent heat fluxes (SH, LH) are missing. But SH is very relevant for heatwaves and LH is very relevant for both droughts and heatwaves. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63713	14	50	15	6	Table 12.1: For clarity, change in the first column "ECV" for "Essential Climate Variable" . This is consistent with the second column where Climatic Impact Driver is not abbreviated. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
63715	14	50	15	6	Table 12.1: Darker lines in the middle of the table should follow the colors. Now they are randomly drawn [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
63717	14	50	15	6	Table 12.1: change: *, #, ^ by: *, **, *** [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
63719	14	50	15	6	Table 12.1: Use color code to make more easy the interpretation of the table. For example link ECVs and CID colors: E.g, use blue for marine things: CID Coastal and ECV Ocean. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
305	14	52	14	52	so sometimes you write CIDs and ECVs, sometimes you write the first in full. This is very confusing for the reader. Especially in Table 12.2 and ALL the others in a similar format in which you have one label ECVs and another label Climate Impact Driver. You should be consistent, and my suggestion is that you write these acronyms in full in all tables (so they can stand alone); in other words so a browsing reader does not have to go back through pages of text to find out what you mean by ECVs. [Patrick Nunn, Australia]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
45041	14	52	15	1	ECVs that will have a primary effect on a given climatic impact driver are indicated in dark green (e.g., often used in indices for the respective climatic impact driver), while ECVs that have a secondary effect (or may at times have an effect) on a given climatic impact driver are indicated in light green. ==> ECVs that have a primary effect on a given climatic impact driver (and thus, e.g., that are often used in indices for the impact driver) are in dark green while ECVs that have a secondary effect (that is e.g., that have only a sporadic effect) are in light green. [Christophe Deissenberg, Luxembourg]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
110107	14	52	15	2	Table caption should make clear that the list of ECVs is not comprehensive - there are 40-odd GCOS ECVs and you are only pulling out here a subset of these. Should lightning be included (it is a ECV since the 2016 Implementation Plan)? [Peter Thorne, Ireland]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
39369	14	52	15	2	How are not major ECV, primary ECV and secondary differentiated from each other? [Lourdes Tibig, Philippines]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
41835	14	52	15	4	The table 12.1 is very relevant and concise; it would be very useful if the chapter 7 of Volume 2 of AR6 can include it analysis with regards to health impacts. [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
69259	14	52	15	4	Table 12.1 is an important table in this chapter, but would merit from revision to facilitate interpretation. For example, GHG concentration is identified as a major ECV of atmospheric CO2. Also, surface temperature is identified as a major ECV of mean temperature. It can be interpreted that the ECV and the CID is the same. Please modify the table so that the relationship between the ECV and the CID is clarified. [Kaoru Magosaki, Japan]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
112811	14	52	15	6	Great concept, but a few comments: 1) I would avoid acronym ECV. 2) It would be good to clarify literature and expert judgment a bit further -- will there be a table in supplementary material? 3) I haven't reviewed details in detail, but the ones I quickly looked at do raise some questions -- for instance, isn't air pollution also affected by (surface) radiation? [Maarten van Aalst, Netherlands]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88349	14	52			Table 12.1 - Confusing - some CIDs are also considered ECVs such as snow cover, sea ice and permafrost which have been identified under WMO as ECVs (in table snow and sea ice appears as both). Also, changing permafrost conditions can influence some of the ECVs such as groundwater storage or GHG concentration as well as influencing some of the CID such as landslides (slope instability) [Sharon Smith, Canada]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
31623	15	1	15	1	In this table, salinity has secondary relevance to mean sea-level (but not flooding); For currents, it is local of course but for example, tidal currents have major relevance to erosion in passes and hoas of atoll islands, as well as in many estuaries. The relevance of river discharge to coastal flood may be debated (it is extremely relevant in many estuaries and not relevant elsewhere), but may be it can be agreed that the link is more direct than for ocean heating. So I would suggest to raise to "primary ECV"; [Gonéri Le Cozannet, France]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
126385	15	1	15	1	Precipitation, river discharge, sea ice, salinity, and sea temperature all affect coastal/local ocean acidification. Suggest adding "coastal acidification" as an additional climatic impact driver under Coastal. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Table 12.1 has been revised. But coastal acidification is included in acidification CID
126383	15	1	15	3	It would be useful to provide the reader with one or two examples of how a specific CID relates to/influences key ECVs so that the reader learns how to "read" the table correctly. [Trigg Talley, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
8961	15	1	15	4	Fire Disturbance is an ECV that should be included in table 12 [Chuvienco Emilio, Spain]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
85077	15	3	14	4	Comment provided by Jennifer Weeks: Table 12.1 - Could this table include an indication of how much published research there is in the area? Could ECV be written out in full at least once within the table itself? [Stacey New, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: this would be too difficult to do
51713	15	3	15	4	It would be useful to state with these tables that ECV stands for Essential Climate Variable' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Acronym has been spelled out in table caption.
307	15	3	15	4	three points - (1) you don't need the word Key as in "Key ECVs" because key merely repeats essential, I think. (2) I suggest the box label "Not Major ECV" is confusing and that you should replace with "Insignificant". (3) The label should be Climatic Impact Drivers (plural consistent with ECVs) [Patrick Nunn, Australia]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
309	15	3	15	4	What you label 'climatic impact drivers' are often not drivers (which are processes) but variables/parameters. People reading the chapter you don't share your implicit understanding of your use of terms like "salinity" rather than "salinity change" will be lost. I think communicating that these variables are actually drivers rather than stationary point-in-time measures is really important. How can atmospheric CO2 drive anything that has an impact? [Patrick Nunn, Australia]	REJECTED: like ocean acidity, CO2 has large impacts on ecosystems. Note that CO2 is now called "CO2 at surface" to emphasize the CID aspect
80217	15	3	15	4	Table 12.1 – CID can be complemented within the "Wet and Dry" category. It should be "River and flash floods" and "Pluvial flood and inland water" if these assessments covered the flash floods or the inland water inundation, respectively. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: Table 12.1 has been revised.
112493	15	3	15	4	In Table 12.1, relative sea level is used as a CID and sea level as an EVC. There is a strong relationship (dark green). The mean sea level rise and the local sea level rise both fall under the category of sea level rise. Maybe the strong relationship is because of this similarity? I may be missing something. [Tirthankar Roy, United States of America]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
109423	15	3	15	4	Table 12.1: Aerosols should be indicated as impacting surface radiation (instead of surface ozone). [Sophie Szopa, France]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
112495	15	3	15	4	In Table 12.1, mean temperature (CID) and temperature (EVC) are also very similar. [Tirthankar Roy, United States of America]	TAKEN INTO ACCOUNT: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
112497	15	3	15	4	In Table 12.1 Spell out "EVC" for consistency. CID is written in full form. [Tirthankar Roy, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112501	15	3	15	4	The aridity may have a strong impact on discharge. The table does not show that. [Tirthankar Roy, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
112505	15	3	15	4	I was expecting precipitation to have significant impacts on discharge. [Tirthankar Roy, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
66427	15	3	15	4	It seems like there ought to be a secondary ECV box at the intersection of permafrost and precipitation. See, e.g., Neumann et al., https://doi.org/10.1029/2018GL081274 , or Westermann et al., doi: 10.5194/tcd-5-1697-2011. Probably for Precipitation and lake/river/sea level rise (at least for the lake and river part) too? [Charles Koven, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
83341	15	3	15	4	I don't understand the Figure/Table here. For example, why are there only 3 variables against Sea Ice as a Key ECV? [Robert Massom, Australia]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
126387	15	3	15	6	ECV should be spelled out in the table so that it can stand alone with as little explanatory text as possible. In general, check to ensure acronyms are defined in the chapter. Note the odd formatting that resulted in bold borders in seemingly random places. [Trigg Talley, United States of America]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
63993	15	3			Table 12.1. Are Salinity and Oxygen considered as CID ans well as ECV? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102607	15	4	15	4	Chapter 12, table 12.1, isn't there a correlation between ice (both land and water based) melting under CID and 'salinity' under ECV? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102609	15	4	15	4	Chapter 12, table 12.1, isn't there a correlation between 'mean ocean temperature' under CID and 'Sea ice' under ECV? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102611	15	4	15	4	Chapter 12, table 12.1, isn't there a correlation between 'mean ocean temperature' under CID and 'Sea level' under ECV? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102613	15	4	15	4	Chapter 12, table 12.1, isn't there a correlation between 'salinity' under CID and 'sea ice' under ECV? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102615	15	4	15	4	Chapter 12, table 12.1, under ocean ECV, wouldn't 'circulation' be more appropriate than 'currents'? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102617	15	4	15	4	Chapter 12, table 12.1, under coastal CID, shouldn't 'marine ecosystems' be included? [Philippe Tulkens, Belgium]	REJECTED: this is a sector/sectoral asset, not a CID
102619	15	4	15	4	Chapter 12, table 12.1, under ocean CID, shouldn't 'circulation' be included? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
102621	15	4	15	4	Chapter 12, table 12.1, under ocean CID, shouldn't 'marine ecosystems' be included? [Philippe Tulkens, Belgium]	REJECTED: this is a sector/sectoral asset, not a CID.
102623	15	4	15	4	Chapter 12, table 12.1, under ocean CID, shouldn't 'stratification' be included? [Philippe Tulkens, Belgium]	REJECTED: Stratification is a driver of other CIDs such as salinity
102625	15	4	15	4	Chapter 12, table 12.1, under CID, other, shouldn't 'biodiversity' be included? [Philippe Tulkens, Belgium]	REJECTED: this is a sector/sectoral asset, not a CID.
105435	15	10	15	25	It is disconcerting and frustrating to have to refer and hunt for tables which are placed several pages further along in order to be able to understand the explanations of confidence levels, colour intensity and colour changes. Suggest that it is more advantageous to have an example of the tables close to page 15, showing only 1 to 3 rows of each the different table types, with the relevant key/legend, especially as all of the header row columns are the CIDs. [Zelina Ibrahim, Malaysia]	ACCEPTED: Text referring to tables in other sections has been removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115109	15	11	15	11	Change "sectoral asset" to "system component". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines).
15701	15	15	15	15	"following the IPCC rules" could be replaced by a more explicit reference (e.g. guidance note on uncertainty, Mastrandrea et al. 2010 ?). [Samuel Morin, France]	NOT APPLICABLE: the paragraph has been rewritten
115111	15	15	15	15	Change "rules" to "guidance". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the paragraph has been rewritten
115113	15	16	15	16	Add "WG I reference" before "regions". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the paragraph has been rewritten
311	15	21	15	22	change clumsy sentence to "Colours should be carefully interpreted from a climatic impact driver perspective" [Patrick Nunn, Australia]	NOT APPLICABLE: the paragraph has been rewritten
14953	15	21	15	25	Even with the cautionary sentence, it is quite odd to interpret the colors of precipitation trends in terms of CID perspective. A precipitation decreasing trend is supposed to have less impact than a precipitation increase? [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: Sentences are removed and colours are explained in the respective sections where the tables are discussed.
110111	15	22	15	25	But this presumably has major implications for the ability of these findings to be communicated clearly to a lay audience and used in outreach and educational settings? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Sentences are removed and colours are explained in the respective sections where the tables are discussed.
45043	15	22	15	25	Please check this sentence. Do you mean "For instance, red is used to indicate a "wet trend" where precipitations increase, and blue a "dry trend". White is used when insignificant changes are projected or when there is a low agreement on the direction of change."? [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Sentences are removed and colours are explained in the respective sections where the tables are discussed.
51715	15	23	15	23	The colour red for an increase in wetness and blue for a decrease feels slightly counterintuitive. Suggest switching this choice. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Sentences are removed and colours are explained in the respective sections where the tables are discussed.
115115	15	23	15	23	Suggest changing to "neutral" colours s per TS and SPM tables. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Sentences are removed and colours are explained in the respective sections where the tables are discussed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66579	15	27	16	4	The SSPs and RCPs are not completely comparable neither on a regional scale (as mentioned in Ch 4) nor on a global scale as the forcing scenarios behind the "nominal forcing levels" such as SSP2-4.5 and RCP4.5 are sometimes very different (different evolution of GHG levels). This implies that resulting climate projections based on these different scenarios can lead to large differences in results even if the nominal radiative forcing is the same. It would be good that this is stated at some point in this chapter as it uses comparisons of CMIP5 and CORDEX on the one hand with CMIP6 on the other for many of the figures. Wyser et al (2020) shows that the EC-Earth model commonly used in CMIP5 and CMIP6 get a much stronger climate change signal when forced by the new CMIP6 SSP-forcing compared to the corresponding RCPs. This difference in forcing has a strong impact in addition to changes in climate sensitivity in this model. Wyser, K., Kjellström, E., König, T., Martins, H. and Doescher, R., 2020. Warmer climate projections in CMIP6: the role of changes in the greenhouse gas concentrations from CMIP5 to CMIP6. Environ. Res. Lett., 15, 054020, DOI: 10.1088/1748-9326/ab81c2. [Kjellström Erik, Sweden]	TAKEN INTO ACCOUNT: Information about the scenarios used in the assessment, tables and figures is included in section 12.4 (Regional assessment method and tables)
51717	15	30	15	30	It would be helpful to explain here that CORDEX are regionally downscaled model outputs. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Text has been added.
130573	15		15		The use of mean precipitation in the table and many other places is confusing! Areal mean, or temporal mean for precipitation? Normally, we are using precipitation total, instead of mean precipitation [Panmao Zhai, China]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
55195	15		15		Soil moisture and snow cover should be included as secondary ECV for wildfires in my opinion, in Table 12.1. Notably, snow cover constrains the begin and the end of the fire season in the boreal biome (including in North America). A lengthening of the snow free season will directly influence the length of the fire season and hence annual area burned. This is mentioned at page 12-23, lines 27-28 " The extent of snow cover can influence the length of the fire season (Abatzoglou et al., 2019) ". Soil moisture also has direct impacts on organic soil combustion rates, as shown in field studies Wilkinson et al 2018 (https://doi.org/10.1088/1748-9326/aaa136) or in laboratory studies: Bencotter et al 2011 (https://doi.org/10.1071/WF08183). [Nancy Hamzawi, Canada]	NOT APPLICABLE: Table 12.1 has been revised and now includes only a description of CIDs without link to ECVs
109425	16	1	16	1	Table 12.2.: Is the level of concern determined only for the deltaCID induced by climate change? For example, in the case of air pollution, should we understand that the air pollution change due to climate change induce only a low risk on cities or is it future air pollution change in general? Actually, it's difficult to understand how to read the Tables since in Table 12.1 the entrances are the rows whereas here the entrances ro read the Tables are the columns, maybe the tables should have different shapes. [Sophie Szopa, France]	TAKEN INTO ACCOUNT: Table 12.2 and 12.1 have been revised.
105437	16	6	18	42	I could not find a clear explanation of the methodology or analysis which was carried out in order to assign the different categories of relevance of the CIDs to the different sectors in this section, although many different articles are referenced covering the different sectors. It would be helpful to arrange the discussion of sector topics according to the sequence used in the Table 12.1 and clearly denote them. For example, it starts off nicely with discussing the Terrestrial and Ecosystem sector but then appears to jump to the Food sector. [Zelina Ibrahim, Malaysia]	TAKE INTO ACCOUNT: We have enhanced our discussion at the top of Section 12.3 to describe how we are identifying connections between CIDs and sectoral assets and the associated confidence levels (at least medium confidence for colours in Table 12.2) and relevance level (based on prominence of CID/asset connection in analyses of current and future impacts/risk). The goal here is not to assess the mechanisms of these connections (that is for Working Group II), but rather to identify the type of climate information that are being utilized in various sectoral studies. We have looked for the most up-to-date and important paper describing each connection (with the help of contributing authors that are also lead authors from the Working Group II Sectoral chapters), but our main goal is to find examples of climate information application that the reader can pursue for deeper exploration in this topic. The table shown in Section 12.3 also directly points the reader to the Working Group II Sectoral Chapters where climate connections are more deeply explored.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
105439	16	6	30	9	I could not find a clear explanation of the methodology or analysis which was carried out in order to assign the different categories of relevance of the CIDs to the different sectors in this section, although many different articles are referenced covering the different sectors. It would be helpful to arrange the discussion of sector topics according to the sequence used in the Table 12.1 and clearly denote them. [Zelina Ibrahim, Malaysia]	TAKE INTO ACCOUNT: We have enhanced our discussion at the top of Section 12.3 to describe how we are identifying connections between CIDs and sectoral assets and the associated confidence levels (at least medium confidence for colours in Table 12.2) and relevance level (based on prominence of CID/asset connection in analyses of current and future impacts/risk). The goal here is not to assess the mechanisms of these connections (that is for Working Group II), but rather to identify the type of climate information that are being utilized in various sectoral studies. We have looked for the most up-to-date and important paper describing each connection (with the help of contributing authors that are also lead authors from the Working Group II Sectoral chapters), but our main goal is to find examples of climate information application that the reader can pursue for deeper exploration in this topic. The table shown in Section 12.3 also directly points the reader to the Working Group II Sectoral Chapters where climate connections are more deeply explored.
63721	16	7	16	7	Please define Sectors. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.2 defines the sectors that we examine in relation to WGII, where sectoral impacts and risk are more fully assessed: "Chapter 12 assesses climate information relevant for impact and for risk assessment in the seven main sectors corresponding to Chapters 2-8 of the WGII assessment report". This also includes a list of those sectors, which are then repeated within Table 12.2 which serves as an overview of Section 12.3.
80225	16	7	30	9	We suggest a bit more uniformed structure of the subchapters for 12.3. (from 12.3.1 to 12.3.7). The structure might consist of 3 main parts: 1) definition of the driver; 2) main impacts of the driver; 3) possible indicators for monitoring. Currently some subchapter have a definition part, while others not; some introduce some indicators, while some not (e.g. severe wind storms, permafrost, mean ocean temperature, salinity, ocean and lake acidification, surface radiation, atmospheric CO2). [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: Climatic impact drivers are defined within 12.2, which we feel nicely consolidates discussions around the structure of the CID tables rather than scattering these across 12.3. We also find that it is more challenging to separate discussion of the sectoral connections from discussion of the CID indices used, as this approach would require duplication of citations and make it more challenging for the reader to connect CID indices with the specific sectoral connection.
110119	16	7			For readability within each sub-section it would be worth having a paragraph per sector clearly identified up front by a bolded sector names and always doing this in the same order. I found in the level 4 headed sub-sections that there was a degree of seeming randomness to the order in which things were covered and whether certain sectors were covered at all. Many readers may wish to look at impacts across a sectoral section so giving each sector a paragraph and a clearly bolded name to start the paragraph would greatly aid readers wanting to search along that axis here? If a sector has no information assessed this would also then be immediately clear and may highlight to you in redrafting present gaps. Many of the sub-sub sections are also unduly short which implies the list of assessed impacts may not be suitably complete and comprehensive? The section ends up being a bit hard to fathom what its doing by the end of it. I wonder whether 12.3 would actually make more sense integrated into 12.4 in the end? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Space limitations prevent us from addressing each sector within each CID, and this would be further constrained if we attempted to address each specific sectoral asset with each CID index. The current structure is oriented around emphasizing highly prominent sectors first (e.g., health is higher for heat than for drought), and where all are affected (e.g., mean temperature) we generally follow the order of the Working Group II Sectoral Chapters. We have revised Section 12.3 to look for opportunities to more clearly adhere to these organizational norms.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
86229	16	7			Entire Section 12.3 This section contains long lists of potential points of impacts. It is not quite clear how comprehensive this list is meant to be, and currently reads mainly as a long list of examples, that is not very useful in its current form. It may be worth thinking about how to get more value out of this section. It is probably impossible to make the list complete in this context (something WG2 is struggling to do even in an entire report). One option would be to group the impacts under each subheading under 'natural, managed and built' systems mentioned earlier. Another alternative would be to reduce this section significantly, and instead give more space in the regional sections, which allow one to look more specifically at local issues. Currently the regional sections discuss mainly observed changes, and not so much the impacts. But impacts especially are determined by local conditions. Warming in one region is pleasantly welcome, in others it is deadly. So could these impacts be moved variously to the regional sections? This would also ensure that impacts are adequately discussed for each region, and gaps would become evident. [Debra Roberts and the Durban WGII TSU, South Africa]	<p>TAKE INTO ACCOUNT: We have enhanced our discussion at the top of Section 12.3 to describe how we are identifying connections between CIDs and sectoral assets and the associated confidence levels (at least medium confidence for colours in Table 12.2) and relevance level (based on prominence of CID/asset connection in analyses of current and future impacts/risk). The goal here is not to assess the mechanisms of these connections (that is for Working Group II), but rather to identify the type of climate information that are being utilized in various sectoral studies. We have looked for the most up-to-date and important paper describing each connection (with the help of contributing authors that are also lead authors from the Working Group II Sectoral chapters), but our main goal is to find examples of climate information application that the reader can pursue for deeper exploration in this topic. The table shown in Section 12.3 also directly points the reader to the Working Group II Sectoral Chapters where climate connections are more deeply explored.</p> <p>The goal of 12.3 is to establish the sectoral connections for CIDs so that the regional sectors can concentrate on the changing climate information and not have to repeat the sectoral connections at each instance (would be distracting and lead to many duplicate references if we had to indicate why extreme heat is important for agriculture in each region, for example). Additionally, regional-specific studies on CID-sectoral connections are not available in many regions even as the connections may be transferable between regions (if not identical).</p>
16291	16	10	16	10	Here the sentence uses 'hazards or benefits.' This would conflict with 'opportunities offered in page 10 line 17. [Sarah Sutton, United States of America]	TAKEN INTO ACCOUNT: We have replaced 'hazard' with 'CID' as an outcome-neutral term in all instances where the directionality of impact has not been determined (could be hazard or boon).
115117	16	10	16	10	Suggest after "natural and" changing the text to "social system components of value either positively or negatively (Table 12.2). [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have re-written the beginning of this paragraph to provide a more complete definition of "asset", and also use CID rather than 'hazard' whenever we are making outcome-neutral assessments of CID/sectoral asset connections.
64089	16	11	16	11	What is meant by an 'impacts scientist' ? Or is that a spelling mistake? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: An Impacts Scientist is somebody who studies the way that climate (and other factors) affect sectors and related systems. This is a hard science considering the many physical, chemical, and biophysical processes involved, and is distinct from classical sectoral expertise in its focus on the interface of climate information with sectors benefiting from rigorous and sector-transferable methods and approaches to dealing with uncertainty. The IPCC WGI Glossary includes a definition for 'impacts', and an impacts scientist logically implies somebody who applies the scientific method to this challenging topic.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
131451	16	11	16	11	Reconsider the list of stakeholders. Policy-makers are decision-makers. 'Impacts scientists' is too unspecific. What about engineers and urban planners? [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: We have added engineers to this list as they have a unique set of climate information needs. We feel that naming urban planners would be too precise as it would open the door to naming specific stakeholders from each sector. It is true that policy-makers are decision-makers, but this group is worth calling out explicitly and there are many other types of decision-makers. An Impacts Scientist is somebody who studies the way that climate (and other factors) affect sectors and related systems. This is a hard science considering the many physical, chemical, and biophysical processes involved, and is distinct from classical sectoral expertise in its focus on the interface of climate information with sectors benefiting from rigorous and sector-transferable methods and approaches to dealing with uncertainty. The IPCC WGI Glossary includes a definition for 'impacts', and an impacts scientist logically implies somebody who applies the scientific method to this challenging topic.
64091	16	11	16	13	The sentence 'Decision makers, policy makers, risk managers, and impacts scientists therefore benefit from climate information that tracks key trends and thresholds that represent crucial challenges for natural and human systems' is really vague and could benefit from more quantitative wording or examples. The terms 'key' and 'crucial' are meaningless if they are not followed up by examples or quantitative expressions. What is considered a key trend? What are the crucial challenges? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This paragraph is meant to be introductory, with the key trends and thresholds described as climatic impact drivers and related indices below, and crucial challenges being the connection between these CIDs and the various sectoral assets they are known to affect. Section 12.3 provides much more specific detail on what stakeholders and experts look for in their research and applications.
89795	16	11	16	13	My above point is relevant here; your report specifies that this will allow policy makers to make impact and risk related decisions; however, its not clear how did you incorporate the impact and risk because of socio-economic factors (not as an outcome). [Bonita Sharma, United States of America]	TAKEN INTO ACCOUNT: In Section 12.1 and Section 12.6 we indicate how this climate information must be combined with vulnerability and exposure (which may relate to socio-economic factors) and non-climatic factors (such as socio-economic changes) in order to make impact and risk-related decisions. Impact and risk assessment is provided in Working Group II, which builds upon the climate information provided in Working Group I (prominently Chapter 12). WGI Chapter 1 also reinforces the role of climate information in the overall Risk framework utilized by WGI.
107871	16	13	16	15	There's something slightly wrong with this sentence. It can't mean that both the indices and the precise threshold values are unknown. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have revised this sentence to distinguish between useful indices for a given sector (which are created for their utility) and precise threshold values (which are not always known)
126389	16	13	16	29	This section seems very long with a lot of jargon and repetition. A suggestion is to only provide short definitions of CIDs in Section 12.3 and use the examples in the regional sections. This way, more time can be spent discussing the use and value of such drivers for assessments. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The original definition of CIDs is provided in Section 12.2. Spreading the examples across all regions makes it difficult to drive home key messages about the importance of each CID, which is now concentrated in short paragraphs within Section 12.3. The goal of Section 12.3 is to concisely establish connections between CIDs and sectoral asset responses so that Section 12.4 can focus on CID changes for each region and reader can refer back to Section 12.3 to understand motivation and sectoral connection of many CID indices.
80725	16	17	6	17	the explanation of the meaning of CID should come earlier in the chapter, the first time CID is used [Helene Jacot Des Combes, Marshall Islands]	TAKEN INTO ACCOUNT: After its definition at first usage in the chapter we use the CID acronym rather than re-defining it here.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102627	16	17	16	20	This is valuable information, as it provides a focus of this Section, and shows how it is different from WGII. However, in the following sub-sections, impacts on the sectors are described per CID, and not so much the CID itself. Perhaps rephrase these lines, and also add that impacts to sectors are broadly describe to illustrate the relevance of the selected CIDs [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have added language here to clarify that sub-sections within Section 12.3 do not assess impacts, they describe connections between the CID and impacts. The motivation for looking at this climate information is that we know it is relevant to the sectors.
81185	16	17	16	41	The crucial roles of climate impact driver is well summarized in Table 12.1 and 12.2, which illustrates the direct sectoral connections of hazard. On the other hand, as explained in the page 12-16 line 27, there are also cascading or secondary effects in the impacts of climate change. Therefore, some of the climate impact drivers (CIDs) can be a "indirect" driver or cause of climate impacts, which should be considered as climate change information. The possible role of indirect driver of CIDs should be discussed here. In our study (Yokohata et al. 2019), the interconnections between climate drivers and climate risks are surveyed and visualized in a comprehensible manner. We also discussed the role of CIDs as indirect drivers. Yokohata, T., Tanaka, K., Nishina, K., Takahashi, K., Emori, S., Kiguchi, M., Iseri, Y., Honda, Y., Okada, M., Masaki, Y., Yamamoto, A., Shigemitsu, M., Yoshimori, M., Sueyoshi, T., Iwase, K., Hanasaki, N., Ito, A., Sakurai, G., Iizumi, T., Nishimori, M., Lim, W. H., Miyazaki, C., Okamoto, A., Kanae, S., and Oki, T.: Visualizing the Interconnections Among Climate Risks, Earth's Future, 7, 85-100, 2019 https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018EF000945 [Tokuta Yokohata, Japan]	TAKEN INTO ACCOUNT: We have added a reference to Yokohata et al. (2019) to note how this framework also leads into further discussions of connected risk.
115119	16	17	16	41	Change "sector" to "system" and "assets" to "components". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines). We also have more explicitly defined 'asset' in the updated chapter.
29339	16	17			"CIDs" was used earlier, so needs to be defined as an acronym earlier. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: After its definition at first usage in the chapter we use the CID acronym rather than re-defining it here.
41745	16	18	16	18	add chapter number ,it is reference , for the reader or reviewer [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: This is meant to be a reference to the entire report, as it would connect to all Working Group II chapters.
13851	16	20	16	20	missing a parenthesis at (notably AR5 WGII [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
27461	16	20	16	22	We feel this specific information has already been repeated several times since the start of the chapter. We suggest that it be mentioned only once. [Eric Brun, France]	TAKEN INTO ACCOUNT: This new section is specifically related to CID/sector connections, which have not been directly assessed in Sections 12.1 or 12.2. It is important that we reiterate that previous IPCC reports have looked for connections between climate indices and sectors, however this new approach builds on these and some outside studies (Mora, ICOMOS, Yokohata) to form a systematic approach to map from climate variables to CID categories to CID/sector connections and CID/region changes.
43459	16	20			Read "on previous IPCC assessments, notably AR5 WGII " rather than "on previous IPCC assessments (notably AR5 WGII " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: sentence restructured as suggested
13853	16	21	16	21	Remove double parentheses ((IPCC, 2018a, 2019b, 2019c)) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43461	16	21			Read " (IPCC, 2018a, 2019b, 2019c)" rather than " ((IPCC, 2018a, 2019b, 2019c))" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
112977	16	23	16	23	Paranthesis should be removed from references [Muhammad Amjad, Pakistan]	ACCEPTED: typo corrected
64093	16	23	16	23	should be referenced as 'summaries of sectoral hazards provided by Forzieri et al. (2018) and Mora et al. (2018).' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: typo corrected
39371	16	23	16	25	The first prt of the statement "Impacts, risks and opportunities are rarely attributable to a single hazard index or threshold " is correct, but the second part "but climate shifts that push conditions beyond responsive levels" is a bit confusing. What is meant by beyond responsive levels? Does it mean levels at which responses become ineffective? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: Adjusted sentence to reflect that climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk, or benefit given vulnerability and exposure
33575	16	23			Change: "...summaries of sectoral hazards provided by (Forzieri et al., 2018; Mora et al., 2018)." By "...summaries of sectoral hazards provided by Forzieri et al. (2018) and Mora et al. (2018). [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
20779	16	24	16	25	What does "climate shifts that push conditions beyond responsive levels" mean? [philippe waldteufel, France]	TAKEN INTO ACCOUNT: Adjusted sentence to reflect that climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk, or benefit given vulnerability and exposure
7641	16	25	16	25	Here 'responsive levels' is unclear. What does it mean? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: Adjusted sentence to reflect that climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk, or benefit given vulnerability and exposure
45045	16	25	16	25	Is "responsive level" defined or can it be assumed to be common knowledge? [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Adjusted sentence to reflect that climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk, or benefit given vulnerability and exposure

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45047	16	26	16	26	direct sectoral connections of a hazard \Rightarrow direct sectoral impacts [Christophe Deissenberg, Luxembourg]	REJECTED: It is beyond the remit of Working Group I to assess sectoral impacts directly, but this table notes the specific CID x Sectoral asset combinations that are studied in the literature due to their impacts and risk implications. This table can be interpreted as an overview of which climatic impact drivers cause impacts, but Chapter 12 does not describe it that way because it is by no means sufficient to assess those impacts given the additionally needed information on hazard, exposure, and vulnerability or specific regional assets. The following sections (12.4, 12.5) provide more information about how the CIDs change, but this information is translated into 'hazards' when connected with vulnerability and exposure into risk frameworks by Working Group II.
51719	16	29	16	29	Suggested edit: '...and response, as discussed in WGII report.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: sentence modified as suggested
80219	16	29	16	29	For some impact experts and in Hungary, the term exposure is used in a different context. We suggest the following change: as these are strongly affected by sensitivity, adaptability and as a consequence, vulnerability, and response discussed in WGII. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: Here we follow the guidance of an IPCC cross-Working Group effort on the Risk framework which includes the use of terms like 'exposure'. We are careful to use that term in a controlled and well-defined manner, and feel that this definition is more comprehensive than sensitivity and adaptability (which are components of vulnerability, as the reader notes. Exposure relates more to the presence of assets in a region affected by a hazard.
102629	16	33	16	33	responses' is mostly used when referring to adaptation by humans. Perhaps better to use 'effects' or 'impacts'. In addition: using the term 'sectors' is tricky as well, while this is mostly used for defining 'economic sectors', and not so much physical defined eco- systems [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have replaced 'responses' with 'consequences' to avoid confusion. We discuss "sectors" to be consistent with the Working Group II Sectoral chapters, which includes both socioeconomic and natural systems as sectors.
45049	16	33	16	34	The logical link from impacts in the first part of the sentence to responses in the second is unclear. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: We have replaced 'responses' with 'consequences' to avoid confusion. Working Group I does not assess impacts, so our aim here is to identify connections between CIDs and sectoral assets that they affect.
126391	16	35	16	38	In much of this chapter, there is a lot of introductory and explanatory text before there is a clear description of the purpose of the specific section. This sentence is an example. It defines the aim of the section in the third paragraph. The chapter overall would be much easier to understand if there was a uniform structure for each section to highlight the purpose/aim of that section, and to summarize the key points of the section. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have streamlined our explanatory/introductory material and each section to increase readability. The CID framework forms the overall organizational structure, as we introduce it in 12.2 and then follow it in 12.3, within each region in 12.4, and in overall global messages and emergence in 12.5. For each CID we lead with the most prominent sectoral connections as this is most understandable to readers who might flip to a given section. Describing each sector in the same order for each 12.3 CID would occasionally bury the most prominent connections and lead to too much empty text about sectors without strong connections. Indices that cut across multiple sectors are also grouped to reduce redundancy.
64095	16	36	16	36	Please include '...Scientists and practitioners monitor and can monitor in the future to understand current and future challenges for important asset groups' since this tabel will help to inform scientist which proxies and drivers should be monitored (in the future) to improve regional and local risk assessments and climate management strategies [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We note that experts monitor climate information with an eye on its sectoral consequences, but the additional detail recommended by the reviewer is too much of an elaboration for 12.3 and is better suited for the climate services section 12.6 (which mentions climate monitoring bulletins in the cross-chapter Box 12.2).

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64097	16	38	16	39	The sentence 'This section examines connections between sectoral assets (rows) and CIDs (columns) in Table 12.2' is a repetition of the sentence in line 31 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have removed the second line and now go straight to guidance of how the reader can analyse across rows or columns, which is an additional value of this table beyond the individual CID x Sectoral Asset combinations.
64099	16	38	16	41	This sentence is quite long and the English language is rather confusing. Please rephrase and shorten the sentence to make the message easier to understand: 'Effects of CIDs affecting each other (across columns) are discussed as climatic phenomena within WGI Chapters 2-11, while the interaction of sectoral assets (across rows) are described in WGII.' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have further clarified this sentence
7643	16	41	16	41	Maybe provide chapters in WGII? Chapters 2-8? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: We now indicate that this is assessed "throughout WGII"
29983	16	44	17	3	Table 12.2 provides an excellent summary but additional bolded lines to denote the sectors and climate impact driver groups would make it easier to read [Janya Kelly, Canada]	ACCEPTED: We have made sure these thicker lines on Sectors and CID groups are clear.
5523	16	44	17	3	Why does the sea level rise have a limited/moderated impact on the groundwater ? The impact is high in different zones of the world, and specifically in the Mediterranean zone with the salinization of the groundwater. Why does not have a relation between the streamflow and the coastal flood : in the coastal zones, the sea level rise and the storm surges block the flow of the river and lead to the inundation. Why does the coastal erosion have a moderate impact on the cities ? Why does not the coastal flood have an impact on the tourism ? The coastal flood and the erosion have a strong impact on the tourism on the beaches. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: - Table 12.2 shows that relative sea level affects both aquifers/groundwater and water quality through salinization. We have elevated both to a primary impact given relative sea level's strong impact/risk relevance in small islands, the Mediterranean and many coastal regions. - Chapter 12 does note the potential for connected extremes, but secondary effects where one CID leads to a second CID are not comprehensively assessed here given the large number of potential combinations. River floods associated with coastal storm surges would still be assessed under the river flood CID, which can result from a number of dynamical processes assessed across Working Group I. Coastal erosion has a moderate relevance for cities, but is not as dramatic and widespread as the other CIDs that are listed as direct connection (e.g., coastal flooding).
132305	16	44	17	3	Table 12.2: This table is highly informative and a true new input to the WG1 assessment. I would have expected to have some salient points from this table being summarized in the ES, e.g. which sectors and assets were considered, how are the different CIDs related to these different sectors and assets? [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: We have added more key messages from this table into the Executive Summary
132307	16	44	17	3	Table 12.2: This table would be even more useful if it were distinguishing between positive and negative impacts. For instance, I assume that having more radiation means a positive change for energy production. Maybe indicate with color coding what is the dominant tendency for changes, i.e. rather benefits or negative impacts? [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: Determination of 'positive' or 'negative' is left to WGII as it also entails vulnerability and exposure as well as the net balance of positive/negative consequences for each sectoral asset. This is also a motivation to use neutral Climatic Impact-Driver framing rather than assign changes as having a 'hazardous' or 'non-hazardous' direction
107873	16	46	16	52	In general this table form works very well. They are highly legible and communicate the information concisely. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Our thanks to the reviewer for the positive feedback and encouragement to keep the information legible and concise.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64101	16	46	17	1	It would be great and indeed necessary if the authors could define what 'widely studied' and 'less commonly-studied' actually means. How are these terms quantified (e.g. how many papers have to talk about a specific topic for it to be considered 'widely studied')? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: "Widely studied" and "less commonly-studied" are not meant to be quantitative terms, but reflect the expert assessment of the author team given available literature. A more rigorous analysis of the literature for each CID x sectoral asset would be interesting but very challenging given that each combination contains multiple specific indices (e.g., Tx>35C, WBGT>31C for heat) and asset subsets (e.g., barley vs. wheat vs. cotton for crop systems) that confound objective scoring rules.
64103	16	46	17	1	The coloring of the assets, sectors and impact drivers is unfortunately quite confusing and distracting. For instance, the background color of the snow and ice (impact driver) column is the same as the sector 'cities settlements, and key infrastructure' and the asset 'Cities Land and water transportation Energy infrastructure Built environment', thereby suggesting somekind of correlation. I would just keep the background color white to avoid confusion. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised the column and row colours to avoid confusion with the specific CID x sectoral asset combination boxes, which are the truly assessed colours presented in this table.
64105	16	46	17	1	The Table would be clearer if the authors would group the sectors into 3 (color-coded) subcategories, i.e environmental, economical and societal. Doing this, would make it easier for the reader to identify which sector or asset will effect which subcategory. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: The proposed categorization of the sectors is not always straight-forward (e.g., are cities economical or societal? Is agroforestry and other ecosystem services environmental or societal?) so we rely on the sectoral chapters determined by Working Group II.
112813	16	46	17	3	Great concept. It might be interesting to also make the connection to the so-called "representative key risks" that WGII ch16 is assessing, if the timing allows. [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: We have added a reference back to this Section 12.3 in Cross-chapter box 12.1 to emphasize the connection to Representative Key Risks in WGII Chapter 16.
39373	16	46	17	3	Table 12.2 is very informative. However, a note of caution should be highlighted about key climatic impact drivers classified as of lower relevance because there are weaker linkages and less-commonly studied driving behaviours in the literature may change as more studies becomes available. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: We agree that well-studied /= important (and vice versa). We have added a caveat that some important linkages may be under-represented in the literature and could be acute in more narrow circumstances.
105615	16	46	17	6	I do think that the analysis from this Table is an important input. However, it is not clear how the categories of None/very little, Low/moderate, and High are allocated for the CIDs with sectors based on "many studies and applications". Was some scoring system used, or a qualitative assessment, or an expert elicitation, number of articles indicating causal impacts, or other method? Is this table completed or an example of a result which will be presented in the next draft? Will there be some Supplementary Information to explain the categorization? [Zelina Ibrahim, Malaysia]	TAKEN INTO ACCOUNT: Colours reflect categories from the expert assessment of the author team given available literature, with text examples and citations provided so that the reader can pursue additional details and related studies. A formal expert elicitation or more quantitative analysis of the literature for each CID x sectoral asset would be interesting but very challenging given that each combination contains multiple specific indices (e.g., Tx>35C, WBGT>31C for heat) and asset subsets (e.g., barley vs. wheat vs. cotton for crop systems) that confound objective scoring rules.
105619	16	46	17	6	There seems to be some inconsistency if it is completed as there is High relevance for Mean Temperature with Lakes, rivers and wetlands, and for Coastal land and intertidal zones, but only Low/moderate relevance for Mean Temperature with Fisheries and Aquaculture systems. Also, I think it is very strange to see High relevance between Mean Temperature and Water Quality, compared to moderate relevance with Drought. So, I am not sure what Water Quality use is being assessed in this context that Mean temperature has a High relevance - for environment, people, food, industry? [Zelina Ibrahim, Malaysia]	TAKEN INTO ACCOUNT: We revised mean temperature effects down to low/moderate impacts and risk-relevance on water quality. Marine aquaculture and fisheries are affected more by marine heatwaves and ocean temperature than air temperature; we have low/moderate connection to aquaculture because there is a strong connection to freshwater fisheries/aquaculture but not ocean fisheries/aquaculture which respond more to ocean temperature and marine heatwaves.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
105647	16	46	17	6	I note that although there is None/very little relevance between Cities and Mean temperature (but then there is Figure 12.3 presenting Cities and Infrastructure with Temperature effects, although in Table 12.2 there is None/very little relevance between Cities and Cold Spell), there is Low/moderate relevance with Air pollution, although there is None/very little relevance between Land and water transport and Air pollution. I find this quite perplexing as transport is acknowledged as a major source of air pollution and cities result in warmer microclimates. I am also unclear on the distinction between Cities and Built environment that is being used here. [Zelina Ibrahim, Malaysia]	TAKEN INTO ACCOUNT: Figure 12.3 includes a column for Cities and Infrastructure, however this is consistent with this Table as most of the specific temperature thresholds in the Figure are associated with infrastructure and the built environment, which are noted in the table.
88351	16	46			Table 12-2 - Landslides don't necessarily need to be associated with mountains, associated with unstable slopes that could be in river valleys for example. There are examples of landslides/mass movements/slope instability in polar regions for example that are triggered by thawing permafrost, eg. thaw slumps and mass movements. It is unclear why this isn't considered in the table (especially when it is identified as a factor in the Polar Table 12.11). It is also unclear why permafrost is not linked to cryosphere-reservoir (or water in general) as it represents storage of groundwater as ice and also influences surface water distribution. [Sharon Smith, Canada]	ACCEPTED: We have added a more direct connection between landslide CIDs and polar regions to highlight the events associated with permafrost and glacial recession. Landslides affect non-mountainous areas like cities and housing stock (not necessarily limited to mountains). Recall that the white box means little impact- and risk-relevance from a broad perspective, even as there are likely examples of CID effects in localized situations in many of these combinations (e.g., landslides in desert valleys).
126393	16	48	16	51	Recommend separating relevance from widely/less commonly studied impact drivers. There may be highly relevant climate impact drivers that have not been well studied. Merging together relevance and quantity of research risks creating a perception that the CIDs that are not well studied are also not relevant. For example, the table depicts that drought has low/moderate impacts to water quality. Presumably there is insufficient research to demonstrate drought's impact on water quality but that does not mean that there is low impact. Could a different color be used to separate relevance from drivers that are not well researched? That would also provide guidance for future research to focus on those CIDs that have not been well studied. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We agree that well-studied does not mean important (and vice versa). We have added a caveat that some important linkages have not been well-studied. This is also a motivation behind using an expert assessment of the chapter authors rather than a formal analysis of the literature that may put too much emphasis on the prevalence of a particular connection within the literature. We considered including additional information within this table (e.g., on the sufficiency of research studies) but felt that this would prove challenging to systematically assess across so many categories and would likely make this table more difficult to read.
64331	16		17		The sources of climate change information and who the stakeholders are should also be discussed. Discussion of communicating climate change information for decision-making or policy making should be part of the chapter. Edited book by Serrao-Neumann et al. (2018) and journal article by Howarth et al., (2020) are worth looking at. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This is discussed in section 12.6 and 10.5 and reference to those sections are included.
5713	17	1	17	1	Table 12.2., row "temperate forest": please re-evaluate the CIDs. It is implausible that "mean wind speed" and "severe wind storm" should have no or very little impact (given the vast amount of literature on wind-related damages and disturbances in temperate forests), and where low / moderate impacts of changes in permafrost should occur in a temperate ecosystem. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: Severe wind storm is now noted as low/moderate relevance for impact and risk for temperate and boreal forests.
80221	17	1	17	1	Table 12.2 - CID can be complemented within the "Wet and Dry" category. It should be "River and flash floods" and "Pluvial flood and inland water" if these assessments covered the flash floods or the inland water inundation, respectively. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: We have renamed the latter as "heavy precipitation and pluvial flood". Inland water suggests a contrast with coastal flooding and is therefore confusing pluvial and fluvial flooding, and flash floods can occur from heavy precipitation events and therefore make more sense in that second CID. Overall we have "River flood", which focuses on large basin flow levels (tending to respond on slower time scale) and "heavy precipitation and pluvial flood" which can still occur in flat ground, smaller streams and river segments in response to intense precipitation events.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
52083	17	1	17	1	<p>Table 12.2 The impacts of heat and cold (Mean temperature +extreme heat) on Energy infrastructure and Built environment are 'High':</p> <p>References</p> <p>A.T.D. Perera, Vahid Nik, Deliang Chen, J.-L. Scartezini, Tianzhen Hong, "Quantifying the impacts of climate change and extreme climate events on energy systems" Nature Energy, 2020, 10.</p> <p>Dasaraden Mauree , Emanuele Naboni , Silvia Coccolo , A.T.D. Perera et al "A review of assessment methods for the urban environment and its energy sustainability to guarantee climate adaptation of future cities " Renewable & Sustainable Energy Reviews, 2019</p> <p>Vahid Nik, A.T.D. Perera, Deliang Chen; Towards Climate Resilient Urban Energy Systems: A review, 2020 National Science Review (NSR) (Accepted) [Amarasinghage Tharindu Dasun Perera, Switzerland]</p>	<p>TAKEN INTO ACCOUNT: We have increased the connections between extreme heat and the built environment as these relate strongly to building design and cooling efficiency. Extreme heat and cold are noted as moderate relevance for energy systems given that these events can cause peak energy demands but these are often a larger function of exposure and system design that exacerbate energy system risk (as assessed in WGII) than direct impacts on the system. We do cite the Nik et al. paper for connections between severe wind storms/tornados and energy systems, and cite the Mauree paper for Urban Heat Island.</p>
52085	17	1	17	1	<p>Table 12.2: what do you mean by mean wind speed? Its hourly mean, daily mean, monthly or average. Depending on that the impact may vary [Amarasinghage Tharindu Dasun Perera, Switzerland]</p>	<p>TAKEN INTO ACCOUNT: We elaborate on our definition of each CID category (including mean wind speed) within Section 12.2. Mean wind is meant to indicate monthly or longer averages, not hourly or daily extremes (which would fall under severe wind storms).</p>
31621	17	1	17	1	<p>This table is a huge and very useful synthesis effort, but there are some details that should be probably checked again: for example, one could argue drought, rain and mean precipitation have relevance for energy infrastructure (e.g. cooling of thermal power plants). As an other example, the fact that "extreme heat" have relevance for coastal seas ecosystems is shown in the "marine heatwaves" column, but not on the "extreme heat column" (?) (see e.g. Damarki et al). It seems to me also that extreme heat, mean precipitation and drought have a stronger relevance than shown to periurban built environment (individual houses) due to shrinking and swelling of clays (see e.g. Harrison et al for an investigation of chains of impacts).</p> <p>Harrison, A. M., J. F. M. Plim, M. Harrison, L. D. Jones, and M. G. Culshaw. "The relationship between shrink–swell occurrence and climate in south-east England." Proceedings of the Geologists' Association 123, no. 4 (2012): 556-575</p> <p>Darmaraki, S., Somot, S., Sevault, F., Nabat, P., Narvaez, W.D.C., Cavicchia, L., Djurdjevic, V., Li, L., Sannino, G. and Sein, D.V., 2019. Future evolution of marine heatwaves in the Mediterranean Sea. Climate Dynamics, 53(3-4), pp.1371-1392 [Gonéri Le Cozannet, France]</p>	<p>TAKEN INTO ACCOUNT:</p> <ul style="list-style-type: none"> - We have noted the connection between mean precipitation, river floods, aridity, and hydrological drought for energy (hydropower) systems. - Section 12.2 emphasizes the difference between air temperature and ocean temperature for marine systems. Heatwaves and mean air temperature are noted as affecting coastal zones. - We cite Hadji et al. (2014) as a connection between drought and the built environment.
55197	17	1	17	1	<p>Wildfire has significant impacts on a number of sectoral aspects listed as "none/very little" in this table. Wildfire has large direct impacts on segregation ground ice in permfrost regions (Holloway et al., 2020; doi: 10.1002/ppp.2048) as well as secondary effects of black carbon deposition on glaciers and permanent snowpack (Kaspari et al 2015; https://doi.org/10.1002/2014JD022676). Wildfire should at least be altered to the "low/moderate" category, as not all permafrost environments are profoundly altered by wildfire. Streamflow impacts from wildfire can be very large and persistent in some areas such as dry temperate conifer forests with high relief (ie. Blount et al 2019, doi: 10.1002/eco.2170) but also minimal in others such as low-relief boreal/polar forests, so should be labelled as "low/moderate". Moreover, impacts on water quality are widespread and should be labelled as low/moderate (see Rhoades et al., 2019; doi: 10.1071/WFv28n10_FO). For the Indigenous traditions asset, wildfire should also be listed as "moderate/high", as these typically low-income communities are more likely to be evacuated and experience economic and social disruption compared to the population at large: Christianson et al (doi: 10.1007/s11069-018-3556-9). If wildfire is listed as having a low/moderate impact on 'crop systems' should it also have a similarly low/moderate impact for 'farmland'? [Nancy Hamzawi, Canada]</p>	<p>TAKEN INTO ACCOUNT: We have considered the suggested increases in sectoral asset connections for fire weather. This table does not affect knock-on effects where one CID drives changes in another CID that influences a sectoral asset (e.g., wildfire -> permafrost -> ecosystems; fire -> pollution -> snowpack -> water resources). We have added a moderate connection between fire weather and indigenous communities and cite Christianson et al., 2019. The farmland asset category is meant to indicate the complete loss of a resource. In this case fire may destroy a given year's crop, but would not destroy the possibility of farming that location again in the future.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
96171	17	1	17	1	Suggest to add thicker lines between groups of climate drivers to increase readability. [Nicole Wilke, Germany]	ACCEPTED: We further emphasize the bold lines between groups of climatic impact drivers in this table.
96173	17	1	17	1	This is surprising, one would assume that "Drought" is of high relevance for "water transportation". This is the case for Europe at least (e.g. https://climate.copernicus.eu/inland-navigation-rhine-river or Forzieri et al., 2018). Please check. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: We agree that drought can have a substantial impact on some transportation routes, but this assessment is intended to generalize the likely importance of this topic in future climate information needs for stakeholders. We assessed that drought had low/moderate relevance for land and water transportation impacts and risk because the affected transportation routes are a subset of all water transportation routes (many operate without restrictions even into severe drought stages) and because water transportation routes are only a subset of all transportation routes (land routes are not substantially affected by drought).
126395	17	1	17	1	Note the odd formatting that resulted in bold borders in seemingly random places. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We further emphasize the bold lines between groups of climatic impact drivers in this table.
126397	17	1	17	1	Table 12.2 ranks "Severe wind storm and Sand and dust storms" as None/very little and Low/moderate, respectively, for Grasslands and savanna and Deserts. Rationale here isn't clear given designation of "High" to other CIDs like flood in these regions. Suggest changing to "High" (if not Low/Moderate) for both CIDs in both terrestrial regions. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have assessed a low/moderate CID connection for sand and dust storms for desert and grassland and savanna ecosystems. Infrastructure and other human systems in these areas are treated separately from the natural ecosystems, which in many cases are accustomed to these phenomena.
79581	17	1	17	1	"Land and water transportation" are important drivers for air pollution, should be coloured brown [Augustin Colette, France]	TAKEN INTO ACCOUNT: The goal of this table is to assess how CIDs affect sectors, not vice versa (sector affects on CIDs would be handled by WGIII). We have added a caveat to this effect in the text.
102631	17	1	17	1	TABLE 12-2: for the intertidal coastal areas, precip + fluvial flood are important since fresh water feeds e.g. lagoon ans mangrove areas [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We note a moderate connection between coastal and intertidal ecosystems with precipitation and fluvial flood
102633	17	1	17	1	Chapter 12, table 12.2 under CID, other, shouldn't 'biodiversity' be included? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Biodiversity is considered a key attribute to terrestrial and marine ecosystems, but is not a CID in its own right. Working Group II is the proper portion of the Report to assess how the impacts on sectors (e.g., CIDs driving ecosystems to lose biodiversity) in turn affects other sectors.
102635	17	1	17	1	Chapter 12, table 12.2 under coastal CID, shouldn't 'marine ecosystems' be included? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Marine ecosystems are a sectoral asset rather than a climatic impact driver in their own right. Working Group II is the proper portion of the Report to assess how the impacts on sectors (e.g., CIDs driving ecosystems to lose biodiversity) in turn affects other sectors.
102637	17	1	17	1	Chapter 12, table 12.2 under ocean CID, shouldn't 'circulation' be included? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Ocean circulation is a dynamical characteristic that in turn affects multiple CIDs (e.g., mean ocean temperature, marine heatwaves, salinity, ocean oxygen). Although there are some examples of potential direct climatic impact driver connections (e.g., range of floating larvae), this is considered to be not prominent enough for its own CID category given space constraints in the report. The same decision was made for the analogous atmospheric circulation CID, although we now discuss circulation patterns within Cross-Chapter Box 12.1 Table 1.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102639	17	1	17	1	Chapter 12, table 12.2 under ocean CID, shouldn't 'marine ecosystems' be included? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Marine ecosystems are a sectoral asset rather than a climatic impact driver in their own right. Working Group II is the proper portion of the Report to assess how the impacts on sectors (e.g., CIDs driving ecosystems to lose biodiversity) in turn affects other sectors.
102641	17	1	17	1	Chapter 12, table 12.2 under ocean CID, shouldn't 'stratification' be included? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Ocean stratification is covered under the ocean temperature and ocean salinity CID categories (See Table 12.1). These categories include metrics on the 3-dimensional structure (and therefore stratification) of the water column, as described in Sections 12.3.6.1 and 12.3.6.4.
102643	17	1	17	1	Chapter 12, table 12.2, 'Open ocean and deep sea' under Assets is impacted by ocean circulation/ventilation, state of 'marine ecosystems', 'stratification' - all missing. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Ocean stratification is covered under the ocean temperature and ocean salinity CID categories (See Table 12.1). These categories include metrics on the 3-dimensional structure (and therefore stratification) of the water column, as described in Sections 12.3.6.1 and 12.3.6.4. Marine ecosystems are a sectoral asset rather than a climatic impact driver in their own right. Working Group II is the proper portion of the Report to assess how the impacts on sectors (e.g., CIDs driving ecosystems to lose biodiversity) in turn affects other sectors. Open ocean and deep sea is noted as being strongly connected to ocean temperature and low/moderately connected to ocean salinity and ocean oxygen.
102645	17	1	17	1	Chapter 12, table 12.2, 'Fisheries and aquaculture systems' under Assets is impacted by state of 'marine ecosystems' (missing). [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Marine ecosystems are a sectoral asset rather than a climatic impact driver in their own right. Working Group II is the proper portion of the Report to assess how the impacts on sectors (e.g., CIDs driving ecosystems to lose biodiversity) in turn affects fisheries and aquaculture systems.
99275	17	1			it is important to state there that this is the global aggregate as the regional assessment of the impacts and the risk does not necessarily reflect the global information [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have added a caveat to help readers interpret this table as generalized information on CID x sectoral asset connection, even as regional examples may be identified that are of higher or lower relevance.
39375	17	6	20	38	This entire subsection offers a whole lot of information on hot and cold hazard indices and how each impacts on the focus sectors, but there must be an easier way to keep track of these information. It is more like a literature review. Figure 12.3 illustrates how successive heat and cold hazards can potentially affect natural and human systems, but not what has been discussed previously.. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
107875	17	6	21	10	This section on temperature is good but overly long. It is much longer than the other impact driver sections. Consider cutting somewhat [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have reduced the length of discussion for the mean temperature CID. Overall the length of discussion reflects the prominence of impacts and risk relevance, and mean temperature is fundamental to many sectors so it is appropriate that this is slightly longer than some other CIDs.
64013	17	6	21		12.3.1. Heat and Cold should be subdivided according to each field affected not by the factor, i.e. it is clear that the title referring to temperature change " which is better than the title HEAT and COLD", so subtopics should advisely be water-life, agriculture, Health...etc. so that a concise profile of the impact of temperature on each item of the ecosystem would be available, instead of being scattered along different sub-sections. Moreover; A simple figure of vrying temperature scale and its impact on each item would be recommended. Example: A figure representing temperature scale from extreme low where there is snow and frost to extreme high and their impact on human health factors, as reproductivity, mortality, stress and so forth for other measurable factors. This would be more informative and into point, especially that this chapter represents a concise summary for the entire report where conclusions are drawn and qualitative and quantitative measures are set for further protection and analysis. Same comment applies to the other proceeding climate change drivers and their presentation. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: We have organized this section from the Working Group I perspective, cycling through each CID and emphasizing the most prominent sectoral connections first. A comprehensive discussion of each sector in a rigid order is not practical and can be misleading when the most relevant sectoral connections would be listed last. We believe that "Heat and cold" adequately denotes temperature-related CIDs, even as the terms are somewhat relative to the beholder and system involved (this is part of the intent of connecting CIDs to specific regional assets and thresholds). The reviewer suggests a figure that is quite similar to Figure 12.3, indicating how increasing temperature shifts from cold extremes to heat extremes and how there are different sectoral thresholds along the progression.
126399	17	6			Encourage the authors to include pest emergence, prevalence, and habitat range in this section on heat, and when considering public health impacts/risk. This should pertain to vector-borne diseases, such as dengue, chikungunya, malaria, Zika; Lyme and other tick-borne diseases; Vibrio spp.; and other pathogens. Additionally, it should include agricultural pests that have direct and indirect health effects, as well as the impact of heat stress on the inability of plants to recover from agricultural pest attacks. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The first sentence in the health sector discussion within the mean temperature CID section discusses mosquito and tick-borne diseases and water temperatures leading to bacterial outbreaks (like Vibrio). There is not sufficient space to name each of these (other reviewers requested a reduction in this section), but the references point to these major disease vector ranges.
80223	17	8	18	42	Tourism sector and the climate impacts on it (e.g. lengthening of the main season / sea- and lakeside beach tourism/ the shortening of ski tourism) can also be mentioned within maybe the mean temperature section or the 12.3.7. Recent research results from Central-Eastern Europe can provide evidence for these. E.g. T. Czira – A. Sütő – R. Domjánné Nyizsalovszki – K. Németh – E. Péter (2019) Climatic adaptation challenges in tourism. In: István Fazekas; István Lázár (ed.) Tájak működése és arculata. [Landscape operation and image.] Debrecen, Hungarian Academy of Sciences, Regional Committee in Debrecen, Committee of Geosciences. ISBN 9789637064395 pp. 9-15.; K. Németh – A. Sütő (2018): Hungarian case study – Climate adaptation issues of the tourism sector of the West Lake Balaton region]. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: We have added a Kovacs et al. (2017) reference related to tourism in Hungary that connects mean temperature to tourism (which is labelled in the table as low/moderate relevance).

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
52091	17	8	30	9	<p>In Section 12.3, authors presents a long list of areas that can be effected. First, there is no qualitative or quantitative explanation. Secondly, does this extensive list cover all the possible areas of impacts? I seriously doubt. Due to these two reasons its really difficult to get an overall idea about the impact of climate change on each sector. This makes it challenging to the policy makers as well as other rele-vant groups to take actions that can improve the climate resilience of each sector.</p> <p>Suggestion: it would be beneficial if you can present a qualitative indicator about the climate impact on each sector (high, moderate, low) along with confidence level in a Tabular manner. So that Section 12.3 will be well correlated with Table 12.2 [Amarasinghage Tharindu Dasun Perera, Switzerland]</p>	<p>TAKE INTO ACCOUNT: We have enhanced our discussion at the top of Section 12.3 to describe how we are identifying connections between CIDs and sectoral assets. The goal here is not to assess the actual impacts of CIDs on each sector (that is for Working Group II), but rather to identify the type of climate information that are being utilized in various sectoral studies. We attempt to identify the most up-to-date and important paper describing each connection (with the help of contributing authors that are also lead authors from the Working Group II Sectoral chapters), but our main goal is to find examples of climate information application that the reader can pursue for deeper exploration in this topic.</p> <p>Section 12.3 points the reader to literature that establishes these CID x sectoral asset connections, with text examples and citations provided so that the reader can pursue additional details and related studies. A formal expert elicitation or more quantitative analysis of the literature for each CID x sectoral asset would be interesting but very challenging given that each combination contains multiple specific indices (e.g., Tx>35C, WBGT>31C for heat) and asset subsets (e.g., barley vs. wheat vs. cotton for crop systems) that confound objective scoring rules.</p>
110115	17	10	17	30	<p>Many of these aspects were covered in section 2.3.4 and yet there is no effort made to cross reference. [Peter Thorne, Ireland]</p>	<p>TAKEN INTO ACCOUNT: Section 2.3.4 mentions many of these CIDs, but does not establish sectoral connections to nearly the extent that they are covered here. We have increased cross-references to Chapter 2 when we introduce related CIDs in 12.2</p>
64107	17	11	17	11	<p>This sentence only mentions freshwater species, but what about marine biota? Marine biota (dependent on the ocean or living in it) will also be impacted by changing temperatures. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>TAKEN INTO ACCOUNT: We have revised this sentence to be inclusive of terrestrial, freshwater, and intertidal species. The mean temperature CID refers to air temperature, which is why it is less relevant to many marine species (that depend more on ocean temperatures, which is a different CID).</p>
126401	17	14	17	14	<p>Change "a comparison of" to "i.e." [Trigg Talley, United States of America]</p>	<p>REJECTED: The definition of climate velocity is based on the comparison between two quantities (rate of warming and spatial temperature gradient), so this replacement leaves out important information.</p>
51721	17	15	17	15	<p>what are 'geographical temperature (or other ECV) gradients'? The way change in temperature at altitude and/or as it varies across a landscape? Would prefer this to be unpacked. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]</p>	<p>TAKEN INTO ACCOUNT: We have expanded this sentence to further explain the implications of climate velocity.</p>
64109	17	18	17	18	<p>What is meant by 'constrained'? In what way are freshwater systems constrained by temperature? The term is pretty vague. Examples or a proper definition of the term would be helpful here .In addition, marine systems, such as lagoons and estuaries will face the same issue as freshwater systems with increasing temperatures. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>TAKEN INTO ACCOUNT: Marine systems respond to ocean temperature (a different CID), although the coastal ecosystems category is noted as being responsive also to mean air temperature. Our use of language here has to be cautious to note connections without directly indicating impacts. We have replaced vague terms as possible.</p>
64111	17	19	17	20	<p>Marine ecosystems will face the same issue and should be included in this paragraph. A stratification of the oceans will have major effects on marine biogeochemical cycles, the carbon pump ,and water flow, i.e. less to no deep water formation and slowing down of the Gulf Stream . Changes in the carbon pump, deep water formation and the Gulf Stream will have in turn major impacts on the global climate. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>TAKEN INTO ACCOUNT: Marine systems respond to ocean temperature (a different CID). Changes in ocean circulation will result in shifts in the 3-dimensional structure of temperatures, salinity, and oxygen within the ocean, which are each CIDs.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126403	17	20			Appreciate the reference to cyanobacterial HABs and how they are impacted by heat stress. Suggest that authors also mention that there is research demonstrating climatic linkages with exacerbated marine HABs, as well as habitat growth/change. Otherwise, it's short-sighted to focus only on cyanoHABs. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We appreciate the reviewer's recognition of the importance of cyanobacterial harmful algal blooms. Section 12.3 can note the connections to the mean temperature changes, however the actual impact of changing climate on HABs would be assessed by Working Group II.
14151	17	25	17	25	It's suggested to replace "Changes in the seasonal timing" for "Changes in the seasonal timing and changes in spatial patterns of climate variables". [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: Spatial pattern changes are emphasized as an important way that CIDs change throughout Chapter 12. This specific paragraph focuses on another major way that CIDs change -- seasonal timing. Spatial patterns are discussed in the previous paragraph (e.g., with climate velocity).
7645	17	28	17	28	Here 'T>5' is 'Tmean>5'? Or 'Tmin>5'? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: We have clarified that the Mueller et al. (2015) study refers to days where temperature exceeds 5C, which is daily maximum temperature>5C.
51723	17	30	17	30	Tmean' = average daily temperature? If so, suggest this is spelt out. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The text indicates that Tmean here refers to the 5-day weighted mean temperature.
38457	17		17		In the Table 12.2, River and Pluvial floods show no impacts/risks on Morbidity, while coastal flood does. Please check if it is really the case. Please also check for similar inconsistencies. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: It makes sense that morbidity concerns would be similar in both situations, and we have reduced the connection between morbidity and coastal flooding as these were related to knock-on effects (e.g., from mold growth in flooded areas) that we do not currently assess. Of course in any situation that can lead to mortality could also lead to serious injury, but this is not the intent of the morbidity category.
55199	17		22	37	While the 'disease vectors' are important to include, it might be helpful to broaden the scope a bit to include direct impacts of climate change on pathogens/bacteria and the changes in ecology and the implications on infectious diseases. "Climate and climate change may directly impact infectious disease emergence and re-emergence via effects on pathogen survival, arthropod vector survival and reproduction, contamination of water and, in the case of zoonoses, abundance of reservoir hosts (the animals that harbour the microbes). Such direct effects of climate change on the ecology, and transmission to humans, of infectious agents have been the focus of previous national and international assessments" https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2019-45/issue-4-april-4-2019/article-1-climate-change-infectious-diseases.html [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have added 'pathogens' and 'zoonotic hosts' to our discussion of diseases in 12.3.1.1.
64113	18	1	18	1	it would be recommended to include aquaculture (of mussels in particular) here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added aquaculture to the list and this connection is noted within the summary table.
64119	18	2	18	2	It might be worth it to define the term 'extreme heat' (How many degrees above mean temperature is considered extreme?), so all the readers are on the same level when it comes to using specific terms. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.2 defines the extreme heat CID, and emphasizes that extreme heat can be a mix of relative and fixed thresholds depending on the sectoral asset and system affected. Figure 12.3 (and surrounding discussions in 12.3.1.2 and 12.3.1.4) shows that there are patterns in specific thresholds of importance even as there is no universal level of what is considered extreme from a sectoral perspective.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64115	18	2	18	16	Most of the issues named here are only set in a terrestrial context. Aquatic issues of higher temperatures, especially for the aquaculture sector are entirely neglected. It would be beneficial to include some aquaculture and fishery aspects into this paragraph i.e., more pathogens, stock reduction, spat die off...(Handisyde, N. T., Ross, L. G., Badjeck, M. C., & Allison, E. H. (2006). The effects of climate change on world aquaculture: a global perspective. Aquaculture and Fish Genetics Research Programme, Stirling Institute of Aquaculture. Final Technical Report, DFID, Stirling. 151pp.) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Marine aquaculture and fisheries are affected by ocean temperature, which is a different CID discussed within 12.3.6.1. Space limitations make it impractical to induce the level of detail requested by the reviewer, but we have explicitly noted how mean air temperature can affect freshwater fisheries and aquaculture. The DFID report is considered grey literature and is therefore not ideal for IPCC referencing.
126405	18	3	18	3	What does "mean warming" mean? Daily mean? Climatological mean? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The mean air temperature CID is defined within Section 12.2 This CID includes a variety of indices related to mean warming, including seasonal and annual perspectives. A variety of sector-specific indices are used so it is not practical to define a rigid definition here, so we focus on the broader category.
5715	18	4	18	4	"Timber types" refers to dimensions and geometric forms of sawn wood. Do you mean "tree species"? [Joachim Rock, Germany]	ACCEPTED: We have clarified that this is tree species.
26433	18	19	18	20	Why is the "wild species migration" mentioned in the middle of a paragraph about agriculture? [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: We have revised to emphasize that this is wild fish species migration (e.g., salmon) that is relevant to the fisheries aspect within the food sector that is the connecting theme of this paragraph.
7647	18	23	18	23	More references should be cited here. For instance: 1) Schlenker, W., & Roberts, M. J. (2009). Nonlinear Temperature Effects Indicate Severe Damages to US Crop Yields under Climate Change. Proceedings of the National Academy of Sciences, 106 (37), 15594–98. 2) Burke, M., & Emerick, K. (2016). Adaptation to Climate Change: Evidence from US Agriculture. American Economic Journal: Economic Policy, 8 (3), 106-140. [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: 1) Schlenker and Roberts reference is now 10+ years old, so we included more recent updates to this approach. 2) The Burke reference includes some information on growing and extreme heat degree days but is primarily focused on economic impacts and adaptation.
51725	18	24	18	24	Suggested edit: 'determination of quantity and quality of spoilage and waste' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The suggested edit may be confusing as we do not look for the quality of spoilage and waste. The overall interest in food quality and waste (throughout the value chain) is the important point.
55201	18	24	22	37	Would be good to see more content relevant to food-borne and water-borne diseases. With heat, longer summer seasons and extreme weather events we will see more impacts on food safety. https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2019-45/issue-4-april-4-2019/article-5-microbial-foodborne-diseases-climate-change.html [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have added the Smith and Fazil reference and noted mean temperature's affect on food contamination. We are limited by space in terms of noting every aspect of food contamination listed in this study, but including this reference will help readers follow this thread.
131453	18	27	18	28	The listing of 'passive' road degradation by warming alongside the 'active/intentional' designing of buildings is unfortunate. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: We have removed the confusing use of passive voice here. Information about warming is important to design of buildings.
51727	18	28	18	28	suggest re-ordering for clarity: '...long-term energy efficiency of buildings' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Sentence re-structured as reviewer recommends.
51729	18	33	18	33	What is the rough relationship between temperature and solar panel efficiency? It would be useful to explain very briefly here. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: There is not sufficient space within Section 12.3 to describe the mechanisms of each CID x sectoral asset connection in great detail, so we utilize short phrases that can point the reader to the general idea (e.g., solar panel efficiency). We have clarified that solar panels are less efficient at high temperatures. The Wild et al. (2015) reference here has further details on the conversion efficiency of silicone photovoltaic modules.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
26435	18	36	18	39	This sentence is slightly unclear. It seems to contain too much information and tries to unite very different aspects and processes. It should be divided up or rewritten. [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: We have slightly restructured this sentence to improve clarity. Constraints in space necessitate combination of different sectoral assets that follow similar patterns -- in this case temperature changes shift the range of wild species that cause disease on land and in water.
105787	18	36	18	42	could also refer to the link between climate and gastro-intestinal illness noted in Chettri et al https://doi.org/10.1186/s12940-019-0550-y (on which I am a co-author) [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: We have added the Chhetri et al. (2019) study for the heavy precipitation CID link to water quality.
7649	18	45	19	42	Overall the order of these paragraphs should follow the table above, species first and then crop production, and health, etc. [Miao Ruiqing, United States of America]	REJECTED: Given overall space constraints we cannot discuss each sector, and want to point the reader to the most important sectoral connections up front. A comprehensive discussion of each sector in a rigid order is not practical and can be misleading when the most relevant sectoral connections would be listed last.
110117	18	47	19	9	Chapter 4 had a segment looking at projections of WBGT. There is no reference made to this here. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Section 12.3.1.2 establishes connections between extreme heat indices and sectoral impacts. This section is therefore not the appropriate place for analysis of future projections, which are handled on a regional basis in Section 12.4 (and Figure 12.4). Updated figures and discussions no longer features WBGT, as subsequent analysis showed that this index is useful but not widely accepted in the human health impacts community.
26441	18	47	19	42	This part ("Extreme heat") contains several paragraphs that seem to have been written by different people and therefore do not interact with each other at all. This entire section is basically a list of different extreme heat consequences. As it is right now it would better to be replace with a table. [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: The table in 12.3 summarizes this material, but could not sufficiently capture the literature and basic descriptions included in this text. 12.3 is organized first by CID (columns of 12.3), and then by impact/risk sector (major rows of 12.3). We also include Figure 12.3 to place the various heat and cold CID indices into their relative context. We have structured the heat extremes discussion in 12.3.1.2 to begin with human health impacts, followed by a paragraph on food sector impacts, then ecosystems, then infrastructure.
64117	18	47	19	42	The structure of section 12.3.1.1'Mean temperature' starts with species and ecosystems, then talks about ecomic and infrastruture issues and then human health. The structure of topics is different for section 12.3.1.2. Please keep one structure throughout to be consistent. A struture follwoing Table 12.1 is here preferable. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Given overall space constraints we cannot discuss each sector, and want to point the reader to the most important sectoral connections up front. A comprehensive discussion of each sector in a rigid order is not practical and can be misleading when the most relevant sectoral connections would be listed last.
52089	18	47	19	42	Extreme climate notably influence the indoor as well as outdoor thermal comfort, which relates with many other factors such as mortality, higher energy consumption, efficiency drop of the workers etc. I think its important to mention this point. Dasaraden Mauree , Emanuele Naboni , Silvia Coccolo , A.T.D. Perera et al "A review of assessment methods for the urban environment and its energy sustainability to guarantee climate adaptation of fu-ture cities " Renewable & Sustainable Energy Reviews, 2019 [Amarasinghage Tharindu Dasun Perera, Switzerland]	ACCEPTED: The reviewers make a good point on the importance of climate change effects on indoor air comfort, but this is often a knock-on effect related to architecture of the built environment, energy systems, and urban heat island (which are all discussed here). We have added the Mauree et al. (2019) reference and mention extreme heat in buildings.
26437	18	49	18	52	Again, one sentence contains too much information and becomes therefore rather uninformative. [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: This sentence has been split into two, which makes more sense considering the large number of references that show the variation in indices utilized.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
105789	18	49	19	2	even though this section is about the risk and not necessarily connecting to projected changes, it seems worth pointing out the connection here between the current practice of using recent historical data to design buildings which exacerbates the high heat impacts since they will occur more frequently than what was designed for (i.e. in the case of indoor building heat extremes in particular, the threshold at which the CID matters is related to the failure to adapt building design practices) [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: A discussion about resilience and adaptation strategies in the building sector is better placed in WGII Chapter 6. Here we note the connection (e.g., with the Mauree et al. (2019) reference that we have added) but leave the further impact, risk, and risk management strategies to WGII,
101635	18	51	18	52	Solar radiation is also an important factor when considering outdoor conditions [Clemens Schwingshackl, Norway]	TAKEN INTO ACCOUNT: Solar radiation is connected to sectoral assets in 12.3.7.3 below, and this includes a connection to recreation and tourism. An examination of literature for extreme heat conditions for outdoor workers showed that indices are largely based on temperature and humidity. Wind and radiation are also noted as being important for local conditions, but are not considered the fundamental climate changes driving shifts in extreme heat characteristics.
108935	18	52	18	52	Other relevant references include Fischer, E. M., and R. Knutti (2013), Robust projections of combined humidity and temperature extremes, Nature Climate Change, 3 (2), 126-130; Diffenbaugh, N. S., Pal, J. S., Giorgi, F., and Gao, X. (2007), Heat stress intensification in the Mediterranean climate change hotspot, Geophys. Res. Lett., 34, L11706, doi:10.1029/2007GL030000.; Fischer, E. M., K. W. Oleson, and D. M. Lawrence (2012b), Contrasting urban and rural heat stress responses to climate change, Geophysical Research Letters, 39. [Erich Fischer, Switzerland]	TAKEN INTO ACCOUNT: We have considered the recommended studies in our assessment and have elected to use the most up-to-date references when possible
51731	18	54	18	54	What does 'local percentiles' mean? A plain English alternative would be useful. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Replaced with "based on local distributions" as plain English alternative
74577	19	1	19	2	To check if it isn't published about ... ; Schwingshackl et al., submitted) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: We have updated the reference to reflect the published literature.
51733	19	2	19	2	Is it possible to say here: 'high wet bulb globe temperatures - i.e. high air temperature combined with high humidity'? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This sentence now begins "Hot and humid heat episodes characterized by high wet bulb globe temperature..."
26439	19	2	19	5	This sentence does not make sense. It seems like some words have disappeared? [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: We have adjusted the sentence to increase clarity.
131455	19	2	19	5	Increase readability by shifting "lower safety and productivity of outdoor labourers" to the end of the sentence. [Hans Poertner and WGII TSU, Germany]	ACCEPTED: We have restructured the sentence as recommended by the reviewer and it now more logically ranges from mortality to morbidity and then productivity.
51735	19	5	19	5	Suggested edit: 'Exposure to elevated night time..'- some people have air conditioning and therefore aren't exposed to high outdoor ambient temperatures at night. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Working Group I is not meant to discuss the exposure elements of impacts and risk, which are assessed in Working Group II. This section therefore is focused on the connection and leaves the distribution of air conditioning for Working Group II to add to the risk assessment.
51737	19	6	19	6	Suggested edit for clarity: '...the human body from experiencing relief from..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We have added this phrasing
27463	19	11	19	14	We suggest adding Sultan Benjamin, Roudier P., Quirion P., Alhassane A., Muller B., Dingkuhn M., Ciais P., Guimberteau M., Traore S., Baron C. (2013). Assessing climate change impacts on sorghum and millet yields in the Sudanian and Sahelian savannas of West Africa. Environmental Research Letters, 8 (1), 014040. ISSN 1748-9326. [Eric Brun, France]	TAKEN INTO ACCOUNT: The Sultan et al. study is focused on yield impacts, which are assessed in Working Group II. Connections between heat extremes and crop productivity are well established by the literature we already cite.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64121	19	11	19	26	The authors neglect any specific mention of the effect of heat extremes on the aquatic environment (freshwater and marine). The focus is here clearly on terrestrial ecosystems. It would be nice to see marine ecosystems included to assess all ecosystems in an even manner. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Marine heatwaves are assessed as a separate CID below for marine environments. We note the effect of mean temperature and extreme heat on aquaculture and freshwater fisheries in the mean temperature section above, and avoid duplication here in the interest of space. We have also emphasized the air/sea distinction between heat extremes and marine heatwaves in 12.2
51739	19	20	19	20	determine' > 'reduce'? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: This sentence describes the indices, which can increase or reduce livestock productivity. As Working Group I is not mandated to assess the true impact or risk, our goal here is to establish the connection in a more neutral manner which is why we use "determine"
55203	19	24	19	25	References on mortality and reduced productivity in association with drought at large spatial scales could be added " Combined heat and drought stress can reduce forest and grassland primary productivity (Ciais et al., 2005; De Boeck et al., 2018 ADD GIRARDIN ET AL. 2016) and cause tree mortality at higher extremes (Teskey et al., 2015; ADD HEMBER ET AL. 2017)." // Girardin, M.P., Hogg, E.H., Bernier, P.Y., Kurz, W.A., Guo, X.J., Cyr, G. 2016. Negative impacts of high temperatures on growth of black spruce forests intensify with the anticipated climate warming. <i>Global Change Biology</i> , 22: 627–643. doi: 10.1111/gcb.13072. hEMBER ET AL. 2017 Relationships between individual-tree mortality and water-balance variables indicate positive trends in water stress-induced tree mortality across North America. 2017. <i>Global Change Biology</i> , 23, 1691–1710. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We discuss drought CID connections and indices in subsequent subsections within Section 12.3. We have considered the recommended studies in that assessment. Compound events with heat extremes and drought are discussed as an added pressure in the description of Table 12.3 (at the top of Section 12.3), but the combined impact of connected extremes (such as this compound event) depends on the system affected and is therefore within the remit of Working Group II (not Working Group I). This is further clarified in our definition of CIDs in 12.1 and 12.2.
51741	19	28	19	28	Suggested edit: 'Heat extremes in cities compound raised temperatures caused by the urban heat island effect..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have adjusted the sentence to refer to the heat island effect rather than simply referring to "heat islands" that some readers may not be familiar with.
6845	19	28	19	30	Referral to the impact of heat stress to photochemical pollutants is needed. Also quantitative information regarding the impact of heat stress to mortality, especially for vulnerable groups is recommended. [Constantinos Cartalis, Greece]	TAKEN INTO ACCOUNT: Connections between heat extremes and pollutants and their combined impacts would be within the affected systems facing compound events, which would belong in a Working Group II assessment considering the need to include substantial discussion of system exposure and vulnerability.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55205	19	28	19	33	<p>Transport Canada and Natural Resources Canada coordinated a knowledge synthesis (combining peer reviewed literature, grey literature and practitioner input) summarizing the state of knowledge on climate risks and adaptation practices in Canada. Released in 2017, the report can be found at: https://www.nrcan.gc.ca/environment/resources/publications/impacts-adaptation/reports/assessments/2017/19623.</p> <p>The synthesis chapter summarizes key impacts to different modes of transportation. These sections (pages 16 to 22) could support several of the findings in the chapter 12 paragraph below. Potential addition highlighted below in red. Should this report be suitable for inclusion, the recommended citation for this chapter is: Palko, K. (2017). Synthesis. In K. Palko and D.S. Lemmen (Eds.), Climate risks and adaptation practices for the Canadian transportation sector 2016 (pp. 12-25). Ottawa, ON: Government of Canada.</p> <p>"28 Heat extremes in cities add to urban heat islands (Gaffin et al., 2012; Oleson et al., 2018; Zhao et al., 2018) 29 and can induce disruptions in critical infrastructure networks (Chapman et al., 2013). Heat can affect 30 transportation infrastructure by warping roads and airport runways (Chinowsky and Arndt, 2012; Palko, 2017) or buckling 31 railways (Dobney et al., 2010; Dépoues, 2017; Palko, 2017; Chinowsky et al., 2019), and also affects outdoor exercise and 32 the use of bike-share facilities (Heaney et al., 2019). High temperatures reduce air density leading to aircraft 33 take off weight restrictions (Coffel et al., 2017; Palko, 2017; Zhou et al., 2018b)." [Nancy Hamzawi, Canada]</p>	<p>TAKEN INTO ACCOUNT: The Palko (2017) reference is very useful for many aspects of transportation - climate connections. We have added the reference in numerous sections, and expect that the reader will also be able to find additional connections through this citation that support other connections where other studies are cited.</p>
64123	19	28	19	35	<p>The authors put a lot of details and examples into this section, which was not done for the previous section ('Mean temperature'). For consistency purposes it would be great if the authors would chose one writing style and stick to it. In addition, even though an enumeration of examples is great for the reader, the authors run the risk of not mentioning all of them, e.g. what about higher energy usage for cooling purposes during heatwaves (I realize that this is explained in the next paragraph, but I think it belong into this one since energy does relate to infrastructure)? Also, how important is it to mention 'bike sharing facilities' in particular? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>TAKEN INTO ACCOUNT: The reviewer is correct that not every example can be provided given space limitations; the goal here is to identify illustrative sectoral asset connections and identify the types of indices that are used in the evaluated climate information. The paragraph on energy infrastructure has been merged with the other infrastructure discussion, with recreation and tourism examples combined and joined to the health section given the new structure of Table 12.2. We feel that including specific examples on occasion will better keep the interest of the reader.</p>
64125	19	28	19	35	<p>The authors jump from infrastructure, to sport and then to infrastructure and sport again. I would keep sport and infrastructure impact separate to make this section easier to follow for the reader. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>ACCEPTED: The paragraph on energy infrastructure has been merged with the other infrastructure discussion, with recreation and tourism examples combined and shifted below. We feel that including specific examples on occasion will better keep the interest of the reader.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
2755	19	28	19	35	This section briefly touches on the impact of Urban Heat Islands, a little more information this issue will be useful. Urban Heat Islands are not a function of heat extremes but a function of impervious surfaces 'trapping' heat. The distinction should be made that heat extremes further contribute to UHI but UHI in itself is not a climatic impact. High temperatures in cities also contribute to poor air quality, a connection to page A connection can be made on the points from pg18 line 47 to pg19 line 9 on how poor air quality in cities is more anthropogenic rather than climatic. UHI is also a contributor to emissions, not noted here, not sure if it is relevant to not in another chapter. UHI also contributes to poor water quality in cities. [Carienne Johnson, Belize]	TAKEN INTO ACCOUNT: Here the discussion of urban heat islands are related to the heightened connection between heat extremes and urban systems. Discussions of future increases or reductions of heat island factors is an element of exposure and vulnerability assessed within Working Group II. Emissions are covered in Working Group II, and the effect of connected extremes (e.g., heat and air pollution) are within the remit of Working Group II considering that the result reflects system exposure and vulnerability. We have further emphasized this distinction around connected CIDs in Section 12.3.7.4. Note however that urban heat island effects are covered in Chapter 10 and also in Section on specific zones in 12.4
86195	19	28		35	Is there no literature which also reflects on the impacts of extreme heat on informal settlements within cities as all the examples given relate only to highly developed urban environments? Same query applies to the flooding section. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Chapter 12 assesses climate information and CIDs, with the effects of exposure and vulnerability added by Working Group II to complete the impacts and risk assessment. Informal environments are strongly related to vulnerability and exposure, however we do include several heat extreme metrics that are particularly important to informal settlements. These include a mention of urban heat-island effects and extreme heat's effects on outdoor labour productivity and night-time temperatures (more relevant in communities without air conditioning). We also include important information related to informal settlements in our discussion of the landslide CID and note pluvial and river flood connections to urban areas.
101637	19	33	18	35	Is there any study investigating heat stress during the World Athletics Championships 2019 in Katar where several runners had severe problems due to the extreme heat? That would maybe be interesting to include here. [Clemens Schwingshackl, Norway]	TAKEN INTO ACCOUNT: We did not find a specific study on the human health and climate connections for the World Athletic Championships in Qatar for 2019, but the reviewer may be interested in Matzarakis and Frolich (2015) which examined the biometeorological conditions for the planned FIFA World Cup to be held in Qatar. This is an interesting topic but we do not include it here because it does not have climate change as a primary focus.
7651	19	33	19	33	Is 'take off weight restrictions' important enough to be included? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: We feel this is an interesting detail and relates to the design and operation of major airports that have a tremendous influence on the world's economy.
63847	19	33	19	35	The statement concerning recreation seems irrelevant and too detailed compared to the broader challenges discussed in this section, especially when published post or mid pandemic [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We feel that including specific examples on occasion will better keep the interest of the reader. The Working Group I report is currently planned to be released in late 2021, which may be in a different environment with regards to the pandemic. Many have also taken up more personal recreation given social distancing.
131457	19	33	19	35	This paragraph is about effects of heat extremes on urban areas. Examining the viability of host cities for sporting events is a reaction to this. It should be linked back to an aspect of heat extremes, e.g. strain on the cardiovascular system of athletes. [Hans Poertner and WGII TSU, Germany]	ACCEPTED: We have re-structured the paragraphs to combine the infrastructure topics and moved the recreational connections to the leading health paragraph in this sub-section.
7653	19	34	19	34	I am not sure if the content here is relevant. [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: We feel this is an interesting detail and relates to the design and operation of major airports that have a tremendous influence on the world's economy.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31657	19	35	19	36	Please add the reference "Brocherie et al. (2014): outdoor exercise performance..." [Alessandro Pezzoli, Italy]	TAKEN INTO ACCOUNT: We have added a more recent Vanos et al. (2020) study that covers much of the same ground as the Brocherie study with an additional focus on climate change context.
66893	19	37	19	42	In a warming world with a growing population and expanding middle-class, the demand for cooling is projected to rise substantially. Currently, there are 3.6 billion cooling appliances, which is projected to rise to 9.5 billion by 2050, though up to 14 billion would be required to provide adequate cooling for all. University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All ("Considering per capita equipment penetrations at regional level, it becomes clear that 9.5 billion cooling appliances by 2050 will, on the current technology pathways, not be sufficient to deliver universal access to cooling, let alone meet the UN SDGs 2030 targets. Food and medicine loss in the supply chain will still be high; food poisoning from lack of cold chain and domestic temperature management will still be significant; farmers will lack market 'connectivity' or 'access'; hundreds of millions of people will not have safe, let alone comfortable, living or working environments; medical centres will not have temperature-controlled services for post-natal care, etc... By 2050, would require a total of 14 bn cooling appliances – an additional 4.5 bn appliances compared to the baseline forecast – or 4 times as many pieces of cooling equipment than are in use today."); Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING. [Kristin Campbell, United States of America]	NOT APPLICABLE: Shifts in air conditioning demand, energy infrastructure, and health systems are elements of exposure, vulnerability, and emissions policy assessed in Working Group II and Working Group III.
66895	19	37	19	42	At the same time, increased demand for air conditioning will increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All; Biardeau, L.T., Davis, L.W., Gertler, P., Wolfram, C., 2020. Heat exposure and global air conditioning. Nature Sustainability 3, 25–28 ("Air conditioning adoption is increasing dramatically worldwide as incomes rise and average temperatures go up. Using daily temperature data from 14,500 weather stations, we rank 219 countries and 1,692 cities based on a widely used measure of cooling demand called total cooling degree day exposure. India, China, Indonesia, Nigeria, Pakistan, Brazil, Bangladesh and the Philippines all have more total cooling degree day exposure than the United States—a country that uses 400 terawatt-hours of electricity annually for air conditioning."). [Kristin Campbell, United States of America]	NOT APPLICABLE: Shifts in air conditioning demand, energy infrastructure, and health systems are elements of exposure, vulnerability, and emissions policy assessed in Working Group II and Working Group III.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68467	19	37	19	42	In a warming world with a growing population and expanding middle-class, the demand for cooling is projected to rise substantially. Currently, there are 3.6 billion cooling appliances, which is projected to rise to 9.5 billion by 2050, though up to 14 billion would be required to provide adequate cooling for all. University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All (“Considering per capita equipment penetrations at regional level, it becomes clear that 9.5 billion cooling appliances by 2050 will, on the current technology pathways, not be sufficient to deliver universal access to cooling, let alone meet the UN SDGs 2030 targets. Food and medicine loss in the supply chain will still be high; food poisoning from lack of cold chain and domestic temperature management will still be significant; farmers will lack market ‘connectivity’ or ‘access’; hundreds of millions of people will not have safe, let alone comfortable, living or working environments; medical centres will not have temperature-controlled services for post-natal care, etc... By 2050, would require a total of 14 bn cooling appliances – an additional 4.5 bn appliances compared to the baseline forecast – or 4 times as many pieces of cooling equipment than are in use today.”); Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING. [Durwood Zaelke, United States of America]	NOT APPLICABLE: Shifts in air conditioning demand, energy infrastructure, and health systems are elements of exposure, vulnerability, and emissions policy assessed in Working Group II and Working Group III.
68469	19	37	19	42	At the same time, increased demand for air conditioning will increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All; Biardeau, L.T., Davis, L.W., Gertler, P., Wolfram, C., 2020. Heat exposure and global air conditioning. Nature Sustainability 3, 25–28 (“Air conditioning adoption is increasing dramatically worldwide as incomes rise and average temperatures go up. Using daily temperature data from 14,500 weather stations, we rank 219 countries and 1,692 cities based on a widely used measure of cooling demand called total cooling degree day exposure. India, China, Indonesia, Nigeria, Pakistan, Brazil, Bangladesh and the Philippines all have more total cooling degree day exposure than the United States—a country that uses 400 terawatt-hours of electricity annually for air conditioning.”). [Durwood Zaelke, United States of America]	NOT APPLICABLE: Shifts in air conditioning demand, energy infrastructure, and health systems are elements of exposure, vulnerability, and emissions policy assessed in Working Group II and Working Group III.
52087	19	37	19	42	Extreme climate events can easily lead to loss of power supply concerning distributed energy systems which can easily penetrate to entire grid as grid is a critical infrastructure leading to blackouts. So its way beyond simple changes that we expect in transformers, transmission lines and thermal power generation. Ref.: A.T.D. Perera, Vahid Nik, Deliang Chen, J.-L. Scartezzini, Tianzhen Hong, “Quantifying the impacts of climate change and extreme climate events on energy systems” Nature Energy, 2020 [Amarasinghage Tharindu Dasun Perera, Switzerland]	TAKEN INTO ACCOUNT: Cascading impacts of extreme heat within the energy sector reflect system vulnerability and exposure affecting impacts and risk assessed in Working Group II.
51743	19	39	19	39	Suggested edit: ‘...to adequately cool if forced to use warmer...’ [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Sentence has been restructured for clarity.
64127	19	39	19	42	At the moment this sentence sounds like nuclear electricity reduces solar efficiency. I am sure the authors meant that heat extremes can reduce solar efficiency. If so, please rephrase. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The sentence on extreme heat affecting photovoltaic efficiency is now separated from the sentence on thermal and nuclear plant cooling.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51745	19	40	19	40	Suggested edit: '...into waterways, which could cause negative river ecosystem impacts' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Sentence has been restructured for clarity.
20781	19	41	19	42	According to Jerez et al's abstract conclusion: "despite small decreases in production expected in some parts of Europe, climate change is unlikely to threaten the European PV sector". In view of this, while the SOD is not necessarily inexact, it ought to be honest make clear that this statement is not firmly supported by Jerez et al. [philippe waldeufel, France]	TAKEN INTO ACCOUNT: The connection between extreme heat and photovoltaic efficiency is relevant for 12.3 even if projections for Europe do not show impacts. Changes in radiation and temperature CIDs for Europe are assessed in 12.4.5 and the net impacts and risk for the power sector are assessed in Working Group II depending also on the exposure and tolerance thresholds of European PV sector.
112503	19	47	20	5	This section looks shorter compared to the preceding and following sections. [Tirthankar Roy, United States of America]	TAKEN INTO ACCOUNT: Space limitations prevent us from extensive discussions of each CID, and it makes sense that the mean temperature and extreme heat get slightly more attention considering their prominence in the climate change literature and the many sectoral assets affected. The cold extremes CID subsection (12.3.1.3) is still among the longest of all CID subsections in 12.3.
64129	19	47	20	5	Just to be consistent with Table 12.2 I would also talk about ocean and coastal systems in this section. Since (from Table 12.2) it looks like there is no risk assessment available for this section, however, it might be worth it to just mention something on the lines of 'There is not enough data currently available to make an informed/scientifically based judgement in this area regarding cold spells'. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: As we now more completely describe in the introductory paragraphs of Section 12.3, we have looked for literature for all CID / sectoral asset connections, and only have the practical space to report on the connections established with at least medium confidence. Ocean temperature and marine heatwaves are discussed as ocean CIDs in 12.3.6.1 and 12.3.6.2, although there is far less literature on marine cold spells.
126407	19	51	19	51	Add reference: ""... in press; Promchote et al. 2017)."" Citation: Promchote, P., S.-Y. Wang, Y. Shen, P. G. Johnson, and M.-H. Yao, 2017: A seasonal prediction for the wet-cold spells leading to winter crop damage in northwestern Taiwan with a combined empirical-dynamical approach. International Journal of Climatology, DOI: 10.1002/joc.5194 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The reviewer recommends an interesting study, however we feel that cold injury to paddy (rice) is already well covered by the Liu et al. (2013) reference included in this section, with that paper also being oriented around climate change rather than seasonal prediction.
51747	19	52	19	52	What is crop 'vernalisation'? It would be helpful to explain this in plain English here. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have replaced "vernalisation" with "chill requirements". This refers to plants' need for a certain amount of cold exposure in order to initiate proper growth and development processes. While vernalisation is a common term in the agricultural sector, "chill requirements" is meant to be more accessible and readers can follow the references for further information.
126409	20	4	20	5	Add reference: ""... 2017), and energy market like the natural gas (Stuivenvolt Allen and Wang 2019)."" Citation: Stuivenvolt Allen, J. J. and S.-Y. Wang, 2019: Data-mining climate variability as an indicator of U.S. natural gas, Frontiers in Big Data (special issue on Data-driven Climate Sciences), doi: 10.3389/fdata.2019.00020 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added a reference to Stuivenvolt Allen and Wang (2019) as a connection between cold extremes and electricity demand.
51751	20	5	20	5	Suggest an additional sentence here: 'a reduction in the frequency and magnitude of extreme cold spells can lead to a reduction of these impacts' - in the interests of balance. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have added a line in the introduction to 12.3 describing how the connections we describe could affect a sector through their increase or decrease. Including the positive and negative change direction response for each CID/sectoral asset would be inefficient and redundant. In this case, extreme cold increases energy demand is an active influence on the energy system, while a reduction in extreme cold reduces energy demand via an absence of that influence on the energy system.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
86231	20	8	20	8	Frost forms the southern limit of malaria distribution in Africa. A climate zone shift here would open up a huge area that has historically been malaria free, to stable transmission, with huge potential death toll. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: We now discuss the limits of pest and disease vector range under the frosts CID with a reference to Zhao et al. (2016) and Smith et al. (2020).
33231	20	10	20	11	In Annex VII, the definition of frost and ice days is $T_{min} < 0^{\circ}C$ and $T_{max} < 0^{\circ}C$, resp. and not $T_{min} \leq 0^{\circ}C$ and $T_{max} \leq 0^{\circ}C$, resp. [Janus Willem Schipper, Germany]	TAKEN INTO ACCOUNT: Corrected to "less than" zero here to match Annex VII and the work of the World Meteorological Organization's Expert Team on Sector-Specific Climate Indices (ET-SCI).
7655	20	14	20	14	provide some more specific degrees for 'at a threshold several degrees below freezing'? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: The exact level is species or system specific, so we do not think it is beneficial to list a single value here. For reference, ClimPACT also has a T_{N1tm2} metric ($T_{min} < 2C$)
88353	20	23	20	31	I assume you are not talking about permafrost here and only referring to seasonal frost. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: Seasonal frost is concentrated on near-surface conditions and permafrost is concentrated on deep sub-surface layers and the active layer above. These are more clearly distinguished when we define the CID categories in 12.2 (Table 12.1).
132043	20	33	20	35	Figure 12.2: this visual is hard to match with the explanations in the main text (see 33-35 p30): the "successive" aspect of heat and cold hazards does not seem to be represented as well as the associated "climate pressures reaching new sectoral assets" or that it becomes more extreme. Re-arranging the design a bit might be helpful. contact the TSU for some guidance // the bold text in the caption makes it much easier to find and get the definitions if needed. [TSU WGI, France]	TAKEN INTO ACCOUNT: We have worked with the TSU to improve this figure and its coherence with the text. This includes a clarified presentation and more professional display
51749	20	37	20	37	Suggested revision: remove the hyphen from 'locally-unprecedented' to simply 'locally unprecedented' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: hyphen removed
132331	20	41	21	12	The index "CDD" is confusing. The same acronym is used for "consecutive dry days" in Chapter 11, and here for "cooling degree days". This needs to be harmonized in the report. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: CDD is commonly used in the drought community for "consecutive dry days" and in the energy community for "cooling degree days". It is therefore impossible to declare a universal definition of this acronym. In this case we define CDD directly in the figure caption to avoid confusion, and agree that we should make sure this is defined when used within each chapter.
132333	20	41	21	12	This figure is an interesting attempt. I would actually have expected chapter 12 to provide more quantitative information along these lines, and not only for temperature indices. For the FGD: Can Chapter 12 please provide for each CID a list of most relevant indices that are considered in the assessment and how they are computed? This would be actionable information that could for instance then be computed by the Atlas. Chapter 11 is ready to also help with this selection. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: 12.3 discusses how such a comprehensive list is not practical, but identifies a large number of key indices for each CID. Technical Annex VII provides more detailed numerical recipes for the CID indices we examine in CH12, and this information has been shared with the Atlas to enable consistent representation in the Interactive Atlas. Other indices can be derived from the literature cited here.
64131	20	43	21	10	In Table 12.2 the authors illustrate 7 sectors with many more assets. Why are only 5 of these assets represented in Figure 12.3? Please explain the choice of these 5 assets. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We show five sectors because these are the sectors that form over-arching patterns in heat and cold temperature thresholds for key sectoral responses. The figure combines marine and terrestrial ecosystems as the basic structure of sectoral thresholds for heat and cold are similar. The poverty and livelihoods sector does not have a strongly dependence on successive heat and cold thresholds other than for livelihoods represented in the agricultural sector or related to cities (as seen in Table 12.2). We thus end up with 5 columns for Figure 12.3.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64133	20	43	21	10	Tcoldroad and Thorroad are not defined in the Figure caption [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added caption definitions for Tcoldroad and Thotroad.
64135	20	43	21	10	Is the Ecosystem asset in the Figure also representative of freshwater (since only terrestrial and marine are mentioned in the Figure caption)? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have removed the "terrestrial and marine" parenthetical for ecosystems that excluded freshwater systems. Without that unnecessary mention this covers all ecosystems.
64137	20	43	21	10	I am not sure if the Figure adds much to the understanding of the section. It is actually quite confusing since it doesn't represent all the sections and assets as described in Table 12.2. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We feel that this is an important figure because it illustrates a key concept that applies to nearly all CIDs and is thus emblematic of the CID framework approach. That is, relevant metrics need to be defined with sectoral assets in mind and, even as the exact threshold values may differ, there is a pattern in the successive nature of CID connection as the physical variables reach more extreme conditions. We show five sectors because these are the sectors that form over-arching patterns in heat and cold temperature thresholds for key sectoral responses. The figure combines marine and terrestrial ecosystems as the basic structure of sectoral thresholds for heat and cold are similar. The poverty and livelihoods sector does not have a strongly dependence on successive heat and cold thresholds other than for livelihoods represented in the agricultural sector or related to cities (as seen in Table 12.2). We thus end up with 5 columns for Figure 12.3.
64139	20	43	21	10	Why is there a line above some 'T' in the Figure and in the caption? This line is not explained in the caption [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We now explain this in the text. The overbar is a common symbol representing a statistical mean (rather than single event).
64141	20	43	21	10	Tpermafrost is included in the Figure but there is no mention of permafrost in the text. Please make sure that everything that is included in the Figure is also described in the text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Permafrost is mentioned in the snow and ice CID categories later in Section 12.3.4.2. This figure includes several CIDs, including mean temperature, heat extremes, cold extremes, frost, permafrost, and even extends to ocean temperature and marine heatwaves.
38171	20	50	20	50	HDDmin --> HDDmax [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: HDDmax is used here because it is the maximum temperature at which heating degree days may be accumulated (warmer temperatures requires no heating). These indices are also defined in the caption.
77653	21	4	21	4	Change to 'a species is stressed' rather than 'species are stressed', as species-specific. [Emer Griffin, Ireland]	ACCEPTED: We have revised the figure caption to indicate biophysical indices that are species-specific rather than generalized.
31659	21	4	21	6	There are some differences between the caption and the Figure 12.3 (i.e.: Thotim in the caption that it is, probably, Tlim in the Figure, Tcoldpest in the caption that it is, probably, Thotpest in the Figure...). Please check and correct [Alessandro Pezzoli, Italy]	TAKEN INTO ACCOUNT: We have corrected these inconsistencies and now ensure that each index in the figure is consistent with the caption (and vice versa).
77655	21	10	21	10	Change to 'a perennial crop' rather than 'perennial crops', as crop-specific. [Emer Griffin, Ireland]	ACCEPTED: We have revised the figure caption to indicate biophysical indices that are species-specific rather than generalized.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126411	21	10	21	12	Add references: ""... submitted; Yoon et al. 2018; Wang et al. 2016)."" Citations: Yoon, J.-H., S.-Y. Wang, M.-H. Lo, and W.-Y. Wu, 2018: Concurrent increases in wet and dry extremes projected in Texas and combined effects on groundwater. Environmental Research Letters, DOI: 10.1088/1748-9326/aab96b Wang, S.-Y., Y.-H. Lin, R. R. Gillies, and K. Hakala, 2016: Indications for protracted groundwater depletion after drought over the Central Valley of California. Journal of Hydrometeorology. DOI: 10.1175/JHM-D-15-0105.1, [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added the Yoon et al. (2018) study to underscore the connection between aridity and groundwater. The Wang et al. (2016) study looks at effects of drought on California but with a seasonal prediction perspective that is not a good fit for the IPCC assessment.
39377	21	15	23	33	Same comment as above, except for that about Fig. 12.3. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: We have added text to the description of Figure 12.3 to underscore how Figure 12.3 places the material discussed above into a different conceptual perspective with patterns in the thresholds exceeded with changing temperature (and associated likelihood shifts as regional CIDs shift). This is an important example to show that the CIDs are not always independent or unrelated. As for wet and dry CIDs: This approach has thus far been the most efficient and clear way to underscore the relevance of wet and dry CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.
86233	21	17	21	17	It may be worth mentioning here that mean precipitation determines the potential for rain-fed agriculture, (e.g. much of Africa), and the type of crops/livestock, which is a separate issue from aridity and drought. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: We now note the importance of minimum rainfall amounts for viable rain-fed agriculture as well as irrigation availability.
2757	21	17	21	37	Not sure why the agricultural industry is the only one highlighted here, are there other industries impacted by mean precipitation? What about increased humidity as a driver for increased mean precipitation? [Carianne Johnson, Belize]	TAKEN INTO ACCOUNT: This section also discusses mean precipitation impacts on ecosystems, river erosion, roads, and water quality. We have added a first reference to the water resources sector, which is naturally the lead to the mean precipitation connections discussion. Increased humidity would be assessed under the aridity section (low aridity), but the overall set of drivers for changes in CIDs is not assessed within Chapter 12 (physical mechanisms are assessed in Chapters 2-11; humidity likely in Chapter 8 and Chapter 11).
7657	21	19	21	19	change 'on' to 'in'. [Miao Ruiqing, United States of America]	ACCEPTED: "on" --> "in"
64143	21	19	21	37	This sections doesn't include the tourism and recreational sector even though this asset is highlighted as a risk area in Table 12.2 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: we added recreation and tourism as a footnote in Table 12.2

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63639	21	25	21	26	There can be sentence build regarding sediment, wetter conditions and road as bridge before the sentence starts which is "wetter conditions alter...". This might prevent the gap throughout the paragraph. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The gap helps separate discussions of two different groups of sectors for mean precipitation CID connections.
27465	21	28	21	29	We recommend to avoid relate mean precipitation or higher rainfall totals to erosion of degradation while those are generally linked to the intensity of rainfall events, not to the cumulated annual rainfall. [Eric Brun, France]	ACCEPTED: We agree that it makes more sense to refer to soil degradation under the heavy precipitation and pluvial flood CID, and have moved the text there.
27467	21	30	21	30	This is true only in tropical regions. In temperate regions it is the overall length of the potential growing season that determines the potential for multiple cropping season. [Eric Brun, France]	TAKEN INTO ACCOUNT: In all regions the ability to double-crop depends in part on total rainfall and whether seasons are limited by water. In temperate regions cold hazards are often more prominent, but we feel that it not necessary to add the "In tropical regions" qualifier here because there are extratropical regions that can double-crop (e.g., North Africa, Northern India, Southern Europe, portions of China and the United States). The text is clear that mean precipitation helps determine the potential for multiple cropping systems, not that it is the only determining factor (many socioeconomic factors as well).
96175	21	36			This sentence seems to be formulated in too general manner/ What is 'excess' rutting/soil compaction for the authors? Maybe you could use: with less rutting and without or less soil compaction (risk). [Nicole Wilke, Germany]	ACCEPTED: We have changed "excess rutting and soil compaction" to "less rutting and soil compaction".
102647	21	40	21	40	I miss a more thorough discussion of the different CIDs? What about the 10 days cummlative precip, which is often used to predict downstream river flooding [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have added a line connecting intensity-duration-frequency metrics to the size and properties of a given catchment, with reference to the 10-day cumulative precipitation index. This is meant to be a more general framework within which different indices may be selected for different basins.
80227	21	40	21	56	The subchapter "River flooding" could be completed with flash floods (around lines 53-55). Flash floods cause severe problems for rural infrastructure, housing stock and agriculture in hilly/mountainous regions. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: Flash floods are covered under the revised CID for "Heavy precipitation and pluvial flood". We do highlight connections between that CID and rural infrastructure, housing stock, and agriculture and also note the strong connection to mountain ecosystems.
51753	21	46	21	46	Suggested edit: of a given historic return period' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text now reads "of a given historic return period"
96177	21	46	21	46	Please check if the numbers in brackets "(e.g., 1-in-100yr rainfall or 1-in-20yr flood event)" have been reversed. Often designs are made for 1-in-100yr flood events (e.g. dikes) and 1-in-5yr (or so) rainfall event (e.g. channels). [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: To reduce confusion between the river flood and heavy precipitation CID we have simplified this example to mention only the 1-in-20 yr flood event.
107675	21	47	21	47	Here I would recommend separating the citations for annual exceedance probability and precipitation intensity-duration-frequency relationships, because they are very different. For precipitation intensity-duration-frequency, you could cite "Courty et al. (2019) Intensity-Duration-Frequency curves at the global scale, Environmental Research Letters, 14(8), https://iopscience.iop.org/article/10.1088/1748-9326/ab370a ". In fact, the part on precipitation IDF curves might fit better in section 12.3.2.3 on pluvial flooding. [Louise Slater, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The sentence becomes unwieldy if we have a list of citations for each metric listed, and some of the cited papers refer to multiple metrics. We agree that these metrics are different but we do not have enough space to go into detail about each and instead refer the reader to a number of papers where they can pursue further information about each metric's motivation and utility. We have added the Courty et al. (2019) study and reinforced the IDF metrics discussion for pluvial flooding, as it is relevant for both CIDs.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
23663	21	53	21	55	Bozkurt et al. (2019) presented a case study of unprecedented snowmelt runoff amounts in the Euphrates and Tigris basins triggered by anomalous warming and heavy precipitation. The event also resulted in, for the first time, the opening of the spillways of the basin's several dams to release water to accommodate the incoming flux. Bozkurt, D., Ezber, Y., Sen, O.L., 2019. Role of the East Asian Trough on the eastern Mediterranean temperature variability in early spring and the extreme case of 2004 warm spell. <i>Climate Dynamics</i> , 53(3-4), 2309–2326, https://doi.org/10.1007/s00382-019-04847-5 . [Deniz Bozkurt, Chile]	TAKEN INTO ACCOUNT: This interesting study is focused more on the dynamical features associated with the extreme runoff event rather than a climate change frame that would justify its inclusion when space is already so limited.
102649	21	53	21	55	Perhaps rephrase leaving out 'information': "Peak river discharges and flooding conditions maybe enhanced by accelerated snow melt" [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have restructured this sentence slightly to better emphasize the need to look at snowpack properties during heavy rain events. The goal of Chapter 12 is to identify the climate information that may be needed to assess impact and risk, and this sentence emphasizes that snowpack information can be useful in determining the potential danger of rain-on-snow event (when stakeholders would need to prepare for both the precipitation amount and the likely snowmelt).
27469	22	1	22	1	We feel there are missing potential consequences to agriculture: Pluvial flooding is also a potential source of inoculum spread within crops and the start of diseases. It can also lead to anoxia in soils in it occurs after sowing. [Eric Brun, France]	TAKEN INTO ACCOUNT: We discuss wetter conditions leading to plant pathogens under the mean precipitation CID, as well as water logging and pluvial and fluvial flooding as potential connections to agriculture.
132351	22	1	22	12	This section should be renamed "Heavy precipitation and pluvial flooding" and should refer to Section 11.4. [Sonia Seneviratne, Switzerland]	ACCEPTED: We have renamed the CID and section to "Heavy precipitation and pluvial flood". We use "flood" rather than "flooding" to emphasize the event rather than the process (this is true for all CIDs).
80229	22	1	22	13	The subchapter "Pluvial flooding" could be completed with inland water inundations. This can cause severe problems for agriculture where the problems of water scarcity and water abundance can hit the same region within a relatively short period of time. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT: We continue to separate river flooding from pluvial flooding as there are differences in terms of effects on the field and confidence in regional observations and projections. We now note the potential for pluvial flooding in farmland, with the earlier references in the fluvial flooding and mean precipitation covering the connected responses.
55207	22	3	22	4	Similar to above comment, the Transport Canada and Natural Resources Canada report's findings also supports the finding in this chapter 12 sentence below. If appropriate, suggest adding a reference to Transport Canada/Natural Resources Canada report (pages 16 and 22) "3 Heavy downpours can lead to pluvial flood hazards for roadways, subway tunnels and buildings (particularly 4 those with basements) (Grahn and Nyberg, 2017; Palko, 2017; Pregnolato et al., 2017; Orr et al., 2018)." [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Added Palko 2017 reference.
10939	22	4	22	7	OK, pluvial flooding may be examined using heavy precipitation as a proxy, but there are also several studies that explicitly simulate the pluvial flooding using hydrologic/hydraulic models, in a climate change context, and I think this could well be mentioned. Here are two possible citations: - Olsson, J., Berggren, K., Olofsson, M., and M. Viklander (2009) Applying climate model precipitation scenarios for urban hydrological assessment: a case study in Kalmar City, Sweden, <i>Atmos. Res.</i> , 92, 364-375, doi:10.1016/j.atmosres.2009.01.015. - Olsson, J., Amaguchi, H., Alsterhag, E., D��verh��g, M., Adrian, P.-E., and A. Kawamura (2013) Adaptation to climate change impacts on urban flooding: a case study in Arvika, Sweden, <i>Clim. Chang.</i> , 116, 231-247, doi:10.100/s10584-012-0480-y. [Jonas Olsson, Sweden]	TAKEN INTO ACCOUNT: These types of complex flooding models are incredibly useful for applications as they can factor in additional locational characteristics, management, vulnerability, and exposure. In this way they are more suited for WGII Chapter 6 on city impacts than the climatic component assessed in Chapter 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
74579	22	6	22	6	Which are typically designed using 1-,6- or 24-hour total accumulated rainfall return periods need to check the meaning again in my sense in terms of return periods it doesn't make sense ! [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: We have clarified this sentence to indicate that we are looking for return periods based on the distribution of 1-, 6-, and 24-hour rainfall totals.
115121	22	6	22	6	Add "or flood fast-responding river catchments" after "systemes". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Chapter 12 handles river floods within their own CID category, even when they may result from short-duration precipitation events. We have a note within the river flooding CID connections discussion indicating that the relevant CID indices depend on the size and characteristics of a catchment, which is meant to bridge between the two. Pluvial flooding would cover roadways, buildings, infrastructure, and agricultural areas rather than the traditional rivers and streams.
112315	22	8		10	heavy precip and water quality - is not only related to erosion but entrainment of pollutants on streets etc (particularly after dry spell) and overwhelming combined sewer systems in urban areas. [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have added a connection between heavy precipitation and pluvial flood and water quality via pollutants washed into drainage systems. Further discussion of connected extremes relates to the exposure and vulnerability of the affected systems (e.g., how often is street cleaning?) which are assessed in Working Group II.
88355	22	15	22	27	Section 12.3.2.4. Permafrost thaw is also an issue for slope instability at high latitudes (non-mountain areas)- These include thaw slumps and active layer detachments, see for example ch 2 section 2.3..2.5 as well as the references below: Lewkowicz AG & Way RG 2019 Extremes of summer climate trigger thousands of thermokarst landslides in a High Arctic Environment. Nature Communications https://doi.org/10.1038/s41467-019-09314-7 Lafrenière, MJ & Lamoureux SF 2019 Effects of changing permafrost conditions on hydrological processes and fluvial fluxes. Earth-Surface Reviews 191:212-223 https://doi.org/10.1016/j.earscirev.2019.02.018 Cassidy, A. E., et al. 2017 Impacts of retrogressive thaw slumps on vegetation, soil and net ecosystem exchange of carbon dioxide in the Canadian High Arctic. Arct. Sci. 3, 179–202. https://doi.org/10.1139/as-2016-0034 Ward Jones, MK et al. 2019. Rapid initialization of retrogressive thaw slumps in the Canadian high Arctic and their response to climate and terrain factors. Environ. Res. Lett. 14 055006 https://doi.org/10.1088/1748-9326/ab12fd [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We have added connection to permafrost thaw mechanisms driving mass movements at high latitudes using the Patton et al. (2019) reference for retrogressive thaw slumps. We cite the Ward Jones et al. (2019) study within 12.4.9 (Polar Regions section).
5525	22	16	22	17	Landslide and rockfall hazards may also be exacerbated by coastal erosion. It is the opposite; it is the coastal erosion who is exacerbated by the landslide and rockfall, which are erosion processes. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: We have removed the reference to coastal erosion as it causes unnecessary confusion between the landslide CID and the coastal erosion CID.
11793	22	25	22	27	an excellent synthesis paper on effects of climate change on periglacial processes is: Lane, S. N., Bakker, M., Gabbud, C., Micheletti, N., & Saugy, J.-N. (2017). Sediment export, transient landscape response and catchment-scale connectivity following rapid climate warming and Alpine glacier recession. Geomorphology, 277, 210–227. [Amy East, United States of America]	TAKEN INTO ACCOUNT: This is an interesting periglacial process paper but does not connect strongly to a specific sectoral asset, which is the focus here.
126413	22	30	22	30	Suggest adding a definition of aridity to distinguish it from drought, as there is lots of confusion about the differences between the two. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Differences between aridity and drought are described in Section 12.2. Here in Section 12.3.2 we also distinguish these CIDs by highlighting their unique metrics including the time scale of the specific indices applied.
132345	22	30	22	41	It is strange that this subsection is not referring to chapter 8 which is the main home for the WG1 AR6 aridity assessment. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: We refer to CH8 and the Atlas as we introduce Aridity as a CID in 12.2.
14153	22	30	23	15	Since aridity and drought conditions will be taken up again for different regions, it is recommended to explain the differences between these two concepts in these sections. [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: Differences between aridity and drought are described in Section 12.2. Here in Section 12.3.2 we also distinguish these CIDs by highlighting their unique metrics including the time scale of the specific indices applied.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
130579	22	32	22	33	Aridity should be defined clearly. It is easy to be mixed with drought if not properly defined. [Panmao Zhai, China]	TAKEN INTO ACCOUNT: Differences between aridity and drought are described in Section 12.2. Here in Section 12.3.2 we also distinguish these CIDs by highlighting their unique metrics including the time scale of the specific indices applied.
64145	22	32	22	41	Some sections of the climate impact drivers start with a definition of the driver or an explanation of how it is measured, whereas others skip this (quite nice) intro and talk directly about the impact of the drivers on certain assets. I think an intro, like the one here in the Aridity section, is quite nice and sets the scene. The authors might want to think about introducing every section with a definition to the CID for consistency purposes. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have largely reduced these introductions given space limitations and the fact that Section 12.2 has just introduced each CID category. The main purpose of the 12.3 sub-sections is to indicate the way we utilize indices for each CID category, and for aridity it is particularly important given the broad array of indices necessary to capture the many aridity characteristics.
112317	22	32		33	sentence confusing; need to articulate what aspect of surface water, groundwater, or soil moisture relate to aridity and how [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: It is not practical to list each aspect of these physical systems that may change in a way that is relevant to aridity. In general the major state variable of each is affected, which is adequately implied by the formation of this list. The following sentences also provide more specific examples (e.g., water table depth) and point to references where the reader can find more information. We have added a caveat that aridity is a long-term change (shorter-term changes would be drought).
126415	22	39	22	39	The sentence about reduction in precipitation would fit better in the drought section. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This sentence refers to long-term changes in precipitation (as now explicitly mentioned at top of aridity paragraph). Drought would be episodic events after which conditions would be expected to return back to climatological conditions. Changing aridity would indicate that the mean climatological conditions throughout the water cycle have changed.
64147	22	39	22	41	The issue of saltwater intrusion into groundwater reservoirs due to decreasing groundwater levels in conjunction with sealevel rise might also be an important point to mention here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Saltwater intrusion is addressed in the relative sea level and coastal flooding CIDs
112319	22	39			annual?, seasonal?, total? Precipitation - too generic; what is the indicator/driver [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: The aridity paragraph now begins by noting that these refer to "long-term changes". It is not helpful to attach a single time frame as the relevant time scales depend on the system (in some cases aquifers have seasonal recharge time scales and others can be decadal or centennial, for example). The main distinction, as defined in Section 12.2, is that aridity is the long term trend in expected conditions and drought refers to episodic events after which conditions would eventually return to the expected conditions.
51755	22	40	22	40	Suggested addition: 'including to meet basic human needs, agriculture and for hydropower...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Added phrase as suggested

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126417	22	44	22	44	It is not clear why this research on drought is cited and not other highly relevant research? What was the selection criteria for determining the scope of this drought section and including this research and excluding other research? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have enhanced our discussion at the top of Section 12.3 to describe how we assess connections between CIDs and sectoral assets. We attempt to identify the most up-to-date and important paper describing each connection (with the help of contributing authors that are also lead authors from the Working Group II Sectoral chapters), but we do not expect that each topic will include a comprehensive reference list (other reviewers have asked us to reduce the overall number of citations). Our main goal is to find examples of climate information application that the reader can pursue for deeper exploration in this topic. The table shown in Section 12.3 also directly points the reader to the Working Group II Sectoral Chapters where climate connections are more deeply explored.
112507	22	44	23	15	How about the "socioeconomic drought"? Maybe it's worth mentioning this here even if the focus is on the physical aspects of droughts. [Tirthankar Roy, United States of America]	TAKEN INTO ACCOUNT: Socioeconomic drought would occur through cascading effects and interactions within socioeconomic systems, which would be discussed in Working Group II.
132347	22	44	23	15	This section should 1) refer to Section 11.6 which assesses drought and its different forms in detail, 2) clarify that this CID needs to be subdivided in 3 types (Precipitation/Meteorological drought, Soil moisture/Agricultural drought, Streamflow/Hydrological drought). The present text in chapter 12 is very superficial. [Sonia Seneviratne, Switzerland]	TAKEN INTO ACCOUNT: Section 12.2 now points the reader to the main Working Group I chapter where the physical mechanisms behind each drought type are assessed (including Chapters 8 and 11 for aridity and drought CIDs). We also follow the guidance of the Working Group I Thematic team on drought to ensure consistency in the use of drought terms. As a result of that process we have split the previous "Drought" CID into "hydrological drought" and "agricultural and ecological drought".
63851	22	44	23	16	This section does not discuss the effects of drought on organisms and general water reserves - if there is none or that isn't considered for some reason should that be mentioned? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have re-organized discussion of these topics into separate discussions of drought into hydrological drought and agricultural and ecosystem drought, with the former referring to general water reserves and the latter entirely devoted to metrics that capture organisms' inability to meet their water demands (in ecosystems and agricultural sectors).
53551	22	44			It may be also useful here and in other related chapters (including CH8, 10 and 11) to distinguish between drought indices using fixed versus time-dependent thresholds. The later may be more suitable to distinguish changes in variability from changes in mean state, and thus changes in drought frequency/severity from changes in aridity. [Hervé Douville, France]	TAKEN INTO ACCOUNT: We now further distinguish aridity and drought CIDs in Section 12.2 with the key distinction being the climatological shifts reflected in aridity versus the episodic droughts that act as fluctuations on top of any long-term trends.
86197	22	44			No mention of drought in relation to urban areas? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: We now mention aridity and hydrological drought as challenging the ability to meet municipal water needs

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102651	22	46	22	48	In the drought community it is preferred to use the term soil moisture drought instead of agricultural drought, because soil moisture deficits can also impact other sectors and ecosystems and it is more consistent with meteorological and hydrological drought. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We follow the cross-Working Group I guidance on drought categories here to distinguish drought types resulting in "Hydrological drought" and "Agricultural and ecological drought" CIDs. Soil moisture drought was considered as a category but soil moisture is relevant to hydrologic drought and soil moisture is not solely responsible for agricultural and ecosystem drought impacts. These drought categories are defined in Chapter 8 and utilized in Chapter 11. We also define these as CID categories in Section 12.2. Hydrological drought focuses on streamflow, surface, and groundwater water availability and is largely dependent on precipitation minus evaporation in a system. Agricultural and ecological drought looks at the ability of a plant to meet its water demand, which is generally related to precipitation minus potential evapotranspiration and available soil moisture. In both cases there are many sub-metrics and indices that elucidate particular aspects of supply and demand, as well as specific sectoral indices such as reference evapotranspiration (ET ₀) for agricultural applications. Meteorological drought, which looks only at precipitation, is not a CID on its own as sectors respond to the imbalance of supply and demand rather than just supply.
102653	22	46	22	49	When reading through these subsections, the impression is given that no specific CIDs indices are discussed, although in the flood section, the 1/20 flood has been explicitly mentioned. Why is this the case? Why not briefly discuss some commonly applied indices such as the SPI, SPEI, NDSI, etc? This would enhance these sections. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We refer the readers to Box 11.3 which details these indices. The large number and complexity of these indices made it difficult to select only a few to include here, so we instead describe the general way these are constructed and utilized and direct the reader to Chapter 11 for details.
7659	22	46	22	55	I am not sure if defining these types of droughts is relevant to the focus in this chapter. Perhaps should focus more on impact of droughts. [Miao Ruiqing, United States of America]	ACCEPTED: We have moved this material to be incorporated into Chapter 11.
110121	22	46	23	1	Droughts have also been defined in chapter 8 where, arguably, these definitional aspects belong. Suggest to liaise with chapters 8 and 11 over this text. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Section 12.2 now points the reader to the main Working Group I chapter where the physical mechanisms behind each drought type are assessed (including Chapters 8 and 11 for aridity and drought CIDs). We also follow the guidance of the Working Group I Thematic team on drought to ensure consistency in the use of drought terms. As a result of that process we have split the previous "Drought" CID into "hydrological drought" and "agricultural and ecological drought".
64149	22	46	23	15	Droughts will also affect biogeochemical cycles and primary productivity (more biolimiting nutrients in surface waters) in the ocean since more dust is transported over and deposited on the ocean during dry periods (https://doi.org/10.1029/2004GB002402). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This is an important phenomenon but is an example of one CID leading to another CID. In this case we would assess dust storms in their own right, even as drought and aridity contribute to the conditions that create dust transport (in this case drought and aridity are physical characteristics, but the climatic impact driver is the dust transport). We do include a connection between dust and coastal oceans and shelf seas to reflect this mechanism and its importance to marine ecosystems.

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74581	22	49	22	49	Oriented around deficits in humidity may be we have to precise in soil humidity. [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: We now distinguish between hydrological and agricultural and ecological drought and emphasize metrics beyond the precipitation statistics that are focused on water supply. It is not always possible to have precise measurements of humidity (let alone soil humidity), so we rely on models and indices that estimate the overall supply and demand relationships that govern water supply and plant requirements.
105735	22	49	22	51	Koen Verbis, Abou Amani, Anil Mishra and Blanca Jiménez Cisneros, 2016: Strengthening drought risk management and policy: UNESCO International Hydrological Programme's case studies from Africa and Latin America and the Caribbean, Water Policy, online 26 October 2016, wp2016223; DOI: 10.2166/wp.2016.223 [Abou Amani, France]	TAKEN INTO ACCOUNT: The Verbis et al. (2016) describes important efforts to disseminate and act upon drought information, but this does not introduce indices or approaches not already described in 12.3.2 and is closer to the adaptation and risk management assessed by WGII.
45569	22	49	22	52	<p>Van Lanen et al. (2016) and Laaha et al. (2017) emphasized that droughts and their socio-economic impacts should be understood through the propagation of water deficits through the hydrological cycle and cannot be apprehended only through a meteorological perspective and purely meteorological indices.</p> <p>Van Lanen, H., Laaha, G., Kingston, D. G., Gauster, T., Ionita, M., Vidal, J.-P., Vlnas, R., Tallaksen, L. M., Stahl, K., Hannaford, J., Delus, C., Fendekova, M., Mediero, L., Prudhomme, C., Rets, E., Romanowicz, R. J., Gailliez, S., Wong, W. K., Adler, M.-J., Blauhut, V., Caillouet, L., Chelcea, S., Frolova, N., Gudmundsson, L., Hanel, M., Haslinger, K., Kireeva, M., Osuch, M., Sauquet, E., Stagge, J. H., Van Loon, A. F. (2016) Hydrology needed to manage droughts: the 2015 European case. <i>Hydrological Processes</i>, 30, 3097–3104, https://doi.org/10.1002/hyp.10838</p> <p>Laaha, G., Gauster, T., Tallaksen, L. M., Vidal, J.-P., Stahl, K., Prudhomme, C., Heudorfer, B., Vlnas, R., Ionita, M., Van Lanen, H. A. J., Adler, M.-J., Caillouet, L., Delus, C., Fendekova, M., Gailliez, S., Hannaford, J., Kingston, D., Van Loon, A. F., Mediero, L., Osuch, M., Romanowicz, R., Sauquet, E., Stagge, J. H., Wong, W. K. (2017) The European 2015 drought from a hydrological perspective, <i>Hydrology and Earth System Sciences</i>, 21, 3001–3024, https://doi.org/10.5194/hess-21-3001-2017 [Jean-Philippe Vidal, France]</p>	TAKEN INTO ACCOUNT: These articles underscore the importance of extending beyond a statistical analysis or CID framework to connect into the full impact and risk assessment framework that incorporates vulnerability and exposure in addition to climatic hazard; however, we note in Section 12.1 that this analysis is conducted in WGII. We have revised the "drought" CID to now distinguish between hydrological and agricultural and ecological drought in order to reduce our dependence on supply-related meteorological indices (i.e., moving beyond meteorological drought). Indices used in the agricultural and ecological drought CID, for example, include reference evapotranspiration and other indicators related to the ability of a plant to meet its water demands for growth and transpiration.
102655	22	50	22	50	The work of Kerstin Stahl's group needs to be mentioned here following the statement on impacts. See suggested references. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: [about references in following comment]: "Anthropogenic drought" recognizes the human role in mitigating and enhancing drought. This is a result of socioeconomic system change and shifting demand that overdraws water from the environment, but also underscores the potential for adaptive risk management. This would be captured by vulnerability and exposure portions of the impacts and risk framework and is therefore a topic better covered in Working Group II Chapter 4.
102657	22	54	22	55	Add: "and anthropogenic drought" (e.g. AghaKouchak et al., 2015; Van Loon et al., 2016); AghaKouchak, A., Feldman, D., Hoerling, M., Huxman, T. and Lund, J., 2015. Water and climate: Recognize anthropogenic drought. <i>Nature</i> , 524(7566), pp.409-411. Van Loon, A. F., Gleeson, T., Clark, J., Van Dijk, A. I. J. M., Stahl, K., Hannaford, J., Di Baldassarre, G., Teuling, A. J., Tallaksen, L. M., Uijlenhoet, R., Hannah, D. M., Sheffield, J., Svoboda, M., Verbeiren, B., Wagener, T., Rangelcroft, S., Wanders, N. and Van Lanen, H. A. J. (2016). Drought in the Anthropocene. <i>Nature Geoscience</i> , 9(2), pp.89-91. doi:10.1038/ngeo2646 [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: "Anthropogenic drought" recognizes the human role in mitigating and enhancing drought. This is a result of socioeconomic system change and shifting demand that overdraws water from the environment, but also underscores the potential for adaptive risk management. This would be captured by vulnerability and exposure portions of the impacts and risk framework and is therefore a topic better covered in Working Group II Chapter 4.

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112321	22	54		55	it would be useful to very briefly describe what these "new" drought types are and implications since would be useful for your audience who generally are not [Linda Mortsch, Canada]	NOT APPLICABLE: We have moved text on this new lexicon of drought to be merged with the discussion in Chapter 8 and Chapter 11, which provide the physical basis for drought changes.
126419	22	55	22	55	Suggest separating mega-droughts from the other, future-oriented drought types in this sentence and explaining that mega-droughts have been a naturally occurring phenomena for thousands of years. [Trigg Talley, United States of America]	NOT APPLICABLE: We have moved text on this new lexicon of drought to be merged with the discussion in Chapter 8 and Chapter 11, which provide the physical basis for drought changes.
7661	22	55	22	55	The following Science paper should be cited about mega-droughts: Williams et al. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. Science. 314–318, 17 April 2020. [Miao Ruiqing, United States of America]	NOT APPLICABLE: We have moved text on this new lexicon of drought to be merged with the discussion in Chapter 8 and Chapter 11, which provide the physical basis for drought changes.
11795	23	3	23	3	if you need to use his initials, it should be A.P. Williams, rather than "Park" [Amy East, United States of America]	TAKEN INTO ACCOUNT: Reference citation formatting corrected
126421	23	3	23	3	Delete "Park" (first name) from "Park Williams". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Reference citation formatting corrected
55213	23	4	23	6	"Severe water stress can lead to crop failure" but also to forest regeneration failure (Boucher et al. 2019) and forest growth and terrestrial ecosystem productivity (Girardin et al. 2016a; 2016b; Babst et al. 2019) // Girardin, M.P., Hogg, E.H., Bernier, P.Y., Kurz, W.A., Guo, X.J., Cyr, G. 2016a. Negative impacts of high temperatures on growth of black spruce forests intensify with the anticipated climate warming. Global Change Biology, 22: 627–643. doi: 10.1111/gcb.13072. Girardin, M.P., Bouriaud, O., Hogg, E.H., Kurz, W.A., Zimmermann, N.E., Metsaranta, J., de Jong, R., Frank, D.C., Esper, J., Büntgen, U., Guo, X.J., Bhatti, J. 2016b. No growth stimulation of Canada's boreal forest under half-century of combined warming and CO2 fertilization. Proceedings of the National Academy of Sciences USA 113: E8406-E8414 Boucher, D., Gauthier, S., Thiffault, N., Marchand, W., Girardin, M.P., Urli, M. Under revision. How climate change might directly affect tree regeneration following fire at northern latitudes: A review. New Forest https://doi.org/10.1007/s11056-019-09745-6. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: These studies are largely focused on forest productivity and regeneration and do not establish a new or notably stronger connection to aridity beyond what is already within our citation list (we already have a study on aridity and forests).
102659	23	7	23	7	or by indices standardizing precipitation or precipitation minus potential evaporation (e.g. Stagge et al., 2015); Stagge, J.H., Tallaksen, L.M., Gudmundsson, L., Van Loon, A.F. and Stahl, K., 2015. Candidate distributions for climatological drought indices (SPI and SPEI). International Journal of Climatology, 35(13), pp.4027-4040. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Drought indices and their relative merits are discussed within Chapter 11. 12.3 now includes several references comparing indices and points the reader to Chapter 11 for further discussion.
11797	23	8	23	8	specify – is drought inversely related to West Nile Virus infection rates? [Amy East, United States of America]	TAKEN INTO ACCOUNT: We note that the Paull et al. study indicates that drought increases West Nile Virus prevalence.
51759	23	8	23	8	Suggested edit: 'connected to' > 'raises' disease infection rates for West Nile Virus? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We note that the Paull et al. study indicates that drought raises West Nile Virus infection rates.
112323	23	10		12	low flow and intermittency not only a water quality issue but a habitat availability issue for selected species (e.g., fishes, macroinvertebrates) [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We note the ecosystem connection of low flows and intermittency
126423	23	13	23	26	Overall, the focus of the section seems to disproportionately highlight impacts and hazards associated with coastal systems and energy production (although only renewable energy; no mention of potential impacts of severe storms to, e.g., offshore oil and gas production and pipelines. Maybe that is outside the scope here though.). Notably, there is little mention of the impacts of dust and sand storms for rangelands, which cover ~30% of the globe and are already "fragile" systems. This could be accomplished with one well-placed sentence. A good reference could be Edwards et al., 2019, Journal of Soil and Water Conservation 74: 260-273. What about impacts to agriculture? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We understand the reviewer to be referring to the severe storms CIDs section rather than the page and line number indicated (which is the drought section and does not match the reviewer's description). - We have distinguished tropical storms as its own CID category Section 12.3.3 notes the potential damage to energy infrastructure. - We have connections in Table 12.2 for sand and dust storm influences on livestock and pasture systems. - We could not locate the Edwards et al. (2019) reference suggested by the reviewer within the Journal of Soil and Water Conservation 74, or through searches for 'Edwards "what about impacts to agriculture"'

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115123	23	18	23	18	Add "weather" after "wildfire". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We have shifted this CID category to be "Fire Weather" rather than simply "Wildfire"
86235	23	18	23	18	Wildfire smoke is deadly on a grand scale (Globally 339 thousand deaths annually from landscape fire smoke exposure. Most affected region was sub-Saharan Africa 157 thousand, SRCCCL). [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: This CID has been clarified as being "fire weather". Smoke created by potential resulting wildfires would be classified as an element of the air pollution weather CID. We examine regional changes of these CIDs in Section 12.4. Damages from smoke exposure would be assessed in WGII.
41747	23	18	23	33	it meaningful if you link wildfire with GHG emissions [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: The effects of CIDs and their impacts on the overall GHG emissions and carbon budgets is beyond the purview of this chapter. Here we focus on fire weather, and the overall impacts (such as area burned) are discussed in Working Group II while the impact on carbon budgets is described in Working Group I chapter 5.
11799	23	18	23	33	section 12.3.2.7, paragraph on Wildfire: it is very important for this paragraph to mention that most wildfires are human-caused. As currently written it is misleading, because only lightning is mentioned. For the U.S., Balch et al. (2017) estimated that 84% of wildfires are caused by human activity. See also Keeley and Syphard (2018) on specific causes, for California. In Portugal, the proportion of wildfires caused by humans has been estimated to be 97%, with only 3% caused by lightning (Hoinka et al., 2009). There are no globally synthesized data on human vs. lightning ignitions, but the estimates just mentioned are nationwide for two countries, respectively, and both show an overwhelming majority of wildfires originating from anthropogenic ignition. However, climate and weather (e.g., fire weather index) determine whether ignitions will grow into large fires. Explaining this distinction is critically important. When the 2019 mega-fires in Australia happened, and the media reported that many of them began as arson, some members of the public did not want to believe climate change could be a factor because humans had started the blazes. It is essential for the IPCC to explain that even though humans ignite most wildfires, climate (and changes to climate) determine how large a threat the fires become (how hot/dry is the fuel? And so on). References: Balch, J. K., Bradley, B. A., Abatzoglou, J. T., Nagy, R. C., Fusco, E. J., & Mahood, A. L. (2017). Human-started wildfires expand the fire niche across the United States. <i>Proceedings of the National Academy of Sciences</i> , 114, 11, 2946–2951. Doi: 10.1073/pnas.1617394114. Keeley, J. E., & Syphard, A. D. (2018). Historical patterns of wildfire ignition sources in California ecosystems. <i>International Journal of Wildland Fire</i> , 27, 781–799. Hoinka, K. P., Carvalho, A., & Miranda, A. I. (2009). Regional-scale weather patterns and wildland fires in central Portugal. <i>International Journal of Wildland Fire</i> , 18, 36–49. [Amy East, United States of America]	TAKEN INTO ACCOUNT: We have revised this CID category to be "fire weather" rather than wildfire on its own, as described in Section 12.2. Here we look at the environmental conditions for fire, while the overall area burned and fire counts would be assessed in Working Group II. We have edited to avoid any impression that all wildfires are ignited via natural causes, but the frequency of dry lightning is still a relevant metric of fire weather. The actual number of fires, area burned, relative causes of ignition, and resulting impacts are assessed in Working Group II.
55209	23	18	23	33	This section is missing content from Canada and the burning of boreal forests. Boreal forests in Canada are an important source for fire emissions transport into the Northern Hemisphere (e.g. Girardin et al. 2019). So not just the affected regions are impacted by fire: its a large-scale environmental issue.// Girardin, M.P., Portier, J., Remy, C., Ali, A.A., Paillard, J., Blarquez, O., Asselin, H., Gauthier, S., Grondin, P., Bergeron, Y. 2020. Coherent signature of warming-induced extreme sub-continental boreal wildfire activity 4,800 and 1,100 years BP. <i>Environmental Research Letters</i> 14(12): 124042. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: This section is not meant to be a comprehensive regional analysis. Rather, it establishes connections between the fire weather CID and various sectoral assets. Fire weather in Canada is assessed within Section 12.4.6.2.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55211	23	18	23	33	It should be specified that scientists are also looking at how changing vegetation anticipated with climate change can affect future wildfire trajectories. In boreal Canada, loss of forest cover with heat-induced tree mortality under high climate change scenarios is projected to feedback on fire, thereby reducing its frequency and severity at the end of the century See Chaste et al. (2019). // Chaste, E., Girardin, M.P., Kaplan, J.O., Bergeron, Y., Hély, C. 2019. Increases in heat-induced tree mortality could drive reductions of biomass resources in Canada's managed boreal forest. Landscape Ecology 34(2): 403–426, https://doi.org/10.1007/s10980-019-00780-4 . [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Changes in ecosystems that will in turn affect wildfire are beyond the purview of this section for two reasons. 1) We now investigate fire weather rather than wildfire itself (burned area and other impact metrics are assessed in Working Group II); and 2) when one CID changes a sector which in turn changes the risk of another CID having an impact that is a reflection of shifting vulnerability or exposure of that system, which are elements of the risk framework assessed within Working Group II.
26443	23	20	23	20	Wildfires do not only imply consequences for "human life" (mortality) but also increased respiratory and cardiovascular morbidity when the air pollution from wildfires is transported over long distances. Please see i.e. Shaposhnikov D, Revich B, Bellander T, Bedada GB, Bottai M, Kharkova T, et al. Mortality related to air pollution with the Moscow heat wave and wildfire of 2010. Epidemiology. 2014;25(3):359-64. [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: We include a reference to health impacts from downstream smoke and more recent references about fire smoke and respiratory ailments (Dennekamp and Abramson, 2011; McKenzie et al., 2014)
112081	23	20	23	33	Fire weather is standard name to refer to the climatic driver for wildfires in the literature, so I would recommend using that term in WGI to make explicit the appropriate scope. I think it is necessary to describe different fire weather indices (such as FWI) which are widely used to characterize (and project) fire weather. Examples are given for instance in one of the described papers, Bedia et al., 2015, and reference therein. This section needs a deep revision in order to focus on these topics (fire weather) and leave other factors affecting wildfire risks (not directly related to climate) to WGII. You might be interested in looking at attribution aspects and the proper use of fire weather projections (e.g. the effect of saturation when interpreting changes) in the above mentioned paper (and references therein). [Jose manuel gutierrez, Spain]	ACCEPTED: We have shifted this CID category to be "Fire Weather" rather than simply "Wildfire". We also expand our discussion of specific fire weather indices, including examining Bedia et al. (2015) and references therein.
40589	23	21	23	21	Note that the glossary has the following definition for 'fire weather': "Weather conditions conducive to triggering and sustaining wildfires, usually based on a set of indicators and combinations of indicators including temperature, soil moisture, humidity, and wind. Fire weather does not include the presence or absence of fuel load." [TSU WGI, France]	TAKEN INTO ACCOUNT: Thanks to the reviewer for pointing us to this glossary definition. Our definition of the "Fire weather" CID (in Section 12.2) is now consistent with this glossary entry.
64151	23	21	23	22	Fire weather indices such as? Would be nice to have some examples. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have shifted this CID category to be "Fire Weather" rather than simply "Wildfire". There are a large number of indices within the citations listed for this sentence, and it would be a potential disservice to the others should we only select one to show.
86677	23	24	23	26	Quotation"Projection of future lightning frequency provides an important natural triggering mechanism, particularly when coupled with long-term warming and drying trends (Romps et al., 2014; Jin et al., 2015; Veraverbeke et al., 2017)". Comment: In chapter 5 page 26, line 26 it seems evident that the lightning frequency will increase. However, expected changes are not available (see our comment to page 75 line 47-49). [Oyvind Christophersen, Norway]	TAKEN INTO ACCOUNT: This section does not make projections of lightning changes, but is rather interested in acknowledging their role as an aspect of fire weather. CH12 does not make any projections of lightning changes in the future, so there is no inconsistency with Chapter 5.
51761	23	26	23	27	Suggested edit: 'aridity measures' > 'aridity metrics' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We now use "aridity metrics"
126425	23	27	23	27	Amplified alternation of wet-dry cycles also increases fuel potential for large-scale fire (Yoon et al. 2015). Citation: Yoon, J.-H., Wang, S.-Y., R. R. Gillies, L. Hipps, B. Kravitz, and P. Rasch, 2015: Extreme Fire Season in California: A Glimpse into the Future?. Bulletin of the American Meteorological Society, 96, DOI: 10.1175/BAMS-D-15-00114.1 ...,2016). [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This type of sequential hazard is noted as being beyond the purview of Chapter 12, as it is a question of the memory, resilience and responsiveness of the system affected (related to vulnerability and exposure), which is more appropriately discussed in WGII.
64153	23	27	23	29	Without further explanation (or reading the cited paper) it is not clear why snow cover would influence the fire season? It would be nice if the authors would add more info on that. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Snow cover is part of the overall water content of the land surface and vegetation that may be evaluated as part of fire risk assessments, with further details available in the cited papers.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112325	23	27		25	how is snow cover extent related to fire hazard - a phrase explaining [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Snow cover is part of the overall water content of the land surface and vegetation that may be evaluated as part of fire risk assessments, with further details available in the cited papers.
51763	23	31	23	31	suggested edit: 'smoke plumes that reduce air quality' (remove 'can') [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Removed "can"
110123	23	31	23	33	Chapter 6 had a substantive assessment which should be linked in place of the present small number of papers? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Our focus is not on the carbon or energy budget implications of fire (which were the primary interest of the Chapter 6 assessment of biomass burning); rather our focus is on the societal implications of fire in naturally vegetated lands (rather than agricultural burns or home fuel burning).
64155	23	31	23	33	Smoke plumes also influence water quality and biogeochemical cycles in marine environment due to aerial trace metal input. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We include a reference to Martin et al. (2016), which examines the nexus of fire, water and society with a focus on water quality.
88063	23	32	24	33	SROCC had the same purpos. Please tell the reader clearer what Ch12 adds to the SROCC assessment [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: We understand that the reviewer intended this comment to be about lines 32 and 33 on page 24 (not 23). We now remind the reader of our point of departure from SROCC in the introduction to 12.3.4. We update this assessment and utilize the CID framework to connect to sectoral assets and then perform a systematic regional assessment of snow and ice CID changes.
39379	23	36	24	26	Same comment as above. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of wind CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.
126427	23	38	23	38	This could be outside the scope of this chapter/section, but for readers who may only read this chapter what, in general are the mean wind trends, and what level of uncertainty do the predictions have? Maybe this is not the relevant place to include this information, but one sentence that mentions global wind stilling with future trends with high uncertainty as the first sentence of this section could be useful. Vautard et al. 2010, Nature Geoscience 3:756-761 is a possible reference. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We describe the regional changes in mean wind CIDs for each region within Section 12.4
112327	23	40		43	prevailing wind direction changes (and storm wind direction) also influences wave energy along the lake and ocean shoreline and can enhance erosion hazard and risk and longshore sediment transport [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We now note the importance of wind direction as a mean wind CID index that is important for sectors. The reviewer also provides an example of a CID change causing additional CID changes (i.e., mean wind is a CID and so is coastal erosion). In our assessment of the coastal erosion CID we examine all factors that would lead to changing coastal erosion, including shifts in wind and wave direction.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51765	23	41	23	41	suggested addition: '...and dust dispersal' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: added "dispersal"
96179	23	41	23	42	With mentioning 'agriculture' alone, it is not clear if the authors also mean 'soil erosion by wind/dust storms' (and its consequences, i.e. for humus content or soil texture, as well as in conjunction with off-site damages like deposition) - or not. Please clarify. [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: We have added the Hellberg and Chu (2016) reference here so that readers can learn more about how wind changes can affect the dispersal of plant diseases. Wind erosion is discussed as part of the sand and dust storm CID.
102661	23	45	23	45	reference not correctly cited [Philippe Tulkens, Belgium]	ACCEPTED: typo corrected
11801	23	45	23	45	formatting of parentheses needs to be fixed, should be "Karnauskas et al. (2018a) noted..." There are many instances of this particular formatting error in this chapter and I won't mention others by line number [Amy East, United States of America]	ACCEPTED: typo corrected
13855	23	45	23	45	change (Karnauskas et al., 2018a) by Karnauskas et al. (2018a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33577	23	45			Change: "(Karnauskas et al., 2018a) noted..." » by « Karnauskas et al. (2018a) noted...". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43463	23	45			Read " Karnauskas et al. (2018a) noted wind thresholds " rather than " (Karnauskas et al., 2018a) noted wind thresholds " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
51767	23	46	23	47	Suggested addition: '...beyond which most current turbines could not operate' as I believe the operating window of turbines varies. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have revised this to be "beyond which given turbines could not operate". This was an example meant to indicate the utility of cut-in and cut-off wind levels, not to specify the specific thresholds considering these are design-specific.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
38173	23	47	20	47	<p>It would be worthwhile to mention that (oceanic) mean wind change can also affect wave height, large-scale ocean circulation (in addition to mixing) and regional distribution of sea level changes as well. (e.g., Timmermann et al. 2010; Frankcombe et al. 2013; Mori et al. 2013; McGregor et al. 2012; Han et al. 2010; Nidheesh et al. 2013; Hamlington et al. 2014; Dobrynin et al. 2014)</p> <p>Dobrynin, M., J. Murawski, J. Baehr, and T. Ilyina, 2014: Detection and Attribution of Climate Change Signal in Ocean Wind Waves. <i>Journal of Climate</i>, 28, 1578–1591, https://doi.org/10.1175/JCLI-D-13-00664.1.</p> <p>Frankcombe, L. M., P. Spence, A. McC. Hogg, M. H. England, and S. M. Griffies, 2013: Sea level changes forced by Southern Ocean winds. <i>Geophysical Research Letters</i>, 40, 5710–5715, https://doi.org/10.1002/2013GL058104.</p> <p>Hamlington, B. D., M. W. Strassburg, R. R. Leben, W. Han, R. S. Nerem, and K.-Y. Kim, 2014: Uncovering an anthropogenic sea-level rise signal in the Pacific Ocean. <i>Nature Climate Change</i>, 4, 782–785, https://doi.org/10.1038/nclimate2307.</p> <p>Han, W., and Coauthors, 2010: Patterns of Indian Ocean sea-level change in a warming climate. <i>Nature Geoscience</i>, 3, 546–550, https://doi.org/10.1038/ngeo901.</p> <p>McGregor, S., A. sen Gupta, and M. H. England, 2012: Constraining Wind Stress Products with Sea Surface Height Observations and Implications for Pacific Ocean Sea Level Trend Attribution. <i>Journal of Climate</i>, 25, 8164–8176, https://doi.org/10.1175/JCLI-D-12-00105.1.</p> <p>Mori, N., T. Shimura, T. Yasuda, and H. Mase, 2013: Multi-model climate projections of ocean surface variables under different climate scenarios—Future change of waves, sea level and wind. <i>Ocean Engineering</i>, 71, 122–129, https://doi.org/https://doi.org/10.1016/j.oceaneng.2013.02.016.</p> <p>Nidheesh, A. G., M. Lengaigne, J. Vialard, A. S. Unnikrishnan, and H. Dayan, 2013: Decadal and long-term sea level variability in the tropical Indo-Pacific Ocean. <i>Climate Dynamics</i>, 41, 381–402, https://doi.org/10.1007/s00382-012-1463-4.</p> <p>Timmermann, A., S. McGregor, and F.-F. Jin, 2010: Wind effects on past and future regional sea level trends in the southern Indo-Pacific. <i>Journal of Climate</i>, 23, 4429–4437. [Junhee Lee,</p>	<p>TAKEN INTO ACCOUNT: We note that mean wind changes drive changes in ocean circulation and upwelling as well as wave energy resources. Wind's effect as a driving mechanism for other CID changes (e.g., relative sea level) are accounted for in the effects of those other CIDs.</p>
126429	23	50	23	50	<p>Title would read better with storms in the plural rather than singular. [Trigg Talley, United States of America]</p>	<p>TAKEN INTO ACCOUNT: Each of the CID is defined in the singular form, reflecting that these CIDs are associated with discrete events. Multiple events would relate to the frequency of that CID.</p>
132349	23	50	24	10	<p>It is strange that this subsection is not referring to chapter 11 which is the main home for the WG1 AR6 severe wind assessment. [Sonia Seneviratne, Switzerland]</p>	<p>TAKEN INTO ACCOUNT: We note the strong connection to Chapter 11 physical description in the definition of this CID category as part of the overall increase in coherence and cross-referencing between chapters. This Section 12.3 continues this discussion by connecting severe wind storms to sectoral assets, which was not the focus of Chapter 11. Assessment of regional changes in severe storms are presented in Section 12.4, with strong references to Chapter 11.</p>
126431	23	50			<p>That's an interesting point about the impact on hydropower. Suggest that the authors mention how wind may impact the extent and toxicity of nuisance/harmful algal blooms in freshwater and marine systems. [Trigg Talley, United States of America]</p>	<p>ACCEPTED: We have added the Townhill et al. (2018) study connecting wind with algal blooms.</p>
126433	23	52	23	52	<p>"Severe wind storms form ..." sounds better than current text. [Trigg Talley, United States of America]</p>	<p>TAKEN INTO ACCOUNT: We have revised this sentence for clarification and legibility.</p>
107877	23	52	23	54	<p>Only earth system model scales are referred to here. What about higher resolution RCMs? Particularly convective resolving ones? [Linda Mearns, United States of America]</p>	<p>TAKEN INTO ACCOUNT: Section 12.3 aims to establish sectoral asset connections rather than assess different simulation methods. These methodological differences are compared in Chapter 11 and the Atlas and are results of different modelling approaches are considered within the multiple lines of evidence assessed within Section 12.4.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110125	23	52	24	1	This was the subject of a substantive assessment in chapter 11 which should be pointed to in place of the present text which risks undermining the very substantive assessment performed by chapter 11. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We note the strong connection to Chapter 11 physical description in the definition of this CID category as part of the overall increase in coherence and cross-referencing between chapters. This Section 12.3 continues this discussion by connecting severe wind storms to sectoral assets, which was not the focus of Chapter 11. Assessment of regional changes in severe storms are presented in Section 12.4, with strong references to Chapter 11.
51757	23	53	24	1	Suggested revision of first part of sentence to "The category 'severe wind storm' encompasses a broad variety of risks...." [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have revised this sentence for clarification and legibility.
20285	23	53	24	1	This sentence needs to be corrected. For example, replace "are" on line 55 by a comma. [philippe waldteufel, France]	TAKEN INTO ACCOUNT: We have revised this sentence to increase clarity.
102663	23	54	23	55	Sentence is not correctly written [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have revised this sentence to increase clarity.
51769	23	55	23	55	suggested edit: '..potential energy (CAPE); strong low-level wind shear..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have revised this sentence to increase clarity.
126435	24	1	24	1	Add reference: ""... 2016; Pokharel et al. 2018."" Citation: Pokharel, B., S.-Y. Wang, J. D. D. Meyer, R. Gillies, and Y.-H. Lin, 2018: Climate of weakly-forced yet high-impact convective storms throughout the Ohio River Valley and Mid-Atlantic United States. Climate Dynamics, DOI: 10.1007/s00382-018-4472-0 [Trigg Talley, United States of America]	REJECTED: The suggested reference focuses on climate dynamics rather than the connection of severe storms to natural and human systems.
126437	24	1	24	10	Suggest adding sentence on severe storms as drivers of intense local-to-regional dust emission events (e.g., haboobs) that frequently traverse into cities -- degrading air quality and acting as a vector for pathogens like Valley fever (Sprigg et al., 2014; Middleton et al., 2017). Citations: Sprigg, W.A., Nickovic, S., Galgiana, J.N., Pejanovic, G., Petkovic, S., Vujadinovic, M., Vukovic, A., Dacic, M., DiBiase, S., Prasad, A., El-Askary, H., 2014. Regional dust storm modeling for health services: The case of valley fever. Aeolian Research 14, 53-73. Middleton, N.J., Tozer, P., Tozer, B., 2017. Sand and dust storms: underrated natural hazards. Disasters 43, 390-409. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Haboobs would be assessed within the dust and sandstorm CID category. That section includes more recent studies connecting dust and valley fever. We do cite the Middleton et al. (2019) study in our overview of the dust CID.
102665	24	4	24	4	a tropical cyclone is the same as a hurricane [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have created a new CID for Tropical cyclones and avoid tropical cyclone/hurricane confusion.
51771	24	4	24	4	suggested edit: 'can deliver wind, extreme rainfall and coastal hazards, with...!' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have clarified this sentence for legibility
126439	24	4	24	4	Storms can deliver wet? This would read better if rephrased. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We rephrased this sentence for clarity.
86237	24	5	24	5	"implications for human health" is an understatement. Floods, droughts, storms can all cause humanitarian disasters, with huge death tolls, and complete destruction of livelihoods, with little chance of recovery over the short term, which are not mentioned clearly enough or at all. Human deaths is the number one leverage for politicians, so please ensure that all hazards that lead directly (or indirectly) to loss of human lives and livelihoods are clearly called out. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: We have reworked this sentence to note the clear negative connotations of severe wind storm and tropical cyclone events. The ramifications of many of these CIDs can be dire in a way that Working Group I is not in a position to convey. Working Group II can take this information and add vulnerability and exposure to assess the impacts and risks of these terrible events.
63853	24	7	24	10	Should increases in wildfire risks be mentioned e.g. Statistical Models of Key Components of Wildfire Risk, Dexen D.Z. Xi, Stephen W. Taylor, Douglas G. Woolford, C.B. Dean, Annual Review of Statistics and Its Application 2019 6:1, 197-222 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This study complements studies that we already cite in the fire weather CID section.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
87237	24	8	24	10	Wind destroys power transmission line and wind power equipment etc. is gust mostly, and safety margin as specification of equipment is not determined against not average wind speed, like 10 minutes average, may be by maximum speed. It is better to explain average and maximum particularly for policy makers. [Takashi Hongo, Japan]	ACCEPTED: We have explicitly noted maximum wind speeds as a threat to power grids, and now cite Ward (2013) and Nik et al. (2020) to bolster this point.
102667	24	9	24	9	Koks, E.E., Rozenberg, J., Zorn, C., Tariverdi, M., Vousdoukas, M., Fraser, S.A., Hall, J.W. and Hallegatte, S., 2019. A global multi-hazard risk analysis of road and railway infrastructure assets. Nature communications, 10(1), pp.1-11. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: We have added the Koks et al. (2019) study for road and railway infrastructure connections to the Tropical Cyclone and River flood CIDs
64015	24	9	26		Snow and ice for example combines what has been reported earlier in the temperature and water subtopics. So, it is an unorganized repetition or appears as rephrasing for the same information. Refer to section 12.3.5 and 12.3.6. where data is professionally presented and well organized. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Snow and ice CIDs are distinct from the heat and cold and wet and dry CIDs presented earlier in Section 12.3, including in their physical properties, their effects on sectoral assets, and the indices utilized. There are necessary parallels in the way that climate information applications approach these CIDs and the heat/cold and wet/dry CIDs, but in many cases stakeholders are interested in these specific CIDs and not the others so the specific approaches used for these CIDs merit specific discussion. In some cases snow or ice is a contributing factor to another CID (river floods, fire, landslides) but that is different than the snow and ice CIDs described here. Our revised explanation of CIDs in 12.2 is also meant to better organize this discussion.
86239	24	13	24	13	Health effects of dust storms are largest near their origin, primarily the Sahara Desert; in countries of the Sahara region, 15–50% of all cardiopulmonary deaths could be caused by dust storms. Meningococcal Meningitis epidemics in Sahel occur during the dry seasons with dusty conditions. (cited from SRCCL) [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Regional analysis of these CIDs' current and future characteristics is provided in Section 12.4. The actual impacts and risk profile of these CID changes is assessed in Working Group II.
126441	24	13	24	13	Title reads "Dust and sandstorm (notably in compound form), while first line of text starts with "Sand and dust storms ...". One of these should be changed for consistency. The section title would read better with storms being plural. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have ensured that we consistently refer to "sandstorm" rather than "sand storm", although we more often group these together as "sand and dust storm", which matches terminology used by the World Meteorological Organization.
11803	24	15	24	15	replace "blast" with "damage" [Amy East, United States of America]	ACCEPTED: Replaced "blast" with "damage"
63855	24	15	24	15	Unsure what is meant by "induce health" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have rephrased this sentence to increase clarity.
126443	24	15	24	15	Suggest revising to: "Sand and dust storms erode topsoils, erode soil carbon and nutrient stocks, blast crops and ..." and add reference to: Webb, N.P., Chappell, A., Strong, C.L., Marx, S.K., McTainsh, G.H., 2012. The significance of carbon-enriched dust for global carbon accounting. Global Change Biology 18, 3275-3278. [Trigg Talley, United States of America]	REJECTED: Carbon accounting is not the subject of this section, which instead focuses on direct societal or ecosystem responses to dust storms.
126445	24	19	24	19	Suggest adding sentence on aeolian processes as a driver of ecosystem change: ""Sand and dust storms are also an important abiotic driver of ecosystem change in drylands, promoting the transition of desert grasslands to shrublands with associated loss of ecosystem services and increased degradation of air quality (Ravi et al., 2011; Bestelmeyer et al., 2018)."" Citations: Bestelmeyer, B.T., Peters, D.P.C., Archer, S.R., Browning, D.M., Okin, G.S., Schooley, R.L., Webb, N.P., 2018. The Grassland-Shrubland Regime Shift in the Southwestern United States: Misconceptions and Their Implications for Management. Bioscience 68, 678-690. Ravi, S., D'Odorico, P., Breshears, D.D., Field, J.P., Goudie, A.S., Huxman, T.E., Li, J., Okin, G.S., Swap, R.J., Thomas, A.D., Van Pelt, S., Whicker, J.J., Zobeck, T.M., 2011. Aeolian processes and the biosphere. Reviews in Geophysics 49, RG3001. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have examined the recommended studies and feel the ramifications of a CID change on land use transitions are a function of the vulnerability (including adaptive capacity) and exposure of the affected systems, which are assessed in Working Group II. The Bestelmeyer et al. (2018) reference, for instance, notes that shrublands have different dust generation processes than grasslands, which contribute to regime shifts. In this case there is a feedback loop to land transitions which is beyond our scope here.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126447	24	19	24	19	Suggest revising sentence to: ""Dust events may be represented as the number of dust hours per dust storm year (Leys et al., 2011; Spickett et al., 2011), as well as by particulate matter (PM) concentrations as monitored by air quality monitoring networks (e.g., Hand et al., 2016)."" Citation: Hand, J.L., White, W.H., Gebhart, K.A., Hyslop, N.P., Gill, T.E., Schichtel, B.A., 2016. Earlier onset of the spring fine dust season in the southwestern United States. Geophysical Research Letters 43, 4001-4009. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We already have references referring to PM concentrations as a measure of dust storm activity, but reference Hand et al. (2016) in the North America section (12.4.6)
64157	24	21	24	24	This sentence is all over the place and doesn't follow a logical structure as represented in Table 12.2. The sentence mentions corals, forests, the photovoltaic panels, then algal blooms, then health and recreation. The jumps are quite confusing. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have separated out the photovoltaic portion as this is referenced in a sentence above.
64159	24	21	24	24	The nutrients delivered by dust storm into the ocean can also be highly beneficial to HNLC regions (high nutrients and low chlorophyll) and thus the global climate as a feedback mechanism of increased phytoplankton productivity (see DOI: 10.1126/science.1105959) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added the Jickells et al. (2005) reference as it supports the beneficial aspects of iron deposition in transported dust.
11805	24	22	24	22	remove "can" (it's superfluous in this context): "may also accumulate" [Amy East, United States of America]	ACCEPTED: typo corrected
110127	24	22	24	22	You have already made the point about photovoltaics. Repetition should be removed [Peter Thorne, Ireland]	ACCEPTED: We have combined these points to avoid repetition
80727	24	22	24	22	The information on the impacts on solar panel is a repetition from line 20 on the same page [Helene Jacot Des Combes, Marshall Islands]	ACCEPTED: We have combined these points to avoid repetition
126449	24	24	24	24	Need text edit for "... may also can accumulate ..." [Trigg Talley, United States of America]	ACCEPTED: typo corrected
45609	24	29	24	29	Why not use "Cryosphere CIDs" instead of "Snow and Ice"? Although I acknowledged that snow and ice are more general public terms, the cryosphere is abroad and more correctly umbrella term for all these CIDs. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We discussed this across multiple expert groups and decided to keep 'snow and ice' as it is more recognizable by the general public.
15703	24	29	24	29	As suggested above, I suggest that "Snow and ice" is replaced here by "Cryosphere". This would be better in line with the content (e.g., it includes permafrost, which is neither snow nor ice but defined based on ground temperature), and provide a more direct link to SROCC. [Samuel Morin, France]	TAKEN INTO ACCOUNT: We discussed this across multiple expert groups and decided to keep 'snow and ice' as it is more recognizable by the general public. Permafrost includes elements of frozen soil water, so we felt this still fits.
89341	24	29	24	33	This introduction should also mention the relevant parts of the AR6 assessment (Chp 2, 9), not just SROCC [Baylor Fox-Kemper, United States of America]	TAKEN INTO ACCOUNT: We note the relevance of Chapters 2, 8 and 9 in the original definition of the CIDs in Section 12.2
39381	24	29	26	17	Same comment as above [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of snow and ice CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45613	24	31	24	33	This introduction needs a better link or recognition of other cryosphere assessments made throughout the report. Please consider this as synthesis: Chapter 2 Global and large-scale changes of glaciers, snow, and permafrost are summarized in Chapter 2. The attribution to the human activity of glacier, snow, and permafrost changes are assessed in Chapter 8 of this report. Progress in observing, understanding, and modeling the evolution of ice sheets, glaciers, snow, and permafrost in the past, present, and future since AR5 and SROCC are assessed in Chapter 9. Glacier's and ice sheet's contribution to sea-level rise assessed in section 9.4 and 9.5 are put into a global context in Section 9.6. The impact of glaciers, permafrost, and snow changes on the hydrology are assessed in Chapter 8. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We note the relevance of Chapters 2, 8 and 9 in the original definition of the CIDs in Section 12.2
63641	24	32	24	32	This is first time mentioning CID without preliminary-explanation (maybe in another chapter). Would be nice to add the full-title as Climatic Impact Drivers. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Climatic Impact-drivers are first introduced as CIDs in Section 12.1 and are used throughout the chapter prior to (and after) this section.
88061	24	32	24	32	I would avoid the very core community specific abbreviation CID. It is unfamiliar to a wider community and makes reading quite difficult. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: Working Group I includes considerable attention to the climatic impact-driver framework including an introduction in Chapter 1 and extensive discussion in Chapter 12 where the approach is fully described (enhanced from last draft). We are confident that readers will be more familiar with this term from the Sixth Assessment Report, and the term has emerged from multiple rounds of review as being a necessarily distinct term that had no prior alternative.
45611	24	36	24	36	Why not use just glaciers instead of land ice? Although land ice is a broader term, which could be any type/kind of ice on earth. Throughout this section, land ice is used as synonymous with glaciers and other types/kinds of ice, like lake or river ice or the ice in permafrost are assessed as different CIDs, so why not be more straight and use the term glacier instead of land ice. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We use 'snow, glaciers and land ice' for this CID instead of 'snow and land ice'.
15705	24	36	24	36	As suggested above, I suggest that "Snow and land ice" is replaced by "Snow cover and glacier". In fact, I think it could be appropriate to split in two, "Glacier" and "Snow cover". The paragraph already covers "snow cover" and "glaciers" quite independently, so this does not require major changes to the text, and there are many regions of the world (e.g. much of northern hemisphere) where snow cover is a major CID without any glacier. Separating out these two components would therefore be appropriate on a policy-maker perspective, too. Note that, if implemented, this change should also be made to the introductory tables on CIDs (links to ECV and links to sectoral impacts). [Samuel Morin, France]	TAKEN INTO ACCOUNT: We use 'snow, glaciers and land ice' for this CID instead of 'snow and land ice'. Chapter 12 acknowledges that each of the CID categories can likely be distinguished further, but is limited by space and presentation clarity is facilitated by groupings such as this. Snow cover and glaciers have distinct CID indices that may be of primary importance to a given stakeholder (as noted), but their regional changes tend to be consistent so they can be effectively grouped as a category for regional climate information assessment.
64161	24	38	25	6	This section doesn't mention any of the influences of increased/decreased ice cover on biota (aquatic or terrestrial such as penguins, polar bears and animals in Alaska dependent on ice or the seasonality of it, let alone the influence of ice and snow to migration routes of some animals), plants, and marine biogeochemical cycles (ice and glacier melts result in increased freshwater input into the marine environment influencing organisms and changing deep water formation as well as currents). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Lake, river, and sea ice are assessed as a separate CID, which includes many connections to ecosystem effects. Heavy snow and ice storms are also a CID with connections to biota. Snow cover connections to biota are also noted in the text and tables.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110587	24	39	24	42	McCrary and Mearns (2019) should also be included - this paper examines change in a number of these key indicators in the NARCCAP ensemble. RR McCrary, LO Mearns - Journal of Hydrometeorology, 2019. - Quantifying and Diagnosing Sources of Uncertainty in Midcentury Changes in North American Snowpack from NARCCAPs as well as Rhoades et al. 2018. evaluates future changes in snow over CA using snow metrics. AM Rhoades, AD Jones, PA Ullrich - Geophysical Research Letters, 2018 - The changing character of the California Sierra Nevada as a natural reservoir; [Rachel McCrary, United States of America]	TAKEN INTO ACCOUNT: We include the McCrary and Mearns paper in the North America Section 12.4.6. We include a different Rhoades et al. (2018) paper which includes both NARCCAP and CESM variable resolution simulations and makes many of the same points as the recommended paper.
88065	24	41	24	42	Avoid citing papers that had been assessed already in AR4 (2007), AR5 (2013) and AR6 SROCC (2019) if of relevance. Please check and revise this throughout the entire chapter. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: We have looked for more updated studies and eliminated some of the older studies if newer studies are available, but our main criterion is the establishment of a connection in the literature; having already been assessed in a previous assessment would not be disqualifying.
15707	24	41	24	42	Specifically on changes in seasonal snow, I suggest assessing whether Verfaillie et al. (2018) could be mentioned here. This publication describes a full set of adjusted EUROCORDEX projections applied to the mountain environment, followed by applying a state-of-the-art physically based snow cover model (Crocus), providing a multi-ensemble perspective on future climate change impacts on snow cover. Note also that this publication indicates that the corresponding data set was produced for the whole French Alps and Pyrenees, and made available through the French climate services portal Drias, which provides an interesting example of bridging snow and ice information into the climate services realm. See https://doi.org/10.5194/tc-12-1249-2018 for direct link (open access). [Samuel Morin, France]	TAKEN INTO ACCOUNT: We have assessed the Verfaillie et al. (2018) study as part of the cryosphere CID change assessment in Section 12.4.5. In this portion of 12.3 our main intent is to establish a connection to the sectoral assets, which we feel is well accomplished by the current set of references.
15709	24	47	24	47	"snow water equivalence >10cm" is highly misleading. Snow water equivalent (usually not referred to as "snow water equivalence") is a unit for snow mass, not length, and while the hydrology community often refers to mm or cm for describing such values, in an IPCC report this should be avoided. At least add "w.e." (for "water equivalent") after cm, or, better, convert to mm w.e., equivalent to kg m-2, and refer to "100 kg m-2 snow mass", directly. [Samuel Morin, France]	TAKEN INTO ACCOUNT: We have updated the text to refer to "snow water equivalent". SWE can be defined by mass or by length (using the known density of freshwater). In this case the cited study (Wobus et al., 2017) uses SWE length.
33579	24	47			Add space in between: "10cm". [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
15711	24	48	24	48	I dare to mention here that all quoted references (Damm et al., 2017; Wobus et al., 2017b; Jacob et al., 2018; Hatchett and Eisen, 2019; Steiger et al., 2019) except Steiger et al. (2019) (which is a review paper) do not explicitly, or consistently, combine natural with managed snow conditions. Steiger et al. (2019), together with SR15 and SROCC, indicate how misleading it is not neglect snowmaking when addressing the impact of climate change on ski tourism. The question is of course not to question whether snowmaking is, or not, a "good" or "bad" thing, but to refer to industry practices in a realistic way when co-designing and applying CIDs, which I believe this paragraph is meant to assess. Damm et al. and Jacob et al. do not account for snowmaking in their calculations, Wobus et al., focus on natural snow and compute an independent "snowmaking hours" indicator, Hatchett and Eisen is indeed focusing only on cross-country and snowmobiling (but this is a short communication). I dare mentioning two references which could be useful here : Spandre et al. (2019) (full model chain addressing the impact of climate change on ski tourism through the computation of advanced snow reliability indicator co-designed with ski tourism stakeholders : https://doi.org/10.1038/s41598-019-44068-8) and Abegg et al. (2020) (critical review of indicators used to assess climate change impacts on ski tourism, including methodological choices and a discussion on how to elaborate/apply the indicators : https://doi.org/10.1007/s00484-020-01867-3). I also suggest reading section 2.3.5 of SROCC Chapter 2, where additional references and context can be found on the topic. [Samuel Morin, France]	TAKEN INTO ACCOUNT: The text does note Wobus et al. (2017) use of snowmaking hours as a secondary condition for potential recreational skiing (in addition to natural snow depth), but this is not problematic as both are relevant CID indices and our goal here is to alert the reader to important climatic information. We have added the recommended Abegg et al. (2020) and a complementary Spandre et al. (2019) paper to update the snow cover CID connections to skiing and other snow recreation. Snowmaking may also be considered a system adaptation, which would be assessed within Working Group II.

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35343	24	54	24	54	"equilibrium mass balance" is not a term used for glaciers, "equilibrium line altitude" or "surface mass balance", suggest to restructure sentence to say "Change in glacier spatial extent and surface mass balance ...". [Guðfinna Aðalgeirsdóttir, Iceland]	ACCEPTED: We now use the suggested text.
2857	24	54	24	54	Remove "equilibrium", [Antoine RABATEL, France]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise
100047	24	54	24	55	Perhaps it would be more straightforward to just say "changes in glacier volume" or "Glacial volume loss is relevant for high mountain..." [Forrest Schoessow, United States of America]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise
15713	24	54	25	6	This paragraph provides some general statements about impacts of glacier changes (although not in a quantitative way), and I don't see a discussion on "glacier-related CIDs", which I thought this subsection was about. I think this space would be better used to assess glacier CIDs, and how they are applied in impact studies (e.g., various CIDs for glacier water runoff). [Samuel Morin, France]	TAKEN INTO ACCOUNT: We have revised this section to focus more on CID-sector connections than physical process discussions.
100049	25	1	25	6	Alpine ice loss changes glacier dynamics which can condition, trigger, and/or amplify the magnitude of many mass movement hazards which often interact in cascading chains. Furthermore, declines in glacier meltwater discharge is currently affecting not only water quality but also water quantity in many high mountain regions of the world. [Forrest Schoessow, United States of America]	TAKEN INTO ACCOUNT: We now cite several papers connecting glacial melt to downstream water resources (this is noted as both quantity and quality in Table 12.2). Changes in mass movements driven by glacial changes would be reported under the landslide CID.
35345	25	3	25	3	suggest to replace "The rate of glacier melting" with "Retreat of glaciers can lead to formation of terminal lakes" [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise
11807	25	3	25	3	edit for accuracy/clarity: "Rapid glacial melting can lead to rapid filling of glacial lakes..." [Amy East, United States of America]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise
83581	25	3	25	5	"The rate of glacial melting retreat of glaciers can lead to the formation or expansion of glacial lakes resulting in and outburst floods that endanger downstream communities" (adding underlined phrases). Studies such as Harrison et al. (2018) (which is cited in the text) show that it is the retreat of glaciers, rather than ablation rates which increase GLOF hazard, so this should be clarified. The proposed rephrasing (above) would also bring this statement in line with p112 lines 50-51: "Glacier recession has led to the creation of new glacial lakes with resulting increases in the occurrence of natural hazards such as glacier lake outburst floods". [Rupert Stuart-Smith, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise
35347	25	5	25	5	suggest to split sentence in two, not have glacier outburst floods and calving in the same sentence [Guðfinna Aðalgeirsdóttir, Iceland]	ACCEPTED: We have split this into two sentences.
35349	25	5	25	5	suggest to replace "frequency of coastal calving events" with "frequency and magnitude of calving events of marine terminating glaciers" [Guðfinna Aðalgeirsdóttir, Iceland]	ACCEPTED: Text updated using the reviewer's recommended text.
35351	25	5	25	5	note that in this context "rate" does not make sense, suggest to replace it with "size" [Guðfinna Aðalgeirsdóttir, Iceland]	ACCEPTED: Replaced "rate" with "size"
88357	25	11	25	11	You can just refer to permafrost extent as this will include both lateral and vertical extent (don't need to refer to area as well) [Sharon Smith, Canada]	ACCEPTED: Removed "area" as this is covered in "extent"
45615	25	11	25	11	permafrost area and extent are synonymous. [Lucas Ruiz, Argentina]	ACCEPTED: Removed "area" as this is covered in "extent"

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88359	25	11	25	13	It needs to be clear that these issues are associated with ice-rich permafrost (don't have these issues when low ice content). Some of these references are pre AR5 so it would be better to refer to post AR5 literature. You could also refer to Romanovsky et al. 2017 (SWIPA 2017 permafrost chapter) and the AMAP AACA reports as they also include discussions of impacts of permafrost thaw. Additional references Pendakur K (2017) Northern Territories. In: Palko K, Lemmen DS (eds) Climate risks and adaptation practices for the Canadian transportation sector 2016. Government of Canada, Ottawa, ON, pp 27-64 Dore et al. 2016. Adaptation Methods for Transportation Infrastructure Built on Degrading Permafrost. Permafrost and Periglacial Processes 27:352-364. https://doi.org/10.1002/ppp.1919 Wu et al. (in press) Engineering in the rugged permafrost terrain on the roof of the world under a warming climate. Permafrost and Periglacial Processes https://doi.org/10.1002/ppp.2059 [Sharon Smith, Canada]	ACCEPTED: We now explicitly note that this applies especially to ice-rich permafrost and have added the Pendakur report as an overview of the transportation connections.
64163	25	11	25	21	The authors neglect here one of the major problems of thawing permafrost and that is the release of massive pool of organic carbon (methane) into the atmosphere which will further fuel climate change (DOI: 10.1038/s41561-019-0526-0) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: It is beyond the mandate of Chapter 12 to assess the global biogeochemical cycling implications of CID changes as they are not direct local impacts for sectors. The important global biogeochemical cycling processes noted by the reviewer are assessed in Chapter 5
45617	25	15	25	15	Although Glacial Lake Outburst Floods (GLOFs) could be triggered by avalanches or mass wasting related to the thawing of permafrost in mountain slopes, they are genetically linked with the glacier realm (the lakes form related with the advance or retreat of glaciers) instead of the permafrost realm. Throughout section 12.4, the increase of GLOFs as CID is assessed in the permafrost sub-sub section and must be located in the snow and land ice sub-sub section. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We have shifted the GLOF discussion to the snow cover and glacier CID throughout Chapter 12.
55215	25	16	25	16	Change "hotter" to "warmer" [Nancy Hamzawi, Canada]	ACCEPTED: "hotter" replaced with "warmer"
88361	25	16	25	17	Ice wedges are part of ice-rich permafrost and it is one form of massive ice. The thawing does not have to be abrupt to cause problems and it is more the physical response to the thawing that is abrupt. "hotter" should probably be replaced with "warmer" [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: On the advice of this reviewer and another reviewer we have removed the word "abrupt" from this sentence as it is not necessary. We also replaced "hotter" with "warmer"
55217	25	16	25	17	Suggest removing "abrupt". Warmer conditions will undoubtedly affect ecosystems and infrastructure by contributing to thawing ice rich permafrost. However, the effects could occur over a range of timescales depending on the specific circumstance. Abrupt means sudden and unexpected. The thaw of ice-rich permafrost in response to warming climate is neither sudden, in the literal sense, nor unexpected (we know if we add heat to permafrost it will warm and thaw). This term has been thrown around in permafrost literature recently and it's largely inappropriate and unnecessary. The sentence is better without it. [Nancy Hamzawi, Canada]	ACCEPTED: We removed the "abrupt" from this sentence
18597	25	17	25	19	Abrupt thaw of ice-rich permafrost in lowlands also increases surface inundation Turetsky et al., Nature Geoscience 2020, Jones et al., Global Change Biology 2017, etc. Rather than pointing to one example, perhaps it should be framed as permafrost thaw can lead to surface drying or increases in surface inundation, depending on local and geomorphic conditions. [Miriam Jones, United States of America]	TAKEN INTO ACCOUNT: The Turetsky and Jones papers are focused on carbon release, while we have added the Farquharson et al. (2019) and Walvoord and Kurylyk (2016) papers focusing on hydrologic implications for ponds, drainage, and surface flow for wetlands and water resources in a more direct CID-sector connection.
71191	25	17			how is "ice-rich" defined? Not in the glossary. The authors may consult CAN/BNQ 2501-500/2017: Geotechnical Site Investigations for Building Foundations in Permafrost Zones, which is a Canadian Standard and this document gives definitions about ice-rich etc. [Lukas Arenson, Canada]	TAKEN INTO ACCOUNT: The recommended document does not seem to have a quantitative definition of "ice-rich permafrost", and a survey of literature shows that this is not consistently defined (nor was it defined in the SROCC) as the term is largely self-explanatory (permafrost with high water ice content that would become liquid when thawed).
88363	25	18	25	19	Thawing of ice-rich permafrost can also result in wetlands and ponds where drainage is poor or where topographic changes occur (e.g. surface settlement) -- e.g. thermokarst ponds [Sharon Smith, Canada]	ACCEPTED: We have added a reference to Farquharson et al. (2019) on thermokarst pond creation.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88365	25	19	25	20	References are pre-AR5 and could be replaced with post-AR5 references such as SWIPA 2017 report (Romanovsky et al. 2017) or the AMAP AACA reports as well as those mentioned in comments on line 11-13. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We have updated to more recent references and cite AMAP2017 and other Romanovsky studies in numerous permafrost sections of 12.4.
83345	25	24	25	36	Adapt this text to also apply to Antarctic sea ice - as it currently only seems to refer to Arctic sea ice. There, sea ice change has implications for tourist activities, fishing, shipping and logistical operations (including the resupply of Antarctic bases), and ecosystems. See comment above. Also, please add: Massom, R. A. 2015. Overview of Antarctic sea ice and challenges. Report of the COMNAP Sea Ice Challenges Workshop, Hobart, Tasmania, May 2015, ISBN 978-0-473-34368-2, pp. 21-23. [Robert Massom, Australia]	TAKEN INTO ACCOUNT: Regional analysis of these CIDs' current and future characteristics is provided in Section 12.4. Here we establish connections to the sectoral assets which would apply at both poles, even as the vulnerability and exposure of natural and human systems varies strongly between these regions (assessed by Working Group II). The Massom report is focused mostly on research challenges and key uncertainties rather than the societal or ecosystem challenges directly associated with local Antarctic sea ice changes. We did add the Massom and Stammerjohn (2010) study which is connected to Antarctic and Southern Ocean ecosystems.
83719	25	25			Should river ice jams and associated floods be mentioned here, too? For instance: Rokaya, P., Budhathoki, S., and Lindenschmidt, K. E.: Trends in the timing and magnitude of ice-jam floods in Canada, Sci. Rep.-UK, 8, 5834, https://doi.org/10.1038/s41598-018-24057-z , 2018a. Rokaya, P., Budhathoki, S., and Lindenschmidt, K. E.: Ice-jam flood research: a scoping review, Nat. Hazards, 94, 1439–1457, https://doi.org/10.1007/s11069-018-3455-0 , 2018b. [Andreas Käåb, Norway]	TAKEN INTO ACCOUNT: We have added the Rokaya et al. (2018a) study although space constraints limit a deeper discussion.
126451	25	26	25	36	Loss of sea ice also leads to increased uptake of CO2 by the ocean, leading to increased acidification. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 does not assess each CID change's effect on other CIDs. Instead, these dynamic connections would appear within the overall changes assessed for that affected CIDs. For example, higher levels of ocean acidification in areas with reduced sea ice would be assessed in the ocean acidification CID.
33581	25	28	25	29	Change: "...traditional indigenous communities (Durkalec et al., 2015; AMAP, 2017; Baztan et al., 2017; Arp et al., 2018 ; Meredith et al., 2019; Sharma et al., 2019). » by "...traditional indigenous communities (Durkalec et al., 2015; AMAP, 2017; Baztan et al., 2017; Meredith et al., 2019; Sharma et al., 2019)(Arp et al., 2018). « . [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43465	25	28		29	Read "(Durkalec et al., 2015; AMAP, 2017; Baztan et al., 2017; Meredith et al., 2019; Sharma et al., 2019; Arp et al., 2018)" rather than "(Durkalec et al., 2015; AMAP, 2017; Baztan et al., 2017; Meredith et al., 2019; Sharma et al., 2019)(Arp et al., 2018)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
38175	25	29	25	29	Isolated citation. (Arp et al., 2018) is cited separately from the others, and should be merged with former. [Junhee Lee, Republic of Korea]	ACCEPTED: typo corrected
11809	25	29	25	29	fix parentheses [Amy East, United States of America]	ACCEPTED: typo corrected
11811	25	32	25	32	add "and" before "the seasonality of lake and coastal..." [Amy East, United States of America]	ACCEPTED: typo corrected
51773	25	32	25	32	suggested edit: 'and the seasonality...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: typo corrected
131459	25	33	25	34	Wording: "sea ice as a critical habitat for fisheries" sounds odd. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: We have updated this sentence to be more precise

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126453	25	33			The statement about phytoplankton is incorrect. Freshwater and marine harmful algal blooms species often are not phytoplankton, with few exceptions. Sea ice also has very little to do with the emergence, prevalence, and severity of marine HABs; those are linked to a number of different stressors. [Trigg Talley, United States of America]	REJECTED: The text statement is about phytoplankton blooms, not harmful algal blooms. Phytoplankton blooms associated with sea ice changes are a primary focus of the Oziel et al. (2017) study: "Role for Atlantic inflows and sea ice loss on shifting phytoplankton blooms in the Barents Sea"
83343	25	34	25	34	Add the following reference to the Bindoff and Meredith references here: Massom, R.A. and S.E. Stammerjohn. 2010. Antarctic sea ice change and variability – Physical and ecological implications. <i>Polar Science</i> , 4, 149-186. [Robert Massom, Australia]	ACCEPTED: We have added the Massom and Stammerjohn reference for its ecological connections to Antarctic sea ice.
51775	25	34	25	36	It would be helpful to include here a definition of 'ice free' as referenced throughout the WG1 chapters and SPM. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We have added text noting the various definitions of an "ice-free Arctic".
110589	25	41	25	41	Additional and very relevant papers include: Zarzycki, C. M. (2018). Projecting changes in societally impactful northeastern U.S. snowstorms. <i>Geophysical Research Letters</i> , 45, 12,067–12,075. https://doi.org/10.1029/2018GL079820 and Ashley, W.S., Haberlie, A.M. & Gensini, V.A. Reduced frequency and size of late-twenty-first-century snowstorms over North America. <i>Nat. Clim. Chang.</i> (2020). https://doi.org/10.1038/s41558-020-0774-4 [Rachel McCrary, United States of America]	TAKEN INTO ACCOUNT: The references in this section adequately establish the connection between heavy snow and society, but we have added these references to our assessment of heavy snow in North America.
64165	25	41	25	48	There is no mention of the water sector here even though the streamflow is considered at high risk (see Table 12.2) from this CID. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have updated the table and text to ensure coherence. Heavy snow is connected to the cryosphere reservoir but not strongly connected to streamflow (which is more closely related to the total snowpack and seasonal snowmelt characteristics).
23771	25	41	25	48	rain-on-snow impacts are an issue for high latitude as they lead to icings with sever impacts, see IPCC cryosphere special report and e.g. http://dx.doi.org/10.1098/rsbl.2016.0466 and https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1890/09-1927.1 [Annett Bartsch, Austria]	ACCEPTED: We cite the Forbes et al. (2016) study connecting rain-on-snow impacts to reindeer herding by indigenous communities.
51777	25	46	25	46	suggested edit: '...and regions susceptible to ice storms, geographically and spatially shift risks for...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: This sentence has been consolidated into others due to space limitations.
126455	25	48	25	48	Add: ""... 2016). Severe cold spells followed by snowstorms also caused energy crisis in natural gas (Stuivenvolt Allen and Wang 2019)."" Citation: Stuivenvolt Allen, J. J. and S.-Y. Wang, 2019: Data-mining climate variability as an indicator of U.S. natural gas, <i>Frontiers in Big Data</i> (special issue on Data-driven Climate Sciences), doi: 10.3389/fdata.2019.00020 [Trigg Talley, United States of America]	NOT APPLICABLE: System effects set off by CIDs are more appropriate for the WGII assessment that can factor in system vulnerability and exposure.
107879	26	1	26	1	global climate models as well as RCMs when run at typical resoluitions of 12 kms. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have revised this sentence to indicate that most climate models do not resolve hail, not just global models.
15715	26	14	26	14	Again "snow water equivalence" is not a commonly used term in snow avalanche research and applications, and "snow mass" (or snow water equivalent) is not the main driver for avalanche hazard. I suggest reading section 2.3.2.1.2 in Chapter 2 of SROCC. [Samuel Morin, France]	TAKEN INTO ACCOUNT: We have replaced with "snow water equivalent", but this term is related to snow loading which is the first factor mentioned in the SROCC 2.3.2.1.2. We have compared across this section of the SROCC and have captured the main aspects of future projections in terms of broad relationships between climate change and snow avalanche hazards..

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
39383	26	20	27	24	Sme comment as above. [Louredes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of coastal CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.
5527	26	20			Need to give a definition of the coastal zone. The coastal zone comprises the sandy coasts, the rocky coasts and the estuaries and deltas. The coastal zones are multi-hazards and multi-risks areas. In the whole document, the coastal zones focuses only on the sandy coasts, why ? There is also a coastal erosion in the rocky coast with cliffs and flooding in this zone in the coastal valleys. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: Here we consider the CIDs applicable mainly to the low elevation coastal zones. It is incorrect that Ch 12 only focussed on sandy coasts. Our RSL change and ESL assessment and projections are given for the entire global coastline, irrespective of their composition. Our coastal recession assessment and projections are indeed limited to sandy coasts, because these are the only coastal types for which global scale projections are currently available.
114879	26	20			12.3.5 Coastal -- this section mentions salinisation and salinity intrusion -- but there is no section on these issues unlike coastal flooding and coastal erosion. Salinisation is an important class of coastal impact so why this omission? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Salinization is an aspect of coastal flooding and relative sea level change affecting the quality of water resources for ecosystems and society. In this sense salinization could be seen as an impact of these Coastal CIDs (e.g., relative sea level rise alters salinity front of river deltas), which would be assessed in Working Group II. Ocean salinity is its own distinct CID, as it relates to ocean stratification and species suitability -- it is therefore not itself an asset but affects ecosystem assets. We note these distinctions in Section 12.2 (Table 12.1).
20783	26	22	26	24	This section 12.3.5 does enumerate a number of future challenges; on the other hand, no opportunities has been found by this reader. Please refer at least to one! [philippe waldteufel, France]	TAKEN INTO ACCOUNT: We have revised this sentence in a way that emphasizes that we seek connections between coastal CIDs and sectoral assets rather than looking specifically for risks and opportunities. The CID framework allows Working Group I to avoid having to make any universal declaration of whether something is hazardous or beneficial, so we instead focus on making CID x sector connections and then looking at regional changes so that Working Group II can add in vulnerability and exposure and assess impacts and risk. In general the CID indices are created to investigate detrimental impact for a given sector, however changes in one direction are likely to be hazardous (e.g., increased coastal erosion bad coastal transportation routes) while changes in the other direction could be beneficial (e.g., reduced coastal erosion could reduce strain on coastal transportation routes).

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64173	26	23	26	24	The authors mention here that the coming paragraphs will highlight the way the CIDs elucidate future challenges and opportunities. However, the paragraphs below (in my opinion) only talk about challenges and not opportunities. I might have overread these, but it might be worth it to delete the term 'opportunities' here or highlight them a bit more in the text below. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised this sentence in a way that emphasizes that we seek connections between coastal CIDs and sectoral assets rather than looking specifically for risks and opportunities. The CID framework allows Working Group I to avoid having to make any universal declaration of whether something is hazardous or beneficial, so we instead focus on making CID x sector connections and then looking at regional changes so that Working Group II can add in vulnerability and exposure and assess impacts and risk. In general the CID indices are created to investigate detrimental impact for a given sector, however changes in one direction are likely to be hazardous (e.g., increased coastal erosion bad coastal transportation routes) while changes in the other direction could be beneficial (e.g., reduced coastal erosion could reduce strain on coastal transportation routes).
79095	26	27	26	27	Relative sea level change? [Aimee Slangen, Netherlands]	TAKEN INTO ACCOUNT: All Sea level related terminology has been made fully consistent with that used in Ch 9 in consultation with Ch 9 CAs in Ch12. The CID is relative sea level, and we are interested in how it changes (12.2 provides further information on each CID type).
79097	26	27	26	27	Please add in a reference to Box 9.1, where relative sea-level change is defined - for people not familiar with the term it doesn't become clear from section 12.3.5.1 what RSL change is. Note that 'sea level change' is in some cases better to use than 'sea level rise', as sea level does not necessarily have to rise, for instance in regions with land uplift. [Aimee Slangen, Netherlands]	TAKEN INTO ACCOUNT: All Sea level related terminology have been made fully consistent with that used in Ch 9 in consultation with Ch 9 CAs in Ch12. Box 9.1 are referred to here as suggested. The CID is relative sea level, and we are interested in how it changes (12.2 provides further information on each CID type and refers the reader to Chapter 9 for further information).
126457	26	27	26	27	In the RSL section and the Coastal Flooding sections, it would be helpful to mention the regional influence of ENSO events on impacts. For example, in the west and south Pacific, during El Niño/La Niña, sea levels are below/above average, which can worsen local impacts. See https://nca2018.globalchange.gov/chapter/27#fig-27-3 , and Sutton, J., N. Luchetti, E. Wright, M. C. Kruk, and J. J. Marra, 2015: An El Niño Southern Oscillation (ENSO) based precipitation climatology for the United States Affiliated Pacific Islands (USAPI) using the PERSIANN Climate Data Record (CDR). NOAA National Centers for Environmental Information, Asheville, NC, 478 pp. [Trigg Talley, United States of America]	REJECTED: Process drivers and modes of variability that cause CIDs are not the focus of CH12 as much as the resulting change in the profile of each CID. Such process descriptions are within the remit of Ch9.
126459	26	27	26	42	This paragraph on relative sea level (RSL) change misses the effect caused by vertical land motion. For example, the study by Han et al. (2019) implies that the recent accelerated RSL rise in the Samoan islands are primarily driven by the gradual land subsidence in response to the 2009 great earthquake. The study indicated that the postseismic (viscoelastic) land subsidence at American Samoa caused ~5 times faster sea level rise than the global average (~3 mm/yr). The postseismic land motion is an important factor that contributes to RSL change. This comment is also relevant to page 48, lines 1-12. Citation: Han, S.C., Sauber, J., Pollitz, F., and Ray, R. (2019). Sea level rise in the Samoan Islands escalated by viscoelastic relaxation after the 2009 Samoa-Tonga earthquake. Journal of Geophysical Research: Solid Earth, 124. https://doi.org/10.1029/2018JB017110 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The relative sea level CID is defined in 12.2 as "The local mean sea surface height relative to the local solid surface". In this sense, relative sea level is used as a CID instead of mean sea level precisely so it can take into account local dynamics such as vertical land motion. We have added a direct mention to land uplift or subsidence in the first line of the relative sea level section within 12.3 to underscore this distinction.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115039	26	27		42	As in so many other places, in this section you omit the good news about the benefits eCO2 and manmade climate change -- even though I brought it to your attention in my FOD comments. You need to add the finding that anthropogenic increases in CO2 level helps salt marshes resist encroachment from rising seas: http://phys.org/news/2015-12-coastal-marshes-resilient-sea-level-previously.html Excerpt: "...the significant boost in marsh plant productivity associated with elevated levels of atmospheric carbon dioxide will allow marshes to trap more sediment and create more organic soil. This, in turn, will result in increased rates of accretion that will allow marshes to keep up with rising sea levels and may increase the thresholds for marsh drowning by up to 60 percent." Ref: Ratliff et al. (2015), Spatial response of coastal marshes to increased atmospheric CO2. DOI:10.1073/pnas.1516286112 The systematic exclusion from AR6 of mention of the benefits of eCO2 is a big part of what makes it more of a political document than a scientific one. [David Burton, United States of America]	TAKEN INTO ACCOUNT: In each chapter draft we have included substantial sections on CO2 benefits for ecosystems and agriculture, as well as water resource efficiency in irrigation. CIDs affecting other CIDs through cascading system responses is beyond our mandate here although we expect that these will be assessed in WGII. CO2 equivalence would not be an appropriate measure for a CID, as methane and other greenhouse gases do not have an equivalent effect on biological systems that is equivalent to their radiative forcing in comparison to CO2. The climatic impact driver framework was introduced partially to eliminate WGI's role in determining what is hazardous and what is beneficial considering that this is strongly regional, sectoral, and asset dependent and thus better left to WGII sectoral and regional impact and risk experts.
107235	26	27		42	As in so many other places, in this section you omit the good news about the benefits eCO2 and manmade climate change -- even though I brought it to your attention in my FOD comments. You need to add the finding that anthropogenic increases in CO2 level helps salt marshes resist encroachment from rising seas: http://phys.org/news/2015-12-coastal-marshes-resilient-sea-level-previously.html Excerpt: "...the significant boost in marsh plant productivity associated with elevated levels of atmospheric carbon dioxide will allow marshes to trap more sediment and create more organic soil. This, in turn, will result in increased rates of accretion that will allow marshes to keep up with rising sea levels and may increase the thresholds for marsh drowning by up to 60 percent." Ref: Ratliff et al. (2015), Spatial response of coastal marshes to increased atmospheric CO2. DOI:10.1073/pnas.1516286112 The systematic exclusion from AR6 of mention of the benefits of eCO2 is a big part of what makes it more of a political document than a scientific one. [David Burton, United States of America]	TAKEN INTO ACCOUNT: In each chapter draft we have included substantial sections on CO2 benefits for ecosystems and agriculture, as well as water resource efficiency in irrigation. CIDs affecting other CIDs through cascading system responses is beyond our mandate here although we expect that these will be assessed in WGII. CO2 equivalence would not be an appropriate measure for a CID, as methane and other greenhouse gases do not have an equivalent effect on biological systems that is equivalent to their radiative forcing in comparison to CO2. The climatic impact driver framework was introduced partially to eliminate WGI's role in determining what is hazardous and what is beneficial considering that this is strongly regional, sectoral, and asset dependent and thus better left to WGII sectoral and regional impact and risk experts.
114903	26	27			12.3.5.1 Relative sea level -- what is assumed about future human-induced subsidence in this analysis? Is this a gap worth mentioning in Section 12.7? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: RSL rise projections provided here are directly taken from Ch 9 and therefore do not include any information on local land subsidence. As far as we are aware there are no global data sets on land subsidence available to date. It is also important to note that this section is concerned with establishing a connection between relative sea level and society and ecosystems, with regional observations and projections provided within 12.4 (based in large part on information from CH9).
114877	26	29	26	30	"are often rooted in changes in relative sea level (RSL)" -- understated. Impacts must consider relative sea-level rise including vertical land movements (e.g. Nicholls et al (2014; 2020) WIRES CC. e.g., doi: 10.1002/wcc.253 [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We now state explicitly in this section that our assessment of the Relative Sea Level CID accounts for land movements (as also defined in 12.2). This is also a major distinction that brings a more practical regional aspect compared to global mean sea level changes.
85363	26	29	26	42	Maybe make a reference to the consequences of relative sea level rise in morphological change across environments? We may think the influence is straightforward, i.e., relative sea level rise equals to an acceleration in coastal erosion. However, the morphodynamics of specific environments are fairly complex and require detailed analysis (e.g, Passeri et al., 2015, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015EF000298 ; Zhang et al., 2020, https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2020GL087862) [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: These morphological aspects are captured within the Coastal Erosion CID and the references in that sub-section (12.3.5.3).

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126461	26	33	26	35	It is not at all clear what is being said regarding permanently inundated here: "... local mean higher-high water (MHHW) that is close to the 'high tide' level (Kulp and Strauss, 2019)..." Also, the reference (Sweet and Park, 2014) does NOT equate 30 days of flooding events per year as being "permanently inundated" so this reference is incorrect and should be removed/corrected. That reference describes an arbitrary 30 day/year of flooding as a "tipping point" to assist with tracking, nothing to do with whether a location is described as permanently inundated. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have removed references to 'permanent' inundation, and instead note several studies that have defined inundation (Sweet and Park, 2014, use 30 events/year as a tipping point for coastal inundation; Dahl et al., 2017, define effective inundation as 26 events/year, and Kulp and Strauss, 2019, define permanent inundation using the MHHW metric quoted in the text.
5529	26	45	27	2	The coastal flooding depend of the combination of several processes : sea level rise, tide, storm surge, high wave, but also of the coastal river flow and flood. The costal river flow is blocked by the sea level rise and storm surge and lead to more inundation. [Benoit Laignel, France]	REJECTED: This comment refers to compound flooding (due to the combination of ESL and Riverflows). This section only deals with coastal flooding due to extreme sea levels. At the top of 12.3 we note that different CIDs can compound, and their net effects are a function of system vulnerability and exposure to be assessed in WGII.
114899	26	45			12.3.5.2 Coastal flooding -- this section makes a lot of comments about human use of the coast -- it makes me wonder what are the subject boundaries of Chapter 12. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The intention of this section is to highlight the sectoral-relevance of coastal flooding. We do not assess these impacts, as indeed impacts fall within the remit of WGII. In Ch 12 we only assess how coastal flooding has changed in the past and how it is projected to change in future. We have expanded our introductory text at the beginning of 12.3 (as well as the text within 12.1-12.2) in order to better set out the boundaries and ambition of the chapter.
126463	26	45			There should be some mention of the effects on real estate and further stressors on inequities in social strata and access. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: These are socioeconomic impact drivers assessed in WGII and WGIII, not CIDs. We describe that these are suited for WGII in 12.1-12.3
55219	26	46	26	46	wave run up (including also swash) [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Here we refer to Extreme Total Water Level which excludes runup. We also mention overtopping, and refer to Extreme coastal water level which is where runup comes into play. (we also refer to Box 9.1 which sheds light on this)
126465	26	47	26	49	The initial statement of this section is confusing. Is it the authors' contention that episodic coastal flooding is ONLY caused by extreme sea levels? In some locations this may be the case; however, there are plenty of examples of coastal flooding occurring 20 days or more out of the year, which wouldn't be defined as extreme events (especially in cases when flooding can occur effectively from tides alone). Suggest a rewrite to clarify. Also recommend rewording "high wave setup" to just "wave setup", as in many cases waves (let alone large waves) do not play a substantial role in flooding events. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This para has be re-written to reflect the different types of Extreme Sea levels as described in Box 9.1. In general this para refers to coastal flooding that may occur due to extreme total water levels and extreme coastal water levels.
85359	26	47	26	49	Maybe it should be included that coastal flooding can occur seasonally at some locations, e.g., tropical coast of Northern South America, because of climate modes such as ENSO? (e.g., Morton et al., 2000, https://www.jstor.org/stable/4300013?seq=1#metadata_info_tab_contents) [Juan Felipe Paniagua-Arroyave, Colombia]	REJECTED :Process drivers and modes of variability that cause CIDs are not the focus of CH12 as much as the resulting change profile of each CID. Such process descriptions are within the remit of Ch9.
79099	26	47	26	50	From this defintion, and the ESL numbers presented throughtout this chapter and in Figure 12.7, it is not clear to me whether the ESL change numbers presented include RSL change, or is it only the change in the value on top of RSL? [Aimee Slangen, Netherlands]	TAKEN INTO ACCOUNT: We have brought definitions in line with those in Box 9.1, and we now explicitly mention that Extreme Total Water Levels (ETWL) includes RSL change.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64167	26	47	27	2	All the paragraphs would be easier to follow for the reader if the authors would stick to the structure/order of topics given in Table 12.2. It would also be great for clarity and consistency if the authors would mention at least all the assets with a medium to high risk associated with them in the text. In the case of this paragraph, there is no mention of the impact of the CID on water quality (i.e. saltwater intrusion affecting freshwater resources), aquaculture and fisheries and human mortality. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have organized this section from the Working Group I perspective, cycling through each CID and emphasizing the most prominent sectoral connections first. A comprehensive discussion of each sector in a rigid order is not practical and can be misleading when the most relevant sectoral connections would be listed last. We have added Ahmed et al. (2019) and Gopalakrishnan (2019) relating to aquaculture and agriculture with a focus on water resources.
2759	26	47	27	2	The example of SIDS can be discussed here where most of their industries are in the coastal zone. The idea is that coastal flooding impacts industries and not just "buildings, transportation routes and other infrastructure" [Carianne Johnson, Belize]	TAKEN INTO ACCOUNT: This sentence now explicitly notes "industry".
69261	26	47	27	24	Cross referencing with the description of coastal flooding and erosion in Chapter 9 is necessary. There are many new description and references in this section in comparison with Chapter 9. [Kaoru Magosaki, Japan]	TAKEN INTO ACCOUNT: This section now includes a connection to Box 9.1 and we have enhanced our description of the CIDs in both 12.2 and 12.3.
33583	26	47			The second « coastal » is needed ? : "Episodic coastal flooding of coastal communities, farmland, buildings, transportation routes, and other...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We prefer to retain the second instance of this word for clarity.
24465	26	50	26	53	Similar study for 100-yr storm surge level has been conducted in relation to the characteristics of typhoons and storm surges. Mori, N., T. Shimura, K. Yoshida, R. Mizuta, Y. Okada, M. Fujita, T. Temur Khujanazarov, E. Nakakita (2019) Future changes in extreme storm surges based on mega-ensemble projection using 60-km resolution atmospheric global circulation model, Coastal Engineering Journal, Taylor & Francis, 61:3, pp.295-307. doi:10.1080/21664250.2019.1586290 [Nobuhito Mori, Japan]	TAKEN INTO ACCOUNT: This section refers to coastal flooding due mainly to ETWL of which storm surge is one component. The paper mentioned presents global projections of storm surge only (incl TC effects) and is more relevant for Ch11. Comment has been forwarded to Ch 11
126467	26	53	26	53	Add reference: ""... 2017b; Promchote et al. 2016."" Citation: Promchote, P., S.-Y. Wang, and P. G. Johnson, 2016: The 2011 Great Flood in Thailand: Climate Diagnostics and Implications from Climate Change. Journal of Climate, 29, 367-379. DOI: 10.1175/JCLI-D-15-0310.1 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This study focuses on the climatic conditions leading to the 2011 Great Flood in Thailand, which is more suited for Chapter 11 than the connection of CIDs and sectoral impacts in 12.3.
64305	27	1	27	2	Coastal inundation can also impact other infrastructure such as water/plumbing explored in Rasoulkhani et al 2020 (Resilience planning in hazards-humans-infrastructure nexus: A multi-agent simulation for exploratory assessment of coastal water supply infrastructure adaptation to sea-level rise) - there may be other more recent literature outlining infrastructure impacts further. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added the Rasoulkhani et al. (2020) reference to highlight the connection to coastal infrastructure and water resources.
44167	27	2	27	5	As requested in a personal comment by the coordinating lead author of Chapter 12 (Ranasinghe), an additional sentence on the reliability of recent exposure estimates is suggested as follows: "A number of studies have already pointed to increases in SLR induced population and assets exposure from coastal flooding (e.g. Muis et al., 2016) but more recent research suggest that absolute numbers are still highly uncertain and may be overestimated due to simplified assumptions in the underlying hydrodynamic processes, such as not taking tide-surge interaction into account (Arns et al., 2020)." Arns, Arne; Wahl, Thomas; Wolff, Claudia; Vafeidis, Athanasios T.; Haigh, Ivan D.; Woodworth, Philip; Jensen, Jürgen (2020): Tide-surge interaction modulates global extreme sea levels, coastal flood exposure, and impacts. Nature Communications 11, Article number: 1918. https://doi.org/10.1038/s41467-020-15752-5 [Arne Arns, Germany]	TAKEN INTO ACCOUNT: This reference and similar text is included in Chapter 9 in the discussion around the dynamics of sea level rise and coastal flooding. It makes more sense there than in 12.3, which is focused on the sectoral connections rather than the complex dynamics.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
5531	27	5	27	24	The description is only for the sandy coast, but there exists other coasts, rocky coasts with cliffs, and the erosion is also important for these coasts, with supplementary processes, like precipitation and infiltration, temperature variations with froze and lanslides. I propose the bibliography references : Emery & Khun, 1980 and Woodroffre, 2002 who present the average rate of coast recession for difrent types of rocks. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: Section 12.3 is devoted to understanding connections between coastal erosion and human and natural systems. We include references that relate to both sandy coastlines and rocky/cliff coastlines. For example, the first reference (Dawson et al., 2009) is a more recent reference than the suggested papers and is entitled "Integrated analysis of risks of coastal flooding and cliff erosion under scenarios of long term change"
313	27	7	27	7	I don't know the focus on "ecosystems" rather than landscapes. Bioecological change is important but it is the underlying geomorphic changes that would seem overarching. Suggest changing "ecosystems" to "landscapes, ecosystems" [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: Here we utilize the framework determined by Working Group II sectoral chapters.
64171	27	7	27	24	This paragraph includes a lot of interesting info re the definition of erosion and indexes to measure this CID, however, the actual impact of this CID on the assets is mostly overlooked. The impact of erosion on the toursims industry, caostal ecosystems (organisms and vegetation), housing etc. should be mentioned here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This section establishes connections to the sectors and the metrics used for planning to motivate our assessment of climatic impact-drivers, but the assessment of impacts is left for WGII. The papers cited further detail the specific impacts on sectoral assets.
83901	27	7	27	24	For coastal erosion include the pan-arctic review by Forbes et al. 2011. Cite as Forbes, D.L. (ed.) 2011: State of the Arctic Coast – Scientific Review and Outlook. IASC, LOILZ, AMSP, and IPA. Helmholtz-Zentrum, Geesthacht, Germany. 168 pp. [Ulf Molau, Sweden]	TAKEN INTO ACCOUNT: We added the Forbes 2011 reference for Arctic coastal communities and erosion.
131461	27	9	27	9	Wording: replace "insidious" with "gradual" [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: Modified as suggested
85361	27	9	27	10	Besides the progressive and episodic causes, I'd suggest including that coastal erosion can also occur as a seasonal event in tropical coasts due to seasonal variations in wave climate and river discharge, thus sediment supply from rivers. Both mechanisms differ according to climate regions, i.e., whether temperate or tropical, and impose morphological conditions that translate into seasonal hazards to communities. [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: The seasonal nature of the episodic and gradual coastal erosion is not the focus of this section, which establishes connections between the Coastal Erosion CID and the sectors with dynamical process understanding provided also in Box 9.1. The metrics identified here could be applied on a seasonal basis in light of the factors noted by the reviewer.
1799	27	9	27	11	It looks like my comment at the FOD stage was missed. This statement does not require references; this has been understood for at least 50-100 years. If references are needed, they should not be from studies in 2016 and 2017. A lead author should not use their position to insert unnecessary self-citations. [Torbjorn Tornqvist, United States of America]	TAKEN INTO ACCOUNT: We feel it is appropriate to err on the side of clarity and reference to latest studies on a matter in case authors want to pursue further and extend beyond the statements made here. In some cases the connections are well known, but this section will still allow a reader to identify entry points into the literature which would allow more complex details. The papers cited here are recent reviews that contain comprehensive reference lists and can therefore be a good starting point for further research.
315	27	9	27	11	This sentence implies that coastal erosion (and I prefer the more precise SHORELINE erosion) is either slow or episodic, which is never the issue except over unrealistically short time periods. Sentence should be rewritten in my view, deleting the text in brackets and replacing the words "when combined" with "coincident". I see no purpose in having the two Ranasinghe citations here - they say similar things. [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: Sentence re-phrased and the redundant references removed.
33585	27	9			Erase "," in: "...Mentaschi et al., 2017); ». [Guiomar Rotllant, Spain]	ACCEPTED: Fixed
102669	27	11	27	11	https://www.nature.com/articles/s41558-020-0697-0 (Vousdoukas et al., 2020) [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Chapter 12 utilizes the Vousdoukas et al. (2020) study throughout Section 12.4, but it is not needed here given that the other studies effectively establish connections between coastal erosion and sectors.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63643	27	12	27	12	SLR has mentioned as first in the sentence with no identification. Would be clear if full-title is written here, as well. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	APPROVED: We define relative sea level (RSL) and relative sea level rise (RSLR) in the text for the RSL CID.
317	27	13	27	13	the use of the word "however" here (and almost every other instance in this chapter) is superfluous - delete is my recommendation throughout. [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: However now only appears once in 12.3.
64169	27	15	27	15	I would include that coastline recession estimates are being more and more used not only to feed into risk assessment and optimization efforts but also to help with adaptation and mitigation strategies, i.e. recovery and preservation of mangroves, building of sea-walls, deichs etc. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: 12.1-12.3 indicate the use of climate information for adaptation, mitigation and risk assessment. This sub-section describes 'effective management' which encompasses all of the above.
7913	27	16	27	19	A suggestion to include as one of the "Commonly used metrics for episodic coastal erosion" the Total Water Level and the Wave run-up as the maximum vertical extent of wave uprush on a beach or structure above the still water level (SWL) reached during a storm and that produces coastal erosion on the dunes/shoreline/coastal infrastructures. References to back this method are: Stockdon, H.F., Holman, R.A., Howd, P.A., and Sallenger, A.H. 2006, Empirical parameterization of setup, swash, and runup: Coastal Engineering, v. 53, no. 7, p. 573-588. Serafin, K. A., and P. Ruggiero (2014), Simulating extreme total water levels using a time-dependent, extreme value approach, J. Geophys. Res. Oceans, 119, 6305-6329, doi:10.1002/2014JC010093. Guisado-Pintado E and Jackson DWT (2019) Coastal Impact From High-Energy Events and the Importance of Concurrent Forcing Parameters: The Cases of Storm Ophelia (2017) and Storm Hector (2018) in NW Ireland. Front. Earth Sci. 7:190. doi: 10.3389/feart.2019.00190 [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT: We now use extreme total water level (ETWL) as an example of this line of metrics, and have several more recent papers to back this than the Serafin and Ruggiero study. The other references include one about processes and another about a case study.
74583	27	17	27	17	expression 1-in-100-year storm ... is not comprehensible [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: We have revised this to read "100 yr recurrence storm wave height"
319	27	18	27	18	I see no reason for citing Callaghan 2009 [Patrick Nunn, Australia]	ACCEPTED: The Callaghan et al 2009 specifically discussed how storm erosion return period statistics are used in practice; however, this topic is also discussed within the more recent Ranasinghe and Callaghan (2017) so we rely on that reference instead.
11813	27	20	27	24	also worth mentioning here is the rapid erosion resulting from destabilization of permafrost cliffs as they thaw: Gibbs, A. E., Nolan, M., Richmond, B. M., Snyder, A. G., & Erikson, L. H. (2019). Assessing patterns of annual change to permafrost bluffs along the North Slope coast of Alaska using high-resolution imagery and elevation models. Geomorphology, 336, 152-164. https://doi.org/10.1016/j.geomorph.2019.03.029 [Amy East, United States of America]	TAKEN INTO ACCOUNT: We have added a mention of permafrost thaw affecting coastal erosion in the Arctic, which is already discussed in our Forbes et al. (2011) study. The Gibbs et al. (2019) study is focused primarily on observations and physical mechanisms and does not strongly make the connection to specifically-affected systems.
85365	27	21	27	22	Maybe reference to the influence of human activities on morphodynamic response of barrier islands to relative sea level rise? By affecting the landward sediment flux at inlets, artificial stabilization influences the overall barrier island response to relative sea level rise (e.g. Nienhuis and Lorenzo-Trueba, 2019, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019GL085524) [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: Engineering, development, and other adaptation/mitigation drivers of impact are beyond the purview of WGI, although we do mention that these are important factors in determining flood hazards. Could do same for sediment transport.
321	27	21	27	23	Given the importance of dams across major rivers in reducing sediment supply to coasts and making them more exposed to erosion, I think there needs to be more than this [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: We believe the references cited here are adequate to substantiate what is mentioned in the sentence. Engineering, development, and other adaptation/mitigation drivers of impact are beyond the purview of WGI, although we do mention that these are important factors in determining flood hazards. Could do same for sediment transport.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
83347	27	23	27	24	State that this specifically refers to Arctic sea ice. ALSO, this would be better stated as "Reduced sea ice increases coastal erosion by waves" - it sounds odd as currently written. [Robert Massom, Australia]	TAKEN INTO ACCOUNT: We have clarified this sentence and note that it applies in the Arctic.
112329	27	23			think the implication of loss of ice on the effects of erosion deserves more than one sentence [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Many of these topics could be expanded but we are limited by space. We have added the Forbes (2011) "State of the Arctic Coast 2010" report as a reference to direct the reader to an extensive discussion of this topic.
39385	27	27	28	36	Same comment as above [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of oceanic CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.
89339	27	27	28	36	There should be a much more extensive effort to reduce duplication in other chapters (2, 5, 7, 9) where these topics are also discussed. References to those chapters instead of SROCC, or in addition to SROCC are needed. A variety of the references added are process references, not regional references, as well, which should be assessed in other chapters and then that discussion should be linked to from here. Of course, the authors in Chp 12 should be included as CAs on those other chapters as that process occurs. [Baylor Fox-Kemper, United States of America]	TAKEN INTO ACCOUNT: We have added a stronger call-back to Section 9.4 at the top of the Coastal CIDs section within 12.3 (in addition to the SROCC). Discussions in chapters 2, 5 and 7 are more related to observations and processes relating to sea level, but are not focused on CID-sector connections. Section 12.4 also refers back to previous chapters when discussing regional CID changes.
64175	27	31	27	31	Oceanic CID will affect ecosystems, economies and society. Please include the term 'economies' here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: Economies is an aggregate or secondary impact via sectoral connections established here (e.g., fisheries). That aggregation and corresponding assessment is provided in WGII.
64177	27	36	27	36	Thermal shifts will also affect species distribution, biodiversity and abundance of native species and increases the dominance of introduced/invasive species (Ref. example: Sorte, C. J., Williams, S. L., & Zerebecki, R. A. (2010). Ocean warming increases threat of invasive species in a marine fouling community. Ecology, 91(8), 2198-2204; Helmuth, B., Mieszkowska, N., Moore, P., & Hawkins, S. J. (2006). Living on the edge of two changing worlds: forecasting the responses of rocky intertidal ecosystems to climate change. Annu. Rev. Ecol. Evol. Syst., 37, 373-404.) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This section already includes several papers on ocean temperatures for ecosystems, including the more recent Burrows et al. (2018) overview of climate velocity for ecosystem change.
64185	27	36	27	42	The authors do not mention the high risk assets (as stated in Table 12.2) of polar regions, aquaculture & fisheries, and farming here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have removed the connection to farmland and do not connect to polar ecosystems (note that ocean temperatures affect marine ecosystems, while the polar ecosystems in Table 12.2 are land-based considering they are connected to the Terrestrial ecosystems sector). We have added the Ahmed et al. (2019) reference to connect to aquaculture.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64307	27	38	27	39	I believe there are more recent articles concerning warming and intertidal habitats such as Collins et al 2020 (Physiological responses to heat stress in an invasive mussel <i>Mytilus galloprovincialis</i> depend on tidal habitat) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have replaced the Stillman et al. (2002) with a more recent study by Monaco and McQuaid (2019) looking at mussel response to air and seawater temperatures in South Africa. The Collins et al. (2020) study was interesting but not as directly related to climate change.
64179	27	38	27	39	Intertidal species are indeed more dependent on suitable conditions, but they are also way more tolerant of, or have adapted to, extreme abiotic condition compared to other organisms. Intertidal species commonly have a wider range of temperatures and salinities they can survive in. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Discussion of the relative vulnerability or resilience of different species or ecosystem types is beyond the remit of Working Group I but is assessed within Working Group II.
64181	27	39	27	42	Ocean warming will indeed affect stratification and upwelling but also deep water formation which in turn alters the biogeochemistry of our oceans re oxygen and nutrients but also, and maybe even more important, the carbon pump with huge follow-on effects on the global climate (Archer, David, Pamela Martin, Bruce Buffett, Victor Brovkin, Stefan Rahmstorf, and Andrey Ganopolski. "The importance of ocean temperature to global biogeochemistry." <i>Earth and Planetary Science Letters</i> 222, no. 2 (2004): 333-348.) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Global biogeochemical cycling and large scale climate circulation changes are beyond the purview of CH12 and assessed elsewhere in WGI
89337	27	45	28	3	This section duplicates assessment and is potentially inconsistent with assessments in cross-chapter box 9.1. Either that box should be relocated to here or this section should be radically shortened to include just a basic description and linkage to that box. [Baylor Fox-Kemper, United States of America]	TAKEN INTO ACCOUNT: We ensure consistency with the marine heat waves Box 9.2, including a direct cross-reference. We have also dramatically shortened this section in light of this cross-reference, but discussion of the CID aspects of marine heatwaves is also needed here and should serve to elaborate upon that cross-chapter box from a sectoral perspective.
64183	27	47	27	49	Marine heatwaves are also really critical for aquacultures which have to deal with die-offs of spats and adult organisms (Mohanty, B., Mohanty, S., Sahoo, J., & Sharma, A. (2010). Climate change: impacts on fisheries and aquaculture. <i>Climate change and variability</i> , 119, 978-953. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We cite the Ahmed et al. (2019) study on aquaculture and climate change numerous times in 12.3. The studies cited in the marine heatwaves section include discussions on fisheries, which we now explicitly note as a MHW connection.
64191	27	47	28	3	The structure of this paragraph is unfortunately not really easy to follow. The authors jump from the effects of MHW to MHW indices and back to effects. Are more consistent structure which would be easier for a reader to follow would be preferred. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have consolidated the paragraph given a strong connection to Box 9.2 and have ensured coherence in the discussion.
13857	27	54	27	54	Change (Hobday et al., 2016) by Hobday et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
64187	27	54	27	54	Cited in the wong format. Should be "Hobday et al. (2016)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: typo corrected
96181	27	54	28	2	Why mention two different definitions for MHW, when only one is further investigated? Please explain the reason for this choice. [Nicole Wilke, Germany]	ACCEPTED: We have removed the definition of MHW given that it may be defined differently across studies. We also more heavily refer the reader to Box 9.2 for further discussion on MHWs.
33587	27	54			Change: "(Hobday et al., 2016) defined..." by "Hobday et al. (2016) defined...". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43467	27	54			Read "Hobday et al. (2016) defined marine heatwaves" rather than "(Hobday et al., 2016) defined marine heatwaves" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
51779	27	55	27	55	Is 'Julian' necessary? Could it just be 'on a given day during 5 or more consecutive days'? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Julian underscores that the comparison is based on the day of the year, which incorporates the expected seasonal cycle.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64189	27	55	27	55	Is the term 'Julian day' necessary here? Is it not sufficient enough to just say 'day'? If not please define the term 'Julian day' sine most readers wont be familiar with this expression. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Julian underscores that the comparison is based on the day of the year, which incorporates the expected seasonal cycle.
64309	28	2	28	3	There are lots of other examples of marine heatwave period impacts. This last sentence seems oddly specific and out of place without the inclusion of other specific heatwave impacts. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: It is not practical to provide a comprehensive set of examples, but including specific examples demonstrates the utility of specific types of indices and thresholds that may be transferable to other applications. We have combined the discussion of MHW duration and return period into a single sentence and now rely more heavily on a cross-chapter reference pointing the reader to Box 9.2 for more information on MHW.
417	28	6	6	17	"lake acidity" may not have been defined correctly in this chapter. Many lakes, especially in the tropical zone, have naturally acidic waters i.e. pH below 7, and because of a combination of pH and temperature act mainly as CO2 sources to the atmosphere. Eutrophic lakes may shift seasonally from CO2 sinks to sources, and hypertrophic lakes may have strong diel (i.e. within 24h - day/night) shifts in their sink-source behaviour. Temperate region lakes may display, especially during spring and summer, a strong estratification, where upper, productive and oxygenated waters may uptake atmospheric CO2 through biological processes (primary production). However mixing during autumn and winter times (if the lake is not ice-covered) may bring "acidified, low oxygen waters from deeper layers to the surface, and then the ecosystem acts as a CO2 source to the atmosphere. Do you mean here coastal lagoons, that have salty to brackish waters, are usually shallower (i.e. wind and turbulence mixing of the water column is more efficient), where alkalinity may indeed regulate surface lake water pH? "Lake acidification" in our present times are very often associated to increase in domestic or industrial sewage or atmospheric deposition enriched in sulphur or nitrogen compounds, which indeed affects the trophic structure of the systems, menaces biodiversity, etc, but the process is different from the "ocean acidification" resulting from the dissolution of the anthropogenic CO2 in seawater. Studies on the impacts of lake acidification are listed here: 1) Bell, G., Fugère, V., Barrett, R., Beisner, B., Cristescu, M., Fussmann, G., et al. (2019). Trophic structure modulates community rescue following acidification. <i>Proc. R. Soc. B Biol. Sci.</i> 286, 20190856. doi:10.1098/rspb.2019.0856. 2) Čtvrtlíková, M., Kopáček, J., Nedoma, J., Znachor, P., and Vrba, J. (2020). Only the adults survive – A long-term resistance of <i>Isoëtes lacustris</i> to acidity and aluminium toxicity stress in a Bohemian Forest lake. <i>Ecol. Indic.</i> 111, 106026. doi:https://doi.org/10.1016/j.ecolind.2019.106026. 3) Leach, T. H., Winslow, L. A., Hayes, N. M., and Rose, K. C. (2019). Decoupled trophic responses to long-term recovery from acidification and associated browning in lakes. <i>Glob. Chang. Biol.</i> 25, 1779–1792. doi:10.1111/gcb.14580. Freshwater carbonate system, that controls the uptake or emission of CO2 at the water-atmosphere interface is very different from seawater carbonate system. One of the main differences is the concentration and relative proportion of dissolved ions, much higher in	TAKEN INTO ACCOUNT: We have removed "Lake acidity" from its prominent position within the ocean acidity CID. We still mention lake acidity as an additional CID that may be examined (like fog), but literature shows that the anthropogenic climate change signal on lake acidity is quite difficult to distinguish from other pollutants and several readers suggested we drop it from its position of prominence.
64195	28	6	28	17	There is no mention in the text re the affect od thid CID on Morbidity which is highlighted in Table 12.2 as a medium risk asset [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have removed the connection between ocean acidity and human morbidity (harmful algal blooms more of a pressing concern for ecosystems).
126469	28	8	28	17	Add a sentence or two about "coastal acidification" and point to Chapter 5. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We note the connection to Chapter 5 when defining the ocean acidity CID in Section 12.2. 12.3 is not assessing surface pollutants that can also lead to coastal acidity.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64193	28	9	28	11	Ocean and lake acidification has an effect on organisms (be it calcifiers or non-calcifiers) growth, reproduction, survival, and metabolism with extended implications for marine ecosystem functionality and diversity, including fisheries and aquacultures [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have several references to this point related to calcifiers, and also note effects on fisheries and phytoplankton.
64197	28	9	28	11	The authors should include the fact that the impacts of OA for marine species can be detrimental, beneficial or neutral depending on the species of interest. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The use of the Climatic Impact-driver framework is designed to focus on the connection between CIDs and sectoral assets while leaving the positive and negative specifics of ecosystem response to a deeper conversation about resilience and exposure as part of the risk assessment framework in Working Group II. At the top of 12.3 we note that the response of any sectoral asset to a CID change is dependent on its own setting and characteristics (e.g., different regional species).
64019	28	9	29	1	12.3.7. Other climatic impact drivers, then 12.3.7.4 Additional relevant climatic impact drivers...So, how can both have the same title while one is a subtopic to the other? the latter should be either merged to the former topic or renamed. However; it is advised that it should be completely separated into a new topic 12.3.8. since the main aim of 12.3.7.4 is discussing risk application as referred to in the first paragraph; which differs from the other sections presenting description and simple identification to the climatic impact driver and its implications. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The other category finishes the CID categories defined in 12.2, and then we have an additional category to mention fog and compound events, which are worth noting here in 12.3 but are not systematically assessed within Chapter 12.
64199	28	14	28	17	The authors describe that there will be an impact of OA on the nutritinal quality of phytoplankton and ecosystems (together with hypoxic zones) but they do not mention in what whay? Is it a positive impact or a negative one? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We now indicate that ocean acidification reduces the nutritional quality of phytoplankton. Overall CH12 establishes connection, WGII assesses direction of change.
43469	28	14			Is it correct " pCO2 concentrations "? [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: This is correct. pCO2 is the partial pressure of dissolved CO2, which is a measure of the amount of dissolved CO2 gas in sea water -- increases in pCO2 can decrease ocean acidity (pH).
126471	28	15	28	16	Consensus does not exist about whether OA favors more toxic algal blooms. Change to "... may provide more favorable conditions ..." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have softened this language on the connection between ocean acidification and toxic algal blooms as suggested.
84057	28	17	28	17	please insert: In these hypoxic zones dissolution takes place in the first plankton and benthic consumers that are made of calcium carbonate. These dissolution will eventually damage the whole ecological community chain (Eichler et al., 2018). [Marco Tulio Cabral, Brazil]	REJECTED: The downstream and system implications of CID changes beyond the initial sectoral connection are assessed within WGII. The reader will be able to learn about the ways that hypoxic zones lead to cascading impacts in ecosystems are described within the cited studies.
64311	28	20	28	20	Salinity also has an impact on coastal erosion: Lawrence et al 2020 (Sea saltwater weakening of chalk and the impact on cliff instability) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We believe the reviewer is referring to Lawrence et al. (2013), which notes the role of salt in limestone cliff weathering but this is not connected to climate change and it is unclear to what extent the levels of salinity changes imposed by climate change would affect this process.
110129	28	20	28	25	Why not merge this with the prior section and miodify its title accordingly? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Ocean salinity has unique effects on sectoral assets (see Table 12.2) and different chemical and dynamical processes associated with anthropogenic changes, so it makes sense to keep these as separate CIDs.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
109449	28	21	28	28	It could be made clearer that here you discuss the change in solar radiation induced by climate change (e.g cloud cover changes) but not the changes due to evolution of the atmospheric composition which then can not be considered strictly as a CID. [Sophie Szopa, France]	TAKEN INTO ACCOUNT: The "Radiation at surface" CID is defined within 12.2. Within Section 12.3 we note that changes in one CID can affect others, but that we examine each CID in its experienced regional changes which may include a combination of changing factors. To make things more clear we define and assess solar radiation just next to air pollution weather and distinguish our examination of the latter from aerosol emissions (and precursors)
64201	28	22	28	25	Salinity changes and therefore changes in the density of water masses can also impact deep water formation with huge follow on impact on the marine carbon pump and thus the global climate [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Global biogeochemical cycling and large scale climate circulation changes are beyond the purview of CH12 and assessed elsewhere in WGI
100131	28	30	28	30	change to read 'Ocean warming and increased stratification reduce ventilation and decrease the oxygen content of the subsurface ocean'. [Steven Bograd, United States of America]	TAKEN INTO ACCOUNT: The dynamics behind changing ocean oxygen levels are not the focus of this section, which instead aims to establish connections between this CID and specific sectoral assets.
39387	28	39	29	29	Same comment as above [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: This approach has thus far been the most efficient and clear way to underscore the relevance of "other" CIDs across a large number of sectors. This section establishes the CID x Sectoral connections as part of the overall climate information framework, which sets up more efficient assessments in the subsequent Chapter 12 sections. We summarize this material in the Table within Section 12.3, and this presentation allows the reader to identify the major motivation for and types of climate information that stakeholders in these sectors may request. The references allow the reader to learn more, the sectoral connections point to Working Group II chapters for further discussion, and these connections lend relevance to the regional CID changes assessed in Section 12.4.
109447	28	41	28	41	WHO defines the Air pollution as a "contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. " Since it encompasses outdoor and indoor pollution this term is not suited for a CID. If kept as a CID, it should be "surface pollutant concentration". and according to this definition neither dust nor haze should be discussed in this category as done for the moment for some regions. [Sophie Szopa, France]	TAKEN INTO ACCOUNT: We define the "air pollution weather" CID in 12.2 and include an explicit note indicating that this CID focuses on conditions that enable low air quality events (e.g., atmospheric stability patterns, conditions conducive to photochemical reactions) rather than the presence of air pollution itself, as the actual air pollution concentrations are strongly related to emissions policies.
109451	28	41	28	41	The CID definition given in chapter 1 is " A natural or human-induced climate event or trend that may have an impact (...)", as air pollution is not a climate event or trends but a forcing driven by anthropogenic activities it should not be mentioned as a CID except if it is made clearer that here it's not air pollution in general but the change in surface pollutants induced by climate change. The current shortcut is misleading. The same confusion can occur with CO2 concentration as a CID. Both could be grouped in climate induced atmospheric composition changes and it could then encompass dust also. [Sophie Szopa, France]	TAKEN INTO ACCOUNT: We define the "air pollution weather" CID in 12.2 and include an explicit note indicating that this CID focuses on conditions that enable low air quality events (e.g., atmospheric stability patterns, conditions conducive to photochemical reactions) rather than the presence of air pollution itself, as the actual air pollution concentrations are strongly related to emissions policies.
109427	28	43	28	54	Wouldn't it be important to also mention that for some specific climate change effects such as increase in precipitation, the effect on air pollution can be a decrease (for aerosols for example)? [Sophie Szopa, France]	ACCEPTED: We have worked with Chapter 6 to improve this section, and immediately point the reader to Chapter 6 for further explanation of associated processes.
126473	28	44	28	45	Since tropospheric ozone and secondary particulate matter are not emitted directly, should there be an addition of "production" or something along those lines in addition to "emissions, concentration, and transport"? [Trigg Talley, United States of America]	ACCEPTED: We have added "production" to this list.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64203	28	46	28	46	Air pollution also has economic impacts (e.g. tourism) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This section now mentions tourism and natural parks.
86241	28	46	28	46	"human health" should be first in the list and elaborated on. Major health implications and thus major communication point for policy makers. Ozone: several hundreds of thousands of premature deaths and tens of millions of asthma-related emergency room visits annually. Pollution has made cancer China's leading cause of death. Ambient air pollution alone is blamed for hundreds of thousands of deaths each year, and big reason why China would reduce emissions. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: We have moved discussion of human health air pollution weather indices to the top of this section and added a stronger connection to Chapter 6. We also note in 12.2 that air pollution weather examines the ability of climate changes to affect the conditions for air pollution, not the air pollution emissions themselves (which in many cases is an order of magnitude larger challenge).
126475	28	51	28	51	Add reference: "... et al., 2018; Wang et al, 2015)." Citation: Wang, S.-Y., L. Hippias, O.-Y. Chung, R. R. Gillies, and R. Martin, 2015: Long-term winter inversion properties in a mountain valley of the western U.S. and implication on air quality. Journal of Applied Meteorology and Climatology, DOI: 10.1175/JAMC-D-15-0172.1 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The recommended paper is focused on dynamical features for a highly polluted valley in Utah. These dynamical features are covered in our cross-chapter reference to Chapter 6.
64205	28	52	28	54	Why are these two examples, i.e. visibility in parks and efficiency of solar panels, given in particular? And why are other examples such as water quality omitted? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Given space limitations it is not practical to include a comprehensive list of examples, so we provide these examples of specific connections of this CID to the energy and tourism/recreation sectors. Connections to water quality are most strongly related to total PM emissions and deposition rather than the climatic connections on air pollution weather.
64017	29	1	29	1	Atmospheric CO2 is part of Air pollution, thus it should be referred to as 12.3.7.1.1 not 12.3.7.2. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Atmospheric CO2 has particularly distinct sectoral connection patterns and a different spatial pattern that merit it being a stand-alone CID category.
115125	29	3	29	18	Add something in here on the CO2 effect on stomatal conductance thus soil moisture, streamflow, flooding etc. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Water use efficiency is mentioned. Downstream implications on other CIDs are the result of system vulnerability and exposure and would be assessed in Working Group II.
64211	29	3	29	18	The focus of the authors is clearly on terrestrial ecosystems and agriculture with a lot of examples for both. The affect of CO2 on coastal systems (increase in ocean acidification) and water quality is here mostly neglected (even though it is highlighted as high risk in Table 12.2) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Ocean acidification is a separate CID. Atmospheric CO2 at surface is not highlighted as being substantially connected to water quality in Table 12.2
64207	29	4	29	8	Changes in CO2 not only affect terrestrial but also aquatic ecosystems and primary production. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We note connections between atmospheric CO2 at the land surface and terrestrial, freshwater, and coastal/intertidal ecosystems. Affects on ocean ecosystems fall into the category of ocean acidification as they are both primarily related to pCO2.
64313	29	5	29	6	You have only stated that production rates are 'modified' Are you able to say specifically how? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Chapter 12 generally leaves analysis of the benefit/detriment of CID changes to WGII, but we do note that higher CO2 concentrations increase photosynthesis and reduces transpiration loss in drought conditions.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64315	29	10	29	10	Pests and weeds are just species which we don't value in our food supply chain or harm the items we place more value on. Using this phrasing is very agro-centric, could you use more neutral phrasing? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We mention natural ecosystems elsewhere, and focus here is on agricultural concerns including weeds and pests.
38177	29	15	29	15	A recent study showed that the increased atmospheric CO2 physiological forcing can alter high-latitude plant transpiration to reduce evaporative cooling and increase sensible heat flux, resulting in Arctic warming amplification.(Park et al., 2020) Park, S.-W., J.-S. Kim, and J.-S. Kug, 2020: The intensification of Arctic warming as a result of CO2 physiological forcing. Nature Communications, 11, 2098, https://doi.org/10.1038/s41467-020-15924-3 . [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: We note the connection between atmospheric CO2 at the surface and plant water retention here, but the large-scale thermodynamic implications of these changes is assessed elsewhere in Working Group I as it is beyond the purview of Chapter 12 .
64317	29	15	29	18	In what way does the CO2 affect the nutritional density of crops and foraged land? Positively or negatively? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We note that CO2 reduces nutritional density and can increase the production of toxins and allergenic pollen.
64209	29	15	29	18	This is a really convoluted sentence which would be clearer if the authors would stick to the structure/order of topic given in Table 12.1. The authors jump here from agriculture to health without a logical connection [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The order of examples is related to the prominence of the CID x sectoral asset connections in the literature. Space limitations prevent further elaboration and transitional sentences -- the goal of this section is to alert the reader to connections that suggest helpful climate information could be applied so we must strike a balance between breadth and depth.
27471	29	21	29	21	This section seems very small to us. We think it is worth keeping it but it can be enriched with the impacts of various aerosol types in the atmosphere, not just SOA. [Eric Brun, France]	TAKEN INTO ACCOUNT: Space limitations prevent a longer discussion of different aerosol effects, and we have removed our discussion of radiation as a driver of air pollution as air pollution weather is described in a separate CID. Our focus is on overall radiation changes driven by anthropogenic climate change with a primary focus on greenhouse gas forcing rather than short-lived aerosols that are highly dependent on aerosol and aerosol-precursor emissions.
126477	29	26	29	26	Add "of" between "production" and "tropospheric". [Trigg Talley, United States of America]	NOT APPLICABLE: Sentence removed
51781	29	26	29	26	Missing word: 'production of tropospheric..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Sentence removed
80729	29	26	29	26	it should be 'production of tropospheric' [Helene Jacot Des Combes, Marshall Islands]	NOT APPLICABLE: Sentence removed
109429	29	26	29	26	"production tropospheric ozone" should be "production OF tropospheric ozone" [Sophie Szopa, France]	NOT APPLICABLE: Sentence removed
91129	29	26	29	26	production OF tropospheric [Martin Wild, Switzerland]	NOT APPLICABLE: Sentence removed
64213	29	27	29	28	It is important to point out that PAR does influence aquatic (as well as terrestrial) primary productivity which in turn changes biogeochemical cycles in aquatic environments (productio of oxygen, increase in carbon fluxes to the seafloor, increase in the biological and carbon pump) with major follow-up effects on global climate. When it comes to the ocean, everything is interconnected. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have added the Ryu et al. (2020) reference which notes the importance of Photosynthetically-Active Radiation for marine systems more explicitly.
33589	29	35	29	36	Change: "Additional CIDs were identified in (IPCC, 2012a, 2019c, 2019b) and additional..." by "Additional CIDs were identified in IPCC (2012a, 2019c, 2019b) and additional...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64215	29	35	29	36	Reference in wrong format. It should be "Additional CIDs were identified in IPCC (2012a, 2019c, 2019b)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Sentence removed
13859	29	43	29	43	Missing closing parenthesis in (see Chapter 11, Section 11.8; (Clarke et al., 2018; IPCC, 2012a; Raymond et al., submitted; Zscheischler et al., 2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43471	29	43			ead " (see Chapter 11, Section 11.8) " rather than " (see Chapter 11, Section 11.8; " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
41749	29	53	29	53	which chapter, for easy reference, mention chapter [Sawsan Mustafa, Sudan]	TAKEN INTO ACCOUNT: Systemic risks are within the purview of every chapter within Working Group II.
110131	29	55	30	9	Why is this section of text bolded. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: This is a section summary that serves as traceback for the Executive Summary statements for Chapter 12. Similar bold text is found at the end of 12.4.1, 12.4.2, etc.
52093	29	55	30	9	Impact of climate change is quite broad and expands into many areas. I think it would be an interesting suggestion to highlight that scientific community need to converge into one or few indicators that can measure the influence of climate change. [Amarasinghage Tharindu Dasun Perera, Switzerland]	TAKEN INTO ACCOUNT: We have updated this summary statement to be consistent with our executive summary statement. We do not feel that the literature or our expert assessment recommends that the scientific community needs to converge into one or few indicators as there is great utility in designing CID indices for specific sectoral asset connections, as shown in Section 12.3.
52095	29	55	30	9	The impacts on all these sectors will lead to economic loss any insight about it? (I hope many policy makers will be interested on it) [Amarasinghage Tharindu Dasun Perera, Switzerland]	TAKEN INTO ACCOUNT: Economic losses are assessed in WGII and WGIII. This chapter is intended to provide useful climatic information into that process by establishing the sectoral connections to climatic impact drivers. The final paragraph in Section 12.3.7.4 discusses compound CID changes and the recognition that Table 12.2 shows multiple CIDs are important for each sector, which underscores the overall need of systems analysis and resilience within Working Group II.
52203	30	0	30	0	It is worth advising to compare the regional information on climate change defined in WGII AR6, with WGII AR5, through a table for example. [Maritza Jadrijevic Girardi, Chile]	TAKEN INTO ACCOUNT: The following section (Section 12.4) performs a systematic assessment of regional CID changes building off of previous IPCC reports and more recent literature.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115127	30	1	30	9	Change "sector/asset" to "system/component". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Here Chapter 12 follows the structure and language utilized within Working Group II, which has sectoral chapters. We are sympathetic to the reviewer given that systems thinking is emerging as a strong force in research and applications. Each sector has systems, but they can vary greatly in scale (e.g., food systems can be global, an ecological system can be microscopic) and therefore the term "sector" offers an appealing categorical term. Likewise, components of a system can vary in scale and value (intrinsic, economic, social, etc.), some systems have dozens of component categories that would be difficult to generalize, and some components may not be valuable in their own right -- "asset" focuses on whole, valuable elements (which fit into larger systems and may be sub-systems in their own right, e.g., livestock systems in the food sector). For all these reasons we prefer the term "sectoral assets" as it focuses on specific elements of value within the Working Group II sectoral organization. Chapter 12 has also worked with Working Group II contributing authors to vet this language and the list of sectoral assets (which in many cases is parallel to Working Group II chapter outlines). We also have more explicitly defined 'asset' in the updated chapter.
102671	30	1	98	1	Chapter 12, section 12.4 Regional information on changing climate, the Coastal and Oceanic Climatic Impact Drivers from the summary tables for each region shouldn't be expanded to also include: 'ocean temperature', 'stratification', 'salinity', 'oxygenation', 'ocean circulation' and 'marine ecosystems'? [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: Section 12.4 often focuses on land regions with additional interest in near-coastal waters. Only the open ocean sub-section looking at deep ocean and far-from-land regions (for this sub-section we include all CIDs). We have streamlined the tables for land domains in Section 12.4 to focus on the most relevant coastal and oceanic CIDs oriented toward the continental (and Small Islands) domains defined by the Working Group II Regional chapters .
45607	30	12	30	12	I will like to acknowledge the effort of assessing the impact of snow, glaciers, and permafrost on different regions (section 12.4). You have made a definite improvement since FOD. Nevertheless, for the sake of consistency between chapter 9 and Chapter 12 and not giving the wrong impression that RCP 8.5 is the most plausible scenario, I encourage the authors to use other future scenarios in their assessment of snow and ice. Except for the European region and Asia, the rest of the regional future evolution of glaciers is based on RCP 8.5. This gives the wrong impression that RCP 8.5 is the only plausible future or the one you think is more worth mentioning. Instead, there is a lot more to say when you show the whole picture. For example, in mountain regions where there are mostly small glaciers, like the Low Latitude region (tropical glaciers), mentioned only the RCP 8.5 could be seen like that only in the worst-case scenario there will be a considerable mass loss. Meanwhile, future projections (please see table 9.3 or figure 9.22) shown that even under RCP 2.6, glacier volume will shrink more than 60% of the present volume, which show that even under a low emission scenario the committed change of glaciers by the end of the century will have a tremendous impact in the water resources of this region. The data to assess the response of glaciers in others future scenarios is presented in Table 9.3 and figure 9.22 and is based mainly on the work of Hock et al. 2019 and the recent accepted Marzeion et al. Marzeion, B. et al. Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change. Earth's Futur. (submitted). Hock, R. et al. GlacierMIP - A model intercomparison of global-scale glacier mass-balance models and projections. J. Glaciol. 65, 453–467 (2019). [Lucas Ruiz, Argentina]	ACCEPTED: we now balance the assessment among different scenarios. We also thank the reviewer for the references which we add provided they are published.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115129	30	12	30	12	General comment on the whole of this section, ensure relevant material on mean climate changes is moved to the Atlas and extremes to Chapter 11 with appropriate synthesis retained here. Some examples are noted in further comments. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This is done from the regional teams, consistency has been checked
64021	30	12	40		12.4. Regional information on changing climate, it is stated that this section presents historical and future projections of the climatic change impacts, however; data presented in most cases is concerned with the status quo without reference to historical data or future projections. On presenting future projections, no criteria are mentioned on which such projections were based. On the contrary, all future projections are presented as extrapolation to the present situation, which means that no real assessment of data or climatic change impact were carried on. Moreover; it is referred that most projections are based on literature, which is a very general and vague statement that doesn't give authenticity to the report, but; makes the report seem as if it is a review article. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: the revised version improves the Africa section, providing models and scenarios used for the projections. However, this section does include full referencing already. Future projections are not presented as extrapolation to the present situation, it is based on climate models projections and scientific literature. We improved the style and the sharpen the assessment.
80231	30	12	91	8	Subregions of 12.4 should have a map about each continent with their subregions should be displayed within the subchapters. [Lilian Fejes, Hungary]	ACCEPTED: A small map is added to each assessment table
35373	30	12	113	51	In section 12.4, particularly 12.4.X.4 (snow and ice) there is inconsistency in the structure (number of subsections) and discussion of observations and projections in all sections. For glacier mass there are a few new references for both observations (Zemp et al 2019, Wouters et al 2019) and for projections (Hock et al 2019 and Marzeion et al Glacier MIP papers) that are used in assessments in Ch9. Coordination with Ch9 on glaciers, snow and permafrost issues would be useful here. We (LAs in ch9: Lucas, Tolly, Gerhard) are willing to help make better consistency between Ch9 and Ch12, as well as consistent referencing to SROCC and Ch9 (and ch2 for global, where relevant) [Guðfinna Aðalgeirsdóttir, Iceland]	A coordination with Chapter 9 has been set up and we added new references
69799	30	12	113	55	For CID-Others-Air pollution. It would be useful to harmonize the type of literature assessed for different regions. Currently different regions have different information being assessed. If certain information is not available, it would be useful to flag it and or if not relevant to the region then also flag the same but useful to have consistency on the information assessed. [Bhupesh Adhikary, Nepal]	TAKEN INTO ACCOUNT: the revision adds homogeneity and harmonizes with Chapter 6. Air pollution is now summarized in the introduction of 12.4
41837	30	14	30	54	This introduction section is very relevant, well written and documented; it allows the reader to better understand the approach. [JACQUES ANDRE NDIONE, Senegal]	NOTED: we thank the reviewer
20785	30	14	117	29	Chapter 1 indeed defines an organisation by continents through showing a map in figure 1.15c. At the same time, chapter 1 does not justify this organisation. Whatever way is chosen to define a climate, there are obviously a variety of climates in each continent (to the extent that even the organisation in 43 regions presented in section 1.4.6.2 may is not always found sufficient). At the same time, the continental scale is so large that many CID behave on that scale in a way rather close to what happens on the global scale. Overall, the next 80 pages seem essentially a way to report the progresses accomplished since AR5 and the literature according to the concerned continents. [philippe waldeufel, France]	NOTED: regions were defined by the Atlas
112331	30	24			suggest rewording since personifying the chapters "Each regional section herein (12.4.1 – 12.4.10) assesses"; maybe reword to presents/reports an assessment? [Linda Mortsch, Canada]	ACCEPTED: this has been reworded
45053	30	28	30	29	support an assessment are not discussed in the text, however, those that are highly relevant are high-lighted as "research gaps" in Section 12.7. They are assessed as uncertain in the climatic impact drivers tables. ==> support an assessment are not discussed here but are nonetheless highlighted as "research gaps" in Section 12.7 if highly relevant. They appear as "uncertain" in the climatic impact drivers tables [Christophe Deissenberg, Luxembourg]	NOT APPLICABLE: All CIDs are now discussed
74585	30	32	30	33	[placeholder ...] to remember for its purpose. [Moulay Driss HASNAOUI, Morocco]	ACCEPTED: We have removed placeholders. Note that figures have changed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
115131	30	44	30	44	Suggest change to stippling where there is no information so as not to obscure the information and consistent with the Atlas and some other chapters. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: we inverted stippling as a rule defined actually for all chapters
51783	30	51	30	51	0.44 or 0.22 (in other continents' - which resolution in which continents, should or be '-'? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE. Text has changed
115133	30	51	30	53	Consider comparing results from CORDEX models only with their driving models and not the full CMIP ensembles. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: We prefer using the full available GCM ensembles as well as regional ensembles as a general rule across regions including all information; the goal is not to discuss the added value / difference of RCMs relative to their GCMs, but to present the full available information
45051	30	55	31	9	The paragraph is very hard to read, some serious editing would be useful. More generally, the fact that "different assets within the same sector require different or tailored indices even for the same hazard" is mostly presented in a very convoluted way throughout the chapter – could you please consider reformulating it in a simpler way. [Christophe Deissenberg, Luxembourg]	ACCEPTED: The updated draft discusses indices and their applicability across and within sectors throughout the chapter to provide a more comprehensive discussion on this topic. This begins in Section 12.1 with a formal definition and example of a CID index, with indices being a theme of the chapter outline provided. Indices are further introduced just after the CID categories are introduced in Section 12.2. They are further described as being distinct across sectors in the first paragraph of Section 12.3, with subsequent sub-sections of 12.3 relating indices to each CID and responsive sector. These indices are then assessed for each region in 12.4, as described in the introductory text for that section. We also further describe the specific indices that we present in the figures within Technical Annex VI on Climatic impact-drivers and Extreme Indices.
98139	31	41	31	53	Re Fig. 12.6: One limitation to this approach so far is that it just shows projections with no check on whether the models were consistent with historical trends. This can actually be assessed to some extent for precipitation historical trends (and even SPI in the appendix) of Knutson and Zeng (2018). So regions with consistency between historical simulated trends and historical observed trends would have relatively higher confidence in projections than those with significant inconsistencies. Can this be applied? Especially needed for precipitation where models seem to struggle more to reproduce observed historical regional trends [Thomas Knutson, United States of America]	REJECTED: The assessment of models is done in the Atlas and in literature, and assessing model past simulated trends in the report would be research which IPCC is not allowed to. In addition this is a complex topic as in most cases past trends are hindered by natural variability. Please note the change in the figure, now assembled in one.
115135	32	15	32	15	Maybe add in here other globally applicable results and then remove references to these in the following sections (except for important regional details/variations). [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We now assess here all the "other" CIDs, but not other ones.
131463	32	16	32	19	If region-specific figures are considered "illustrative" of the broader CID changes "since they do not represent the full range of indices", why were they chosen in the first place? Can you provide a justification that relates to external and/or internal (regional) validity of the region-specific indices? [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The selection of indices was made on the basis of illustration for the main messages for CIDs that have regional patterns that would make them difficult to read at global scale. The indices were selected as relevant for each continent.
52629	32	16	32	21	It would be good to say something about the rationale for the choice of selected CIDs for the regional figures. Is it, for example, the CIDs that show greatest change? [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The selection of indices was made on the basis of illustration for the main messages for CIDs that have regional patterns that would make them difficult to read at global scale. The indices were selected as relevant for each continent.
107883	32	27	32	27	Taking Africa as a sample region, there is a lot of repetition in the mean climate change information presented in Chap 12 and in the Atals. There needs to be serious discussions on the desirability/undesirability of such repetitions. This goes for all the regions. [Linda Mearns, United States of America]	ACCEPTED: The first paragraph is removed from all sections
4589	32	27	32	27	Suggest add a short summary to describe Africa's diverse climate types and hazards in different regions. [Rita Yu, China]	REJECTED: due to space constraints, we keep CID descriptions in the subsections

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126479	32	29	32	29	This first sentence introducing this section speaks to vulnerability in Africa, but the remainder of the section does not refer to, explain, or provide information about vulnerability, so this introductory sentence might be better if it focused on the contents of the section. [Trigg Talley, United States of America]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
86243	32	29	32	29	The word "depicted" suggests it is imaginary rather than factual. Better alternatives include "highlighted, identified, featured, described etc." [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
20947	32	29	32	30	The section has been well introduced by underscoring the high vulnerability Africa is facing. We think to enhance readability sequential flow of information the Author need to put a statement describing why Africa is and will continue to be more vulnerable under different scenarios of climate change. [Ladislav Chang, United Republic of Tanzania]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
86245	32	29	32	36	It is worth noting that Africa is a huge, hot, dry continent. Even the tropics are a lot drier than tropics elsewhere see https://data.giss.nasa.gov/impacts/agmipcf/rain.jpg . It straddles the equator and sits bang where it is already hottest. [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
100883	32	30	32	31	Here it would be more appropriate to refer to climate modes of variability than to "oceanic basins features". ENSO and NAO are listed in Technical Annex VI, which introduces and defines the main climate modes of variability and their teleconnections. More in general Annex VI should be referred across the chapter and, as much as possible, the names and acronyms should be consistent with those used in the Annex (where the various flavours and history of names and acronyms, e.g. AMV vs IPO, is clarified. [Corti Susanna, Italy]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
51785	32	31	32	31	Typo: 'basin features' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
106483	32	33	32	36	Could you add mid-latitude cyclones to the list. Not only because I live in Cape Town but because they are essential for the formation of tropical temperate troughs in the summer rainfall region of southern Africa and can also be very high-impact events. [Lennard Christopher, South Africa]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
51787	32	34	32	34	Please could 'mesoscale' and 'heat lows' be described here? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: to avoid repetition with Atlas, the first paragraph is removed
20949	32	38	32	44	This section need to be re-enforced with the documented facts, especially on the frequency and intensity of extreme precipitation. The IPCC Special report on Managing the Risks of extreme event clearly highlight that "It is likely that the frequency and intensity of heavy precipitation or the proportional of total rainfall from heavy falls will increase in the 21st Century over Many Areas of the globe including in TROPICAL REGIONS. The Special report on global warming of 1.5 and the Special report on Climate Change and Land also re-emphasize that warming of 1.5 will lead to increased frequency and intensity of heavy precipitation in SEVERAL REGIONS (High confidence), in this case several regions also include some regions in Africa. I therefore I think this need to be revisited to be more precise. [Ladislav Chang, United Republic of Tanzania]	REJECTED: a full assessment of heavy precipitations is made in CH11.
114789	32	39	32	41	This is not an accurate reflection of the AR5 assessment for Sub-Saharan Africa. It has in fact been assessed in AR4 (Christensen et al., 2007) that southern Africa is likely to become drier under low mitigation futures, and in AR5 (Niang et al., 2014) the same statement was made but with a "very likely" level of confidence. The changes described for central and east Africa were also assessed to be "likely" in AR5. That is, a high confidence assessment was made for most of Sub-Saharan Africa, not low confidence as the authors are reporting here. [Francois Engelbrecht, South Africa]	NOTED. Section has been removed now and reference to the Atlas added
51789	32	40	32	40	most of Sub-Saharan Africa' (remove 'the') [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED. Section has been removed now and reference to the Atlas added
100307	32	41	32	41	Is it possible to include the regions divisions (RAR, RFE, ESB, WSB,WCA, TIB, EAS, ARP, SAS, SEA) in the Figure 12.9? [Claudine Dereczynski, Brazil]	NOTED. Section has been removed now and reference to the Atlas added

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51791	32	41	32	44	Suggested edit: 'Observed change in extreme precipitation and drought were also of low confidence due to lack of observations. There was high confidence that heat waves will increase across the entire continent of Africa, and low to medium confidence that heavy precipitation events will amplify towards the end of the century.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED. Section has been removed now and reference to the Atlas added
51793	32	46	32	46	suggested additions for clarity: '...result of regionally downscaled CORDEX Africa outputs..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Edited as suggested
114791	32	46	32	46	Before the new literature is discussed it will be fitting if the authors can also briefly report on the SR1.5 assessment for Africa (Chapter 3, SR1.5). Please see in particular the discussion of southern Africa as a climate change hotspot, and the AR1.5 Africa box (Chapter 3, SR1.5). It is important for the Africa assessment in Chapter 12 to build on that of SR1.5, and also to guard against inconsistencies with SR1.5. [Francois Engelbrecht, South Africa]	Noted: the reader is referred to the Atlas in the beginning of the section for the summary of previous assessment to avoid repetitions.
105737	32	46	32	49	Justin Sheffield; Eric Wood; Nathaniel Chaney; Kaiyu Guan; Sara Sadri; Xing Yuan; Luke Olang; Abou Amani; Abdou Ali; Siegfried Demuth; Laban Ogallo, 2013: A Drought Monitoring and Forecasting System for Sub-Sahara African Water Resources and Food Security, BAMS-D-12-00124 [Abou Amani, France]	REJECTED: this paper is about seasonal forecasting and drought monitoring, so it is not relevant for this section.
15139	32	46	32	49	It is strange to me that despite 'quite a large body of literature is available' as results of CORDEX Africa only very few works are cited and mostly coming from one or two modelling centres (and analyzing only one RCM). There are many papers available assessing results for CORDEX Africa that should be mentioned here. https://link.springer.com/article/10.1007/s00382-019-04900-3#Abs1 and https://link.springer.com/article/10.1007/s00382-016-3355-5 (both already listed in the reference list, by the way) analyze temperature and precipitation projections over continental Africa based on the large CORDEX africa RCM ensemble, whereas many others (listed eg in the two papers mentioned above) analyze projections at sub-continental level that should be cited in the lines 51-55. [Alessandro Dosio, Italy]	TAKEN INTO ACCOUNT - paper have been cited now.
31815	32	46	32	49	I think that there are more published literature about Africa CORDEX that could be referenced here. [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT - more papers are added now.
14955	32	46	32	55	This paragraph seems devoted to outline the main outcomes of model validation over Africa. I believe this should be removed given that it should be something described in Chapter 10 [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: Text has been rephrased.
31813	32	49	32	55	Is my understanding that the information presented here or in the AR6 reports should be based on assessment of published and peer reviewed literature! I would suggest the authors assess also published literature in this case. There are several published papers about CORDEX Africa that can be referenced here. Same comment applies elsewhere where only the Atlas is referenced. [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: Text has been rephrased.
29343	32	49	32	55	The statements here are reasonable although don't seem to be properly referenced. Do they pertain to the model assessment in the Atlas and if so to what sections? [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been rephrased.
29341	32	50			Change "show a reasonable skill" to "show reasonable skill" [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been rephrased.
88067	32	51	32	55	References are needed for this statement. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: Text has been rephrased.
126481	32	54	32	54	It is important to include the end of the rainy season because changes in that varibale can indicate onset of drought or flooding. [Trigg Talley, United States of America]	NOTED: text has been revised and text modified.
51795	32	55	32	55	lower performance in reproducing the precipitation climatology and extremes' - is this because of poor model performance/agreement or a lack of observation data, or both? It would be useful to explain this. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been rephrased and reader is now is referred to the ATLAS for a more in depth explanation.
15141	33	3	33	3	Figure 12.8; Percentile based indices won't be affected by bias-adjustment [Alessandro Dosio, Italy]	NOTED: figures have been changed now

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
100295	33	3	33	3	Is it possible to include the regions divisions (WAF, SAH, NEAF, CEAF, SWAF, SEAF, CAF) in the Figure 12.8? [Claudine Dereczynski, Brazil]	ACCEPTED: regions are added now
115137	33	13	33	13	Add "WG I reference" before "regions". [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
27473	33	24	33	24	This whole section is very interesting but in most cases we miss the link with impacts. The Climate Impact Drivers is missing and what is written could have stand in other chapters like the one on 'extreme weather events'. [Eric Brun, France]	TAKEN INTO ACCOUNT: the FGD version has improved this aspect
126483	33	26	33	26	It is recommended to incorporate in this section research on how these changes (temperature and extremes) affect the continent/sub-continent (similar to the section on North America). For example, research estimates significant yield losses of common crops (maize, beans, sorghum, millet, with strong regional variations). Given the high livelihood dependence on these crops in Africa, including that type of information in the report is recommended, while recognizing that impact assessment work is separate. [Trigg Talley, United States of America]	REJECTED: WGII domain
126485	33	26	33	26	Why does the section on Africa does not examine climate impacts by ecosystems. In particular, Savannah ecosystems and ocean ecosystems are very vulnerable to the effects of climate change. [Trigg Talley, United States of America]	REJECTED: WGII domain
98141	33	26	33	28	Add: "The mean warming and increases in mean summertime wet bulb globe temperature in Africa, at least in most regions with adequate data coverage for trends, are assessed as detectable and at least partly attributable to anthropogenic forcing, according to CMIP5 models (Knutson et al. 2013; Figs. 10-12; Knutson and Ploshay, 2016, Fig. 5)." Ref: Knutson, T.R., F. Zeng, and A.T. Wittenberg, 2013: Multimodel Assessment of Regional Surface Temperature Trends: CMIP3 and CMIP5 Twentieth-Century Simulations. J. Climate, 26, 8709–8743, https://doi.org/10.1175/JCLI-D-12-00567.1 [Thomas Knutson, United States of America]	ACCEPTED: text has been revised and references added if relevant
115139	33	26	33	44	Much of this overlaps with the Atlas. Maybe synthesis here of Atlas findings. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised and references to the Atlas added.
126487	33	27	33	27	The information provided about warming is relevant to areas where there are long-term homogeneous observations. It is important to provide information about this spatial coverage. What percent of Africa has long-term homogeneous observations and what sub-regions of Africa? It is important to provide this context or to provide information that clarifies the geographic scope of the statements regarding warming. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been revised and references to the Atlas added where the observational coverage is assessed.
13861	33	28	33	28	It is suggested to indicate the section or annex of the Atlas [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Edited as suggested
51797	33	28	33	28	recent decades' - please specify how many if possible. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: the use of recent decade terminology is well established
86295	33	31	33	31	Cross-referencing the section where this was assessed in Ch3 would be more helpful. Please try and address similar references in the chapter where possible. [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: Edited as suggested
51799	33	34	33	34	increased temperature variability' - please specify if this refers to temporal and/or spatial variability. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: sentence has been removed
28257	33	34	33	37	The section is labeled as "mean temperature:" in bold. This sentence however refers to temperature variability. Since the impacts associated with increased variability are typically related with extreme heat, maybe it would make sense to move th sentence to the next section ("extreme heat:", starting in line 46). [Sebastian Bathiany, Germany]	TAKEN INTO ACCOUNT: sentence has been removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
86247	33	35	33	37	What exactly does it mean, "standard deviation of monthly temperature elevated 10% per degree of warming"? Mean temperature varies from month to month? Mean temperature for any month varies from year to year? Mean vs max monthly temperature? If this is an important finding, please clarify. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: sentence has been removed
51801	33	37	33	37	It would be helpful to briefly describe RCP4.5 (plausible medium emissions scenario)? Or similar [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised and this sentence is removed.
29345	33	38			Use of incorrect degree symbol [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	EDITORIAL: done
57455	33	39	33	41	In Ch 12 says that the annual mean temperatura over Africa is very likely to exceed 2°C by the end of the century under RCP 8.5, citing the Atlas, but the Atlas ES says that it is likely to exceed 4°C. Needs correction or clarificarion [Daniel Martinez Castro, Cuba]	TAKEN INTO ACCOUNT: Text has been revised.
86199	33	39			Is it not possible to refer to the months rather than use terms like boreal winter and summer which may mean lttle to many policy makers - same applies to the use of austral later on? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Text has been revised.
33591	33	41			Add dot at the end of the sentence: "...relative to the late 20th century annual mean temperature by 2100 (Atlas) (Teichmann et al., submitted)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: Text has been revised.
126489	33	43	33	43	"part" should be "parts" [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
29347	33	44			Use of incorrect degree symbol [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised.
126491	33	46	33	46	Separate facts about changes that have occurred from projected future changes into different paragraphs for greater clarity. [Trigg Talley, United States of America]	ACCEPTED: modified as suggested
100289	33	46	33	50	According to Chapter 11 (Table 11.4), increasing in hot extremes is observed: over CAF with low confidence; over SAH, WAF, NEAF and CEAF with medium confidence; over SWAF and SEAF with high confidence. [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: Text has been revised.
41839	33	46	33	57	Some references are little bit old... I think that IPCC makes priority to recent littérature and the Volume 1 of AR5 has been published in 2013; why quoting references published in 2013? [JACQUES ANDRE NDIONE, Senegal]	TAKEN INTO ACCOUNT: Text has been revised.
100291	33	48	33	48	Please delete "and": ... And South-East and South-West Africa [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: Text has been revised.
115141	33	48	33	50	Maybe refer to CH 11 tables and synthesise these here and just focus on CIDs. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised.
74587	33	49	33	49	To check if it isn't published about ... ; Driouech et al., submitted; ... [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: Text has been revised and reference is not longer there
126493	33	50	33	50	Delete comma after "that". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
126495	33	50	33	50	Remove the comma before "Africa". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
51803	33	53	33	53	hot nights' - a definition here would be helpful. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: A definition is provided in 12.3
86249	33	53	33	54	What exactly does the following mean: "increases of mean annual hot nights ... reaching 95% by 2060 compared to the reference period (1981-2010)"? That the number of hot nights will be nearly double compared to reference period? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Text has been removed.
51805	33	54	33	54	reaching 95%' - increase of 95% or 95% of all nights? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been removed.
28259	33	55			The statement about the increased number of hot nights should not be linked to Bathiany et al. - this paper deals with monthly temperature variability in general but does not analyse the number of hot nights. Instead, the statement about temperature variability from the previous section could be moved here. [Sebastian Bathiany, Germany]	TAKEN INTO ACCOUNT: Text has been removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51807	33	56	33	56	What does Tx90p mean? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been removed.
86251	33	56	33	56	What is (Tx90p)? These abbreviations are nice short-hand for experts, but are not helpful for the reader. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Text has been removed.
31819	34	3	34	3	The authors should clarify what scenarios are all. [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: Text has been revised and specification added
33593	34	4			Change: "For instance, Russo et al., (2016)... » by "For instance, Russo et al. (2016)...". [Guiomar Rotllant, Spain]	ACCEPTED: modified as suggested
126497	34	6	34	6	Some words are missing after RCP8.5. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
51809	34	6	34	6	Suggested addition: '...in RCP8.5, by the end of the century.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised.
86253	34	7	34	7	The word "potential" can be removed. [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: Text has been removed.
41841	34	8	34	8	Instead of writing "Coppola,, submitted", please write "Coppola, submitted"; there is a double coma after Coppola! [JACQUES ANDRE NDIONE, Senegal]	Accepted: fixed and citation updated
33595	34	8			Check for the right reference: "...agriculture (Coppola,, submitted; Dosio, 2017...." [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: check done
33597	34	10			Check for the right reference: a,b o c ? : "(Coppola et al., submitted)". [Guiomar Rotllant, Spain]	EDITORIAL: fixed
51811	34	11	34	11	Suggested edit: '...with a lower increase in..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised.
63679	34	13	34	15	There are multiple instances of parentheses in a row which makes it difficult to read. It is not clear what the West Africa and North-East Africa on line 15 refer to. Are these these in reference to the number of days in exceedance of 40 degrees C (the 20 to 40-50 days by mid-century or 90-100 days by end century)? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Text has been revised.
126499	34	14	34	15	Should read "... by mid-century in West Africa ...? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
31825	34	18	34	19	I find this sentence unclear. Needs to be rewritten for clarity [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: Text has been revised.
15143	34	18	34	27	This paper may fit here https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018EF001020 [Alessandro Dosio, Italy]	NOTED: the paper is more suited for the urban box.
114793	34	18	34	27	A further paper discussing increases in oppressive temperatures in Africa, with implications for human health and mortality, is that of Garland et al. (2015): Garland R.M., Matooane M., Engelbrecht F.A., Bopape M-J.M., Landman W.A., Naidoo M., Van der Merwe J. And Wright C.Y. (2015). Regional projections of extreme apparent temperature days in Africa and the related potential risk to human health. International Journal of Environmental Research and Public Health 10/2015 12 12577-12604. DOI: 10.3390/ijerph121012577. [Francois Engelbrecht, South Africa]	NOTED: paper inserted but got removed in the final shortening
13863	34	19	34	19	Change 1.5 by 1.5°C [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL: done
26445	34	19	34	19	Is this relevant for the whole continent or just for certian parts of Africa? [Mare Sundström, Sweden]	ACCEPTED: text has been revised

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
86255	34	21	34	21	Heat stroke can be the combined effect of heat and dehydration, so is particularly likely in dry heat, while heat stress in humid/hot simply leads to overheating. [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED: text has been removed
38179	34	25	34	27	Missing subjective word. Something like > In West Africa (Central Africa), "the exceedance occurs" ~ should be added. [Junhee Lee, Republic of Korea]	ACCEPTED: text has been revised
86257	34	29	34	29	Frost forms the southern limit of malaria distribution in Africa. A climate zone shift here would open up a huge area that has historically been malaria free, or rarely epidemic, to stable annual transmission, with huge potential death toll. [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED. There is not literature specific on frost.
86297	34	29	34	34	Is there any observed difference in the severity of the forsts? Also, consider specifying the change in terms of the actual number of days. And is this the same for all RCPs? [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: text has been revised e reference to CH11 included.
126501	34	31	34	34	Is this referring to the past, present, or future? Perhaps add some additional explanation to this paragraph as it is not very clear. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
74589	34	33	34	33	To check if it isn't published about (Driouech et al., submitted; ... [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: Text has been removed.
31817	34	36	34	36	"Cold spells are projected to have a decreasing frequency in all scenarios...". The authors should clarify if by all scenarios it refers to RCPs and SSPs. [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: Text has been revised.
126503	34	40	34	40	Define "periods requiring heating"? [Trigg Talley, United States of America]	ACCEPTED: We have re-phrased for more clarity
33599	34	42			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	Accepted: fixed and citation updated
63867	34	47	34	50	This sentence refers to the high humid stress thresholds being crossed 150 (90) days and 110 (45) days under SSP5-8.5 and SSP1-2.6 respectively for the end of century (mid century) throughout West and Central Africa which contradicts lines 22-27 on the same page which assigns these values to West Africa (Central Africa) at the end of the century. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Text has been removed.
35995	35	1	36	15	Globally I find this section on "Wet and Dry in Africa" (section 12.4.1.2) lacking of substance given the huge impact that climate warming could have on this continent. The various sub-regions are exposed to different dynamics and rainfall/water related risks would deserve a more indepth treatment. I am especillay lacking a sub-section on extreme rainfall [Thierry Lebel, France]	NOTED: we have improved the section , but notice that extremes are assessed essentially in CH11
114795	35	2	35	6	The text first refers to southern Africa (line 2, trends), and then to "South West" and "South East Africa (line 2, projections). It may better to consistently refer to "southern Africa". [Francois Engelbrecht, South Africa]	ACCEPTED: text has been revised
27475	35	3	35	3	As for the above section on temperature, we are loosing track here of the CID aspects and the links with societally-relevant impacts. Such text could have stand anywhere else than in chapter 12. [Eric Brun, France]	REJECTED: the mandate of CH12 is to assess the climate change impact on CID that are relevant for impact assessment, but the latter is left to the WGII.
27477	35	3	35	4	There are many papers showing recovery of precipitations trends, that is wetting, post 1990s ... So how do you reconcile those wetting trend with your statement about drying that suggests drying has started in 1950 and continues since then? What are the references you use for your statement about historical trends? [Eric Brun, France]	NOTED: this assessment is done by the Atlas chapter and also the Atlas has now a revised the assessment
98143	35	3	35	4	Add: Knutson and Zeng find detectable anthropogenic decreases in mean precipitation since 1901 over the Mediterranean region of Africa, parts of northern tropical Africa, including the Sudan region, and in a small region along the southwestern coast of Africa. Over 1951-2010 the drying in the Sahel is still detectable but not well simulated by models, which tend to show an increasing trend instead. Over 1981-2010 during the Sahel recovery period, models and historical trends agree on an increasing trend over parts of northern tropical Africa. Modeled and observed trends over much of southern Africa disagree on even the sign of change over the 1981-2010 period, indicating either strong internal variability influence on observed trends, or problems with model forcing and/or response to forcing for precipitation in the region.' [Thomas Knutson, United States of America]	NOTED. This paper is used as a reference already in the Mediterranean region. We refer here to the assessment done in the Atlas.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
35997	35	3	35	13	<p>A few important points could be added to this section devoted to mean precipitation. One is related to the change in seasonality, which is mentioned further in lines 49-50 for West Africa but holds also for Central Africa. This is clearly a change of high significance from both a climatological and water cycle points of view. Furthermore models and observations agree on this. A second important point is the analysis of the so-called "rainfall recovery" observed in West Africa, starting at the beginning of the 2000s; Panthou et al. (2014) have shown that this was associated with the combination of a persistent deficit in rainfall occurrence (causing the big Sahelian drought at the end of the 20th century) with an intensification of the rain events. Here again this result is central from both a climatological point of view (emergence of the hydro-climatic intensification anticipated by Giorgi et al., 2014) and a water cycle/water resources point of view, since it means a persistent risk of dry spells during the rainy season and of more extreme rain events that could cause more frequent and heavier floodings.</p> <p>Ref: Panthou, G.; Vischel, T.; Lebel, T. Recent trends in the regime of extreme rainfall in the Central Sahel. Int. J. Climatol. 2014, 34, 3998–4006, doi:10.1002/joc.3984 [Thierry Lebel, France]</p>	Noted: The Panthou 2014 paper is included in the Atlas assessment.
115279	35	3	35	25	Again move relevant material to Atlas if appropriate and synthesise here. [Richard Jones, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: It's already a synthesis. Necessary overlap
74591	35	8	35	8	To check if it isn't published about ... ; Teichmann et al., submitted) [Moulay Driss HASNAOUI, Morocco]	NOTED: paper is published now.
126505	35	10	35	10	Either "a projected drying trend" or "projected drying trends". [Trigg Talley, United States of America]	ACCEPTED: text has been revised
29349	35	10	35	11	<p>The statement seems somewhat at odds with the confidence given to increases in West Africa in Chapter 8 (page 79) "Overall, CMIP3 and CMIP5 models agree in projecting a wetter West African monsoon (WAFriM) (Biasutti, 2013a)". No doubt this will be further updated with CMIP6 results, but the authors here should ensure consistency.</p> <p>Nevertheless, it is very encouraging that Chapter 12 appears to be clearly assessing different lines of evidence (GCMs and RCMs in this case) in a coherent way, as suggested in Chapter 10. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]</p>	NOTED. As stated in the beginning of the sentence global and regional models do not really agree, but almost all regional studies show this dipole of wet and dry within the West Africa region. Assessment is referred to the Atlas since the Atlas is responsible of the mean precip. assessment.
15145	35	10	35	13	I am not so sure about the high confidence in the drying of western Sahel. CORDEX Africa RCMs are nearly equally split between 'dry' and 'wet' (see eg https://iopscience.iop.org/article/10.1088/1748-9326/ab7fde In addition it is not clear if this assessment is based on RCMs only (and if yes, why is it so?) [Alessandro Dosio, Italy]	ACCEPTED. Confidence is medium now and in line with the Atlas that is responsible for the assessment of mean precip.
126507	35	11	35	11	Remove "a" before "medium confidence". [Trigg Talley, United States of America]	ACCEPTED: done
106485	35	15	35	20	Why the "low confidence" for increasing precipitation for a 1.5oC and 2oC warming scenario are found in central and eastern Sahel when there are in the next sentences listed a series of papers that support this increasing precip trend with warming for this region? Why not "medium confidence"? Unless there are other papers showing no change or drying, in which case this should be mentioned and the papers cited. [Lennard Christopher, South Africa]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
31821	35	15	35	25	<p>These are just some references from many that should be considered as lines of evidence in the assessment if the authors are considering GWL:</p> <p>Maure et al 2018 doi:10.1088/1748-9326/aab190. Klutse et al 2018 doi: 10.1088/1748-9326/aab37b Mba et al 2018 doi: 10.1088/1748-9326/aab048 Osima et al 2018 doi: 10.1088/1748-9326/aaba1b Kumi and Abiodun 2018 doi: 10.1088/1748-9326/aab89e [Izidine Pinto, South Africa]</p>	Noted: all these references are in the Atlas Africa section which we refer to. No need to include here too.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
114797	35	15	35	25	The discussion is somewhat confusing, and needs to be rewritten. The authors should generate clear assessments for confidence statements for southern Africa, West Africa and East Africa. Please take care for the discussion to be consistent with that of Chapter 3, which shows for example, substantial and robust decreases in precipitation projected for southern Africa. [Francois Engelbrecht, South Africa]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
35999	35	15	35	25	In this section devoted to results obtained from the CORDEX simulation, more should be said about some basic flaws of the GCMs (used to force the Cordex simulations) in tropical regions. Roehrig et al. (2013), for instance, showed that for West Africa "CMIP5 models have not yet reached a degree of maturity which makes it possible to rely directly on them to anticipate climate changes and their impacts, especially with regards to rainfall"; Annual rainfall over a Sahel box may vary by a factor 10 across models, interannual variability and decadal variability being also very different from one model to the other. This point was already mentioned in my first review. It seems that things have not improved in CMIP6 simulations, at least for some models, as mentioned in Voltaire et al. (2019), the West African monsoon being degraded as compared to what it was in CMIP5. This is indirectly acknowledged since the paragraph starts by mentioning "low confidence". But this is followed by a whole set of numbers whose significance is highly questionable. Ref: Roehrig, R., Bouniol, D., Guichard, F., Hourdin, F. and Redelsperger, J.-L. The present and future of the west african monsoon: a process oriented assessment of CMIP5 simulations along the AMMA transect. J. Climate, 26.17, 6471-6505 Voldoire, A.; SaintMartin, D.; Sénési, S.; Decharme, B.; Alias, A.; Chevallier, M.; Colin, J.; Guérémy, J.; Michou, M.; Moine, M.; et al. Evaluation of CMIP6 DECK Experiments With CNRMCM61. J. Adv. Model. Earth Syst. 2019, 11, 2177–2213, doi:10.1029/2019MS001683 [Thierry Lebel, France]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
126509	35	18	35	18	Check parentheses for reference to Teichmann. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
74593	35	18	35	18	To check if it isn't published about (Teichmann et al., submitted) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
33601	35	18			Change: "...and in (Teichmann et al., submitted) that..." by "...and in Teichmann et al. (submitted) that...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
51813	35	22	35	22	Suggested edit: '...except for Ethiopia, where a mixed..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
126511	35	23	35	23	Add: ""... submitted). In Tanzania, the observed drying trend contradicts the projected increase in precipitation from climate models (Borhara et al. 2020)."" Citation: Borhara, K., B. Pokharel, B. Bean, L. Deng, and S.-Y. Wang, 2020: On Tanzania's Precipitation Climatology, Variability, and Future Projection. Climate, 8, 34. https://www.mdpi.com/2225-1154/8/2/34 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
31823	35	23	35	24	Adding this sentences in a paragraph dealing with projections based on GLW is confusing. The authors should clarify the period and scenario for these projections. [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: text has been removed and referred to Atlas.
106487	35	27	35	28	I think this is too general and think the statement needs to have a regional aspect so that it reads something like "In many parts of Africa, from 1990 through 2014," [Lennard Christopher, South Africa]	NOTED: text has been revised but this opening sentence has been kept since it gives a general overview followed but region specific assessment.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
74595	35	27	35	39	Within the paragraph lign 27 to 39 if you find it interesting its about significant obserbvations in Morocco in north Africa : First according to the National Plan of Inundations (NPI) it shows that the number of inundated sites between 2002 and 2017 increases from 392 to 1032 inundated sites (the frequency of inundation is in rise), secondly the bassin Saquia Al Hamra branch most active part of about 35000 km square (the total area of the basin is of 78 000 km square) located in the south of Morocco has known in october 2016 a big inundation generated by more than 300 mm/day (i.e. more than ten times the mean annual rainfall) in some rainfall gauging stations from the upper part of the basin (Hasnaoui, 2018). Ref. Hasnaoui M.D. (2018). Reconstitution of October 25th, 2016 flood in the Saquia Al Hamra basin through hydrological-hydraulic modeling, Fourth International Symposium on Flash Floods in Wadi Systems (4th ISFF), December 4th-6th, 2018, Casablanca-Morocco (www.isff2018.com). [Moulay Driss HASNAOUI, Morocco]	Noted: the paper seems not be available.
36001	35	27	35	39	A specific section on rainfall extremes, before tackling the quesions of floods would have been appropriate here. Indeed the reinforcement of rainfall extremes, in the general framework of hydro-climatic intensification is , before anything else, a climatological phenomenon, while an increased frequency and severity of floods and inundations (e.G. Di Baldassare et al., 2010) result from both heavy rainfall and changing surface conditions. These two issues shoud thus be treated separately Ref: Di Baldassarre, G.; Montanari, A.; Lins, H.; Koutsoyiannis, D.; Brandimarte, L.; Blöschl, G. Flood fatalities in Africa: From diagnosis to mitigation. Geophys. Res. Lett. 2010, 37, doi:10.1029/2010GL045467. [Thierry Lebel, France]	TAKEN INTO ACCOUNT: the section has been revised and there is a separate paragraph on Heavy precipitation and pluvial flooding has been added that refers to CH11.
36003	35	32	35	34	Precipitation intensity also likely increased in recent years over West Africa from the 1990s after decreasing precipitation amount trends in the 1970s and early 1980s causing floods in the region (Evan et al., 2015; Li et al., 2016a; Barry et al., 2018; Panthou et al., 2018; Biasutti, 2019). Mention the work of Panthou et al. (2014) here; they were the first to perform an anlysis on the intensification from gauge data for a region in Africa. Ref: Panthou, G.; Vischel, T.; Lebel, T. Recent trends in the regime of extreme rainfall in the Central Sahel. Int. J. Climatol. 2014, 34, 3998–4006, doi:10.1002/joc.3984 [Thierry Lebel, France]	NOTED: text has been revised and this sentence removed.
36005	35	32	35	34	Precipitation intensity also likely increased in recent years over West Africa from the 1990s after decreasing precipitation amount trends in the 1970s and early 1980s causing floods in the region. This statement is not well balanced; as shown by Panthou et al. (2014), the drought of the end of the 20th century was mostly linked to a decrease of the number of rainfall events (see also LeBarbé et al., 2002 on this issue), the mean rainfall per event remaining somewhat unchanged from the previous wet period. At eh beginning of the 2000s, the mean rainfall per event started to increase, mostly due to heavier extreme events, while the deficit of rainfall occurrence pervaded. I suggest to reformulate the statement to better explain this fundamental change of the rainfall regime. [Thierry Lebel, France]	NOTED: text has been revised and this sentence removed.
51815	35	33	35	33	Grammatical edit: '1980s, causing floods..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
126513	35	34	35	39	What timeframe is referred to here with flood events? [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51817	35	38	35	38	Missing word: In Southern Africa heavy precipitation events have increase in frequency (medium confidence). [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: modified as suggested
38461	35	38	35	42	The two statements on the projections over South Africa contradict each other. Even if it is correct, we suggest more explanation about the difference between “increase in frequency” and “extreme precipitation change”. [Mansour Almazroui, Saudi Arabia]	NOTED: text has been revised only one statement is now kept.
38181	35	41	35	41	In North and South Africa models general"ly" disagree on ~ [Junhee Lee, Republic of Korea]	NOTED: text has been revised and this sentence removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126515	35	41	35	41	Replace "general" with "generally". [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
126517	35	41	35	41	What does "the sign of extreme precipitation change that can lead to pluvial floods" mean? [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
20951	35	41	35	42	The way the sentence has been introduced cause confusion. I suggest the Author to find the better way to present the facts, but probably there might be more models are on agreement on the intensification of extreme precipitation, which is consistent with previous findings or even previous statement in this chapter [Ladislaus Chang'a, United Republic of Tanzania]	NOTED: text has been revised and this sentence removed.
100293	35	41	35	48	According to Chapter 11 (Table 11.4), increasing in heavy precipitation over NEAF and CEAF - low confidence [Claudine Dereczynski, Brazil]	NOTED: text has been revised and this sentence removed. The text refers to CH11 now
13865	35	42	35	42	check if R99a is correct, not understood [Maria Amparo Martinez Arroyo, Mexico]	NOTED: text has been revised and this sentence removed.
33603	35	44			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	NOTED: text has been revised and this sentence removed.
126519	35	47	35	47	Remove "for" [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51819	35	47	35	47	suggested edit: '...scenarios, with widespread flood occurrences projected before...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
38183	35	48	35	48	Missing parenthesis after (high confidence)" [Junhee Lee, Republic of Korea]	NOTED: text has been revised and this sentence removed.
13867	35	48	35	48	Missing closing parenthesis in (high confidence (Sylla et al., 2015; Diallo et al., 2016; Dosio et al., 2019; Kendon et al., 2019) [Maria Amparo Martinez Arroyo, Mexico]	NOTED: text has been revised and this sentence removed.
33605	35	48			Change: "...mature monsoon season (high confidence (Sylla et al., 2015; Diallo et al., 2016; Dosio et al., 2019; Kendon.. » by « ...mature monsoon season (high confidence) (Sylla et al., 2015; Diallo et al., 2016; Dosio et al., 2019; Kendon..." [Guiomar Rotllant, Spain]	NOTED: text has been revised and this sentence removed.
36007	35	49	35	50	A change in monsoon seasonality is also reported in West Africa and Sahel. Why is this statement appearing here and not in the first paragraph devoted to "Mean precipitation" ? A reference to Lebel and Ali (2009) would be appropriate, since they were the first to point to a durable shifting of the seasonality of the Sahelian rainfall after the annua rainfall regained some stream in the 2000s Ref: Lebel, T. and Ali, A., 2009. Recent trends in the Central and Western Sahel rainfall regime (1990 - 2007). J. Hydrol., 375(1-2), 52-64 [Thierry Lebel, France]	NOTED: text has been revised and this sentence removed.
29351	35	49			The change in monsoon seasonality is raised here but it does not define how that seasonality has changed. Does the onset occur earlier or later, or does the cessation date change? Alternatively, the following sentence seems to suggest a weakening of rainfall during the WAM monsoon season (and therefore a damping of the seasonality) but that appears at odds with the findings of Chapter 8 for a wetter West African monsoon. This should be verified. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
126521	35	50	35	50	"A forward shift in time" sounds a bit like time travel. Does this mean that the monsoon season may start earlier in the year? [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
126523	35	51	35	51	Revised to "associated with" [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
126525	35	51	35	51	Change "to" to "with" [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51821	35	51	35	51	suggested edit: 'been associated with a...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
29353	35	51			Change "associated to" to "associated with" [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126527	35	52	35	52	Explain "a soil precipitation feedback". [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51823	35	52	35	52	African Easterly Wave activity in the 6-9 day regime ¹ - it is not clear what this means, please explain. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
51825	35	55	35	55	Extreme river discharge, as characterised by the 30 year return period (T30) of 5-day average peak flow, ... ¹ (comma missing) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	EDITORIAL: revised as suggested.
27479	35	55	36	2	We suggest checking the information: Roudier, P., Ducharne, A., and Feyen, L.: Climate change impacts on runoff in West Africa: a review, Hydrol. Earth Syst. Sci., 18, 2789–2801, https://doi.org/10.5194/hess-18-2789-2014 , 2014. The future tendency in streamflow developments is overall very uncertain (median of the 301 points is 0% and mean +5.2 %), except for (i) the Gambia River, which exhibits a significant negative change (median=-4.5 %), and (ii) the Sassandra and the Niger rivers, where the change is positive (+14.4% and +6.1 %). A correlation analysis revealed that runoff changes are tightly linked to changes in rainfall (R =0.49), and to a smaller extent also to changes in potential evapotranspiration. [Eric Brun, France]	ACCEPTED: we included the reference.
51827	36	1	36	7	It would be helpful to clarify here the assumption that there are no flood management interventions in these simulations. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: That fact that the Ch 12 assessment of CID changes only takes into account climatic phenomena and not adaptation measures is now discussed in Pg 13,, lines 19-29.
33607	36	3			Change: "...Q90 quantiles shown in (Krysanova et al., 2017),..." by "...Q90 quantiles shown in Krysanova et al. (2017),...". [Guiomar Rotllant, Spain]	NOTED: text has been revised and text modified.
126529	36	5	36	5	Clarify "gets the same uncertainty conclusion". [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51829	36	9	36	9	floods, represented by the 100-years return period threshold (T100), are.. (add comma) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and text modified.
31827	36	9	36	15	Sentence not clear. Needs to be rewritten for clarity [Izidine Pinto, South Africa]	NOTED: text has been revised and this sentence removed.
33609	36	10			Erase comma: "projected by Alfieri et al., (2017)". [Guiomar Rotllant, Spain]	NOTED: text has been revised and text modified.
51831	36	11	36	11	and hydraulic model projections..' (remove 's') [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and text modified.
51833	36	11	36	13	Are these estimates averaged over the whole continent of Africa? Please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and text modified.
74597	36	12	36	12	a flood event of T100 in present day climate will have a returne periode of : first to define T100 even if we can understand that it's a return period but not by every one; second for "present day climate" we need to precise [Moulay Driss HASNAOUI, Morocco]	NOTED: text has been revised and text modified.
33611	36	14			Erase comma: "Hirabayashi et al., (2013b)". [Guiomar Rotllant, Spain]	NOTED: text has been revised and text modified.
106493	36	17	36	19	Generalizing this to all of Africa in line 17 and then listing sub region in lines 18 and 19 is a bit confusing. Maybe start with "Many regions of Africa will undergo....". [Lennard Christopher, South Africa]	REJECTED: the text refers to specific regions only.
41843	36	17	36	20	I strongly recommend that Authors visit the UNDRR and EM-DAT International database with regards to landslides issues. Talking about landslides, how many people died from landslides during the last years? Please, find references dealing with economic losses and deaths; this is important for decinion makers, etc. [JACQUES ANDRE NDIONE, Senegal]	REJECTED: this is outside of the WGI mandate and falls within the remit if WGII
43473	36	17			Read " There is an increase in reported landslides " rather than " There in an increase in reported landslides " [Cyriaque Rufin Nguimalet, Central African Republic]	NOTED: non really clear which is the suggestion
126531	36	18	36	18	Can the timeframe be more precise? [Trigg Talley, United States of America]	REJECTED: "past decades" is an acceptable time frame

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102673	36	22	36	22	Where in Africa: South Africa? [Philippe Tulkens, Belgium]	REJECTED: Since this is the starting sentence we use Africa here. More specific regional details are given from the next sentence onward.
41845	36	22	36	22	"Droughts in Africa regions have been a major hazard in recent decades": this statement is right but it would be good if we can add some references, and give the number of economic losses and deaths that it resulted; this is important for decision makers, etc. [JACQUES ANDRE NDIONE, Senegal]	REJECTED: Impacts are exclusively discussed in WGII report
86259	36	22	36	22	"in recent decades" – droughts have always been a major hazard. [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED: text has been revised and this sentence removed.
20953	36	22	36	24	We suggest to improve the way the sentence has been written. It is not clear to say increased tendency for long duration drought is substantially relevant for Grain production. Suggest to say significantly affecting crop production to be more clear and precise [Ladislav Chang'a, United Republic of Tanzania]	ACCEPTED: text has been revised
11815	36	22	36	46	the paragraph on Aridity and Drought should also cite Thomas et al., 2005, who pointed out that reactivation of now-quasi-stable aeolian (wind-formed) dunes under a warmer, drier climate that reduces vegetation cover is expected to decrease the habitability of numerous regions, including large portions of Africa: Thomas, D. S. G., Knight, M., & Wiggs, G. F. S. (2005). Remobilization of southern African desert dune systems by twenty-first century global warming. Nature, 435, 1218–1221. Doi:10.1038/nature03717 [Amy East, United States of America]	REJECTED: this paper is relevant for the ecosystem impact so more a WGII topic.
38203	36	22	36	46	Sahel rainfall/aridity/drought projection uncertainty is interlinked to the Mediterranean and wetting impact of Mediterranean Sea warming can become more dominant in a future warming climate (e.g., Park et al., 2015, 2016). Park, J.-Y., J. Bader, and D. Matei, 2015: Northern-hemispheric differential warming is the key to understanding the discrepancies in the projected Sahel rainfall. Nature communications, 6, 5985, https://doi.org/10.1038/ncomms6985 . —, —, and —, 2016: Anthropogenic Mediterranean warming essential driver for present and future Sahel rainfall. Nature Climate Change, 6, https://doi.org/10.1038/nclimate3065 . [Junhee Lee, Republic of Korea]	Rejected: these papers are mainly referring to single model study for process understanding that is dealt with in Chapter 11.
38463	36	22	37	6	Findings from the Figure 12.6, especially the information from the CMIP6 scenarios, is not sufficiently reflected in this section. Therefore, we suggest to include the relevant information. [Mansour Almazroui, Saudi Arabia]	REJECTED: figures have been modified and when relevant are referred to in the text.
126533	36	23	36	23	Clarify the timeframe for increased tendency for droughts. Also, the tendency has increased by how much? [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
51835	36	23	36	23	long duration' - can this be more specific? E.g. how long - is this seasons or years? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: text has been revised and this sentence removed.
126535	36	23	36	29	Remove "the" after "In Ethiopia" [Trigg Talley, United States of America]	ACCEPTED: text has been revised
106489	36	24	36	24	Is it necessary to single out grain production? In these regions drought impacts all crop types. [Lennard Christopher, South Africa]	NOTED: text has been revised and this sentence removed.
74599	36	25	36	26	To check if it isn't published about (Driouech et al., submitted) [Moulay Driss HASNAOUI, Morocco]	NOTED: text has been revised and this sentence removed.
86261	36	30	36	30	What does this mean, "have turned to moderate dry events in recent years"? [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: text has been revised
51837	36	31	36	31	short duration' - can this be more specific? E.g. how long - is this seasons or years? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised
51839	36	31	36	32	suggested edit: 'increased by 220% between 1961 and 2016 as a result of..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126537	36	32	36	32	Clarify the time period for the risk of further increase. [Trigg Talley, United States of America]	NOTED: text has been revised and this sentence removed.
126539	36	34	36	34	This link between heatwaves and drought is good. Should this section include "flash droughts"? Also, it would be good for the earlier paragraphs about increased temperatures and extreme heat to refer to this section on drought. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: flash drought. terminology is now used.
114799	36	35	36	35	Here the authors need to refer to the Chapter 10 Box on the drought in the Western Cape in South Africa, and they should ensure that the discussion is consistent with that Box. [Francois Engelbrecht, South Africa]	NOTED: reference to CH10 is there at the end of the Cape Town discussion
20955	36	35	36	37	Three consecutive years of below normal rainfall does not necessarily mean drought. It depend to what extend is rainfall below normal. I suggest the Author make improvement to enhance clarity. [Ladislaus Chang'a, United Republic of Tanzania]	ACCEPTED: sentence has been rephrased now
14957	36	35	36	42	Might be worth to add the following reference: Burls, N.J., Blamey, R.C., Cash, B.A., Swenson, E.T., al Fahad, A., Bopape, M.-J.M., Straus, D.M., Reason, C.J.C., 2019. The Cape Town "Day Zero" drought and Hadley cell expansion. npj Clim. Atmos. Sci. 2, 27. https://doi.org/10.1038/s41612-019-0084-6 [Juan Rivera, Argentina]	ACCEPTED: thanks, we now include the reference
31829	36	42	36	42	Please change "The same region (specifically in Malawi) has witnessed..." to something as "Malawi has experienced...". By using 'the same region' after discussing Western Cape drought previously one assumes Malawi is in Western Cape. [Izidine Pinto, South Africa]	ACCEPTED: sentence has been rephrased now
86263	36	42	36	42	"The same region" – what is this referring to? The text was discussing the Western Cape? [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: sentence has been rephrased now
106491	36	42	36	42	Remove "The same region (specifically in Malawi)" and start with "In Malawi, ". Because the text implies Cape Town is in the same region as Malawi and also because Malawi and Cape town experience two totally different rainfall regimes. [Lennard Christopher, South Africa]	ACCEPTED: sentence has been rephrased now
51841	36	45	36	46	Suggested reordering: 'In summary there is (with medium confidence) an increase in droughts in past decades for South Africa and West Africa and generally low confidence in other African regions.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: sentence has been removed now
100297	36	45	36	46	According to Chapter 11 (Table 11.4), over WAF there is decrease in the dryness (medium confidence) and over CAF there is increase (high confidence) [Claudine Dereczynski, Brazil]	ACCEPTED: sentence has been removed now and the section refers to CH11.
31831	36	46	36	46	Please clarify if it is South Africa the country or Southern Africa the region which is sub-divided into two regions according to Iturbe et al 2020 (https://doi.org/10.5194/essd-2019-258) [Izidine Pinto, South Africa]	ACCEPTED: sentence has been removed now and the section refers to CH11.
114801	36	48	37	6	Here the authors may also want to consider the paper by Engelbrecht et al. (2015), which discusses drastic increases in near-surface temperatures in Africa that co-occur with projected decreases in soil-moisture and rainfall. [Francois Engelbrecht, South Africa]	ACCEPTED: references added.
100299	36	48	37	6	Please, refer to Africa subregions: WAF, SAH, NEAF, CEAF, SWAF, SEAF and CAF [Claudine Dereczynski, Brazil]	ACCEPTED: text has been revised
13869	36	49	36	49	Change 1.5 to 2 by 1.5 °C to 2 °C [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: modified as suggested
126541	36	49	36	49	Suggest defining aridity as distinct from drought. [Trigg Talley, United States of America]	NOTED: This distinction is made in 12.2
100301	36	50	36	51	According to Chapter 11 (Table 11.4) high confidence in increse dryness over SWAF and SEAF [Claudine Dereczynski, Brazil]	ACCEPTED: assessment is consistent now
33613	36	52			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	EDITORIAL: done
20957	36	55	37	2	The Author need to be more descriptive and specify the Population exposed to What ? [Ladislaus Chang'a, United Republic of Tanzania]	ACCEPTED: text has been revised and sentence removed.
14959	37	3			"agricultural and hydrological moderate drought" please rephrase the sentence for clarity [Juan Rivera, Argentina]	ACCEPTED: text has been revised

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51843	37	4	37	4	by the end of the 21st century' - please specify under which scenario(s) this refers to. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised
41751	37	5	5	37	add Palmer Drought Severity Index (PDSI)to glossary [Sawsan Mustafa, Sudan]	ACCEPTED: Comment forwarded to Glossary
11817	37	5	37	5	“the” rather than “a” Palmer Drought Severity Index [Amy East, United States of America]	ACCEPTED: text has been revised
13871	37	6	37	6	Change 1.5 by 1.5 °C [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: text has been revised
31833	37	6	37	6	Should it be “1.5 and 2°C global warming levels’ instead of ‘... 1.5 and 2°C global warming scenarios’? [Izidine Pinto, South Africa]	ACCEPTED: text has been revised
114803	37	8	37	15	The authors may want to consult Engelbrecht et al. (2015), which discusses projected changes in high fire-danger days in Africa under low mitigation futures, and Engelbrecht and Engelbrecht (2016), which discusses changes in aridity under different levels of global warming: Engelbrecht F.A., Adegoke J., Bopape M-J., Naidoo M., Garland R., Thatcher M., McGregor J., Katzfey J., Werner M., Ichoku C. and Gatebe C. (2015). Projections of rapidly rising surface temperatures over Africa under low mitigation. Env. Res. Letters. 10 085004. Engelbrecht C.J. and Engelbrecht F.A. (2016). Shifts in Köppen-Geiger climate zones over southern Africa in relation to key global temperature goals. Theoretical and applied climatology 123 247-261. DOI 10.1007/s00704-014-1354-1. [Francois Engelbrecht, South Africa]	ACCEPTED: text has been revised and the relevant paper included
33615	37	12			Add comma. Change: “In the future fire activity trends are expected to be controlled by...” by “In the future, fire activity trends are expected to be controlled by...”. [Guiomar Rotllant, Spain]	ACCEPTED: text has been revised
51845	37	13	37	13	suggested edit: 'demography and to continue to decrease...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised
33617	37	13			Add comma. Change: “However fire..” by “However, fire..” [Guiomar Rotllant, Spain]	ACCEPTED: text has been revised
51847	37	14	37	14	in North and South Africa, where...' (add comma) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: text has been revised
110139	37	17	37	21	This is an example where the finding is implied to lead to changes irrespective of future emissions choices. The finding needs to be rewritten to explicitly note scenario dependnece and the preceding text needs to be modified accordingly. [Peter Thorne, Ireland]	ACCEPTED: text has been revised
126543	37	17	37	21	The summary paragraph states that there is expected heavy precipitation and drought in several regions within Africa. That seems contradictory, so it might be good to add a sentence explaining why both are projected and can co-occur. [Trigg Talley, United States of America]	ACCEPTED: text has been revised
100303	37	17	37	21	Please, refer to Africa subregions: WAF, SAH, NEAF, CEAF, SWAF, SEAF and CAF [Claudine Dereczynski, Brazil]	ACCEPTED: text has been revised
100305	37	17	37	21	Please, check Chapter 11 (Table 11.4) to adjust some inconsistencies [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: a cross-chapter team has fixed inconsistencies
38185	37	20	37	20	Western part of west Africa --> western part of West Africa [Junhee Lee, Republic of Korea]	ACCEPTED: modified as suggested
98145	37	20	37	20	High confidence in increasing drought conditions in Southern African regions seems not justified iwhen observed trends (1901-2010) over most the region show little evidence of detectable decreases in precipitation, with a mix of nondetectable positive and negative trends across the region. They show some decreases across southeastern Africa over 1951-2010, but then back to increases over 1981-2010 The models are indeed very consistently indicating decreases over these, but the observations don't seem to have the same story as the models, and seem more influenced by natural variability. [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: Based on extensive discussions with the cross-chapter group on droughts, high confidence in changes are now only projected in WSAF (of the southern African regions) and only for Agr&Eco droughts.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
29355	37	32			Change from "consequences on" to "consequences for" (likewise "for extreme winds" later in the sentence). [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Modified as suggested
102675	37	41	37	41	decreased->decrease [Philippe Tulkens, Belgium]	ACCEPTED: Modified as suggested
20287	37	41	37	41	decrease [philippe waldteufel, France]	ACCEPTED: Modified as suggested
126545	37	41	37	41	Revise to "projected decrease" [Trigg Talley, United States of America]	ACCEPTED: Modified as suggested
126547	37	41	37	41	Change "decreased" to "decrease" [Trigg Talley, United States of America]	ACCEPTED: Modified as suggested
86265	37	41	37	43	Re cyclones: perhaps more important than how often they make landfall, is how severe they are? And there is evidence that category 4 and 5 cyclones in the southern Indian ocean are on the increase. http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S0038-23532018000600018 [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: And thanks for the new reference, now included
13873	37	42	37	42	Change 1, 2 by 1 °C, 2 °C [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Modified as suggested
81235	37	47	37	48	"There is limited evidence and low agreement of secular 20th century trends in wind speeds or dust emissions" please specify taking into account the conclusions in L35-L37 "there is medium confidence in future decreasing mean wind, wind energy potential and strong winds in North Africa and Mediterranean regions." [Fatima Driouech, Morocco]	ACCEPTED: We now actually have fixed inconsistencies, the confidence in past trends is low.
13875	37	52	37	52	Change (Evan et al., 2016; Ridley et al., 2014) by (Evan et al., 2016; Ridley et al., 2014). [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Modified as suggested
33619	37	52	37	53	Check for reference format. Change: "...between the 1970s and 1980s and lower concentrations thereafter (Evan et al., 2016; Ridley et al., 2014). Yet, the effect of vegetation changes may not be negligible (Pu and Ginoux, 2017) (Pu and Ginoux, 2018)." By "...between the 1970s and 1980s and lower concentrations thereafter (Evan et al., 2016; Ridley et al., 2014). Yet, the effect of vegetation changes may not be negligible (Pu and Ginoux, 2017, 2018)". [Guimar Rotllant, Spain]	ACCEPTED: Modified as suggested
13877	37	53	37	53	Change (Pu and Ginoux, 2017) (Pu and Ginoux, 2018) by (Pu and Ginoux, 2017, 2018). [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Modified as suggested
126549	37	53	37	53	Suggest revising to: ""Yet, the effect of vegetation changes may not be negligible (Pu and Ginoux, 2017; Pu and Ginoux, 2018). Current dust models do not adequately represent dynamic or changing surface roughness due to vegetation change and so projections of dust emissions through the 21st century lack validity (e.g., Albani et al., 2014)."" Citation: Albani, S., Mahowald, N.M., Perry, A.T., Scanza, R.A., Zender, C.S., Heavens, N.G., Maggi, V., Kok, J.F., Otto-Bliesner, B.L., 2014. Improved dust representation in the Community Atmosphere Model. Journal of Advances in Modeling Earth Systems 6, doi:10.1002/2013MS000279.) [Trigg Talley, United States of America]	ACCEPTED: Suggestion included, thanks to the reviewer
43475	37	53			Read " (Pu and Ginoux, 2017, 2018)" rather than " (Pu and Ginoux, 2017) (Pu and Ginoux, 2018) [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: Modified as suggested
126551	38	2	38	2	Suggesting revising to: "" ... and anthropogenic land use change and land cover change due to invasive species and the intensity of land management (Ginoux et al., 2012; Webb and Pierre, 2018)."" Citation: Webb, N.P., Pierre, C., 2018. Quantifying anthropogenic dust emissions. Earth's Future 6, 286-295. [Trigg Talley, United States of America]	ACCEPTED: And thanks for the new reference, now included
26447	38	7	38	8	If possible avoid giving the information about alternative scenarios in the brackets - it is not obvious how this should be read. ("...decrease (increase) in mean wind speed in North Africa (South East and South West Africa)...") [Mare Sundström, Sweden]	REJECTED: we keep this style for the whole chapter which condenses best the information

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20959	38	9	38	9	Replace Majority with Most or Many to be consistent with previous and mostly used wording. [Ladislaus Chang'a, United Republic of Tanzania]	ACCEPTED: Modified as suggested
67081	38	15	38	15	Remove 'In Africa' [Regine Hock, United States of America]	ACCEPTED: modify as suggested
67079	38	15	38	17	The only reference given does not support all aspects of this statement esp the agricultural and water resources impact. Needs reference or sentence adjusted [Regine Hock, United States of America]	NOTED: text has been revised and text modified.
45619	38	15	38	17	The substantial impact of glacier and snow decrease over those mountain regions of Africa over agriculture, water resource and ecosystem is not supported by any reference here. Please provided a supported reference for this statement. In the case of Kilimanjaro, Said et al. (2019) mentioned that glacier contribution to river runoff is around 5% and could be considered negligible. Said, M., Komakech, H.C., Munishi, L.K. et al. Evidence of climate change impacts on water, food and energy resources around Kilimanjaro, Tanzania. Reg Environ Change 19, 2521–2534 (2019). https://doi.org/10.1007/s10113-019-01568-7 [Lucas Ruiz, Argentina]	NOTED: text has been revised and text modified.
45621	38	15	38	28	The use of the term "ice" is confusing here. I suggest to use glacier, glacier extent or glacier mass loss, instead of ice. [Lucas Ruiz, Argentina]	ACCEPTED: modified as suggested
88069	38	15			The entire section over-simplifying, to a large extent ignoring the majority of scientific findings and in parts simply not correct. It needs to be rewritten as a whole. You may also refer to AR4 WG1 and WG2. The paper by Veettil and Kamp (2019) is of very low quality, listing a long series of references but ignoring their content and results but basing the findings on a very coarse satellite image analysis instead. Please do not use it. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: We revised this section based on more references
63681	38	15			Section 12.4.1.4: The conclusion states that there is low confidence in a continuing trend of glacial ice decrease in the future. Should this be a higher confidence level? There is limited evidence exploring the question directly, but substantial confidence that temperatures will increase in the future which drives the melt (and has led to the observed decrease in glacial ice extent in the past). This would also increase consistency with what is displayed in Table 12.3 which states medium confidence of decrease is snow and land ice and permafrost. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: we revised the statements
126553	38	16	38	16	Remove "the". Clarify the term "impact". Snow and ice contribute significantly and positively to agriculture, etc., so "impact" likely not the right word choice. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been revised
88071	38	16	38	17	The statement that there is substantial impact on water resources is incorrect. Such an impact is not possible due to the small size of the glaciers. Mölg et al. (2008, 2013) made this point very clearly and provided simple calculation examples that show that these glaciers cannot be significant water resources. If there is any impact on agriculture and ecosystems, the extent of this impact (e.g. local, catchment scale) must be specified. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
132055	38	16	38	17	Mölg, T., D.R. Hardy, N.J. Cullen, and G. Kaser (2008): Tropical Glaciers, climate change, and society: Focus on Kilimanjaro (East Africa). In: Orlove, B., E. Wiegandt, and B. Luckman (eds.): The Darkening Peaks: Glacial Retreat in Scientific and Social Context. University of California Press: Berkeley, London, pp. 168-182. [Georg Kaser, Austria]	NOTED: text has been revised and text modified.
132057	38	16	38	17	Mölg, T., N.J. Cullen, D.R. Hardy, G. Kaser, L. Nicholson, R. Prinz, and M. Winkler (2013): East African glacier loss and climate change: Corrections to the UNEP article "Africa without ice and snow". Environmental Development, vol. 6, pp. 1-6. [Georg Kaser, Austria]	NOTED: text has been revised and text modified.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
132059	38	16	38	17	The statement that there is substantial impact on water resources is incorrect. Such an impact is not possible due to the small size of the glaciers. Mölg et al. (2008, 2013) made this point very clearly and provided simple calculation examples that show that these glaciers cannot be significant water resources. If there is any impact on agriculture and ecosystems, the extent of this impact (e.g. local, catchment scale) must be specified. --- Mölg, T., D.R. Hardy, N.J. Cullen, and G. Kaser (2008): Tropical Glaciers, climate change, and society: Focus on Kilimanjaro (East Africa). In: Orlove, B., E. Wiegandt, and B. Luckman (eds.): The Darkening Peaks: Glacial Retreat in Scientific and Social Context. University of California Press: Berkeley, London, pp. 168-182. ---- Mölg, T., N.J. Cullen, D.R. Hardy, G. Kaser, L. Nicholson, R. Prinz, and M. Winkler (2013): East African glacier loss and climate change: Corrections to the UNEP article "Africa without ice and snow". Environmental Development, vol. 6, pp. 1-6. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
88073	38	17	38	19	"The fate of these glaciers is largely dependent to temperature. rising temperature and fluctuating precipitation." First, it is not clear whether global temperature or local temperature is meant. Second, assuming that a local climate statement is desired here, the statement is in conflict with many published studies. These studies presented overwhelming evidence, based on the physics of the glacier-atmosphere interaction, that a decline in local snowfall at the high summits has been the major local driver of modern (since the late 19th century) glacier recession in East Africa. These studies are most advanced for Kilimanjaro and Mount Kenya, and while there are many more, Mölg et al. (2009) and Prinz et al. (2016) would be the ones that summarize the problem most obviously. Kruss (1983), moreover, was an early study to point out the precipitation importance. Mölg et al. (2013) also emphasize that the snowfall driver refers to the LOCAL scale, and that this does not rule out that GLOBAL warming is a background driver through Indian Ocean dynamics influences on East African precipitation (see also Thielke & Mölg, 2019). ---- Mölg, T., N.J. Cullen, D.R. Hardy, M. Winkler, and G. Kaser (2009): Quantifying climate change in the tropical mid-troposphere over East Africa from glacier shrinkage on Kilimanjaro. Journal of Climate, vol. 22, pp. 4162-4181. ---- Prinz, R., L.I. Nicholson, W. Gurgiser, T. Mölg, and G. Kaser (2016): Climatic controls and climate proxy potential of Lewis Glacier, Mt Kenya. The Cryosphere, vol. 10, pp. 133-148. ---- Kruss PD. (1983): Climate Change in East Africa: a numerical simulation from the 100 years of terminus record at Lewis Glacier, Mount Kenya. Zeitschrift für Gletscherkunde und Glazialgeologie, vol. 19, pp. 43-60. ---- Mölg, T., N.J. Cullen, D.R. Hardy, G. Kaser, L. Nicholson, R. Prinz, and M. Winkler (2013): East African glacier loss and climate change: Corrections to the UNEP article "Africa without ice and snow". Environmental Development, vol. 6, pp. 1-6. --- Thielke, A. and T. Mölg (2019): Observed and simulated Indian Ocean Dipole activity since the mid-19th century and its relation to East African short rains. International Journal of Climatology, vol. 39, pp. 4467-4478. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
132061	38	17	38	19	“The fate of these glaciers is largely dependent to temperature. rising temperature and fluctuating precipitation.” First, it is not clear whether global temperature or local temperature is meant. Second, assuming that a local climate statement is desired here, the statement is in conflict with many published studies. These studies presented overwhelming evidence, based on the physics of the glacier-atmosphere interaction, that a decline in local snowfall at the high summits has been the major local driver of modern (since the late 19th century) glacier recession in East Africa. These studies are most advanced for Kilimanjaro and Mount Kenya, and while there are many more, Mölg et al. (2009) and Prinz et al. (2016) would be the ones that summarize the problem most obviously. Kruss (1983), moreover, was an early study to point out the precipitation importance. Mölg et al. (2013) also emphasize that the snowfall driver refers to the LOCAL scale, and that this does not rule out that GLOBAL warming is a background driver through Indian Ocean dynamics influences on East African precipitation (see also Thielke & Mölg, 2019). --- Mölg, T., N.J. Cullen, D.R. Hardy, M. Winkler, and G. Kaser (2009): Quantifying climate change in the tropical mid-troposphere over East Africa from glacier shrinkage on Kilimanjaro. <i>Journal of Climate</i> , vol. 22, pp. 4162-4181. ---- Prinz, R., L.I. Nicholson, W. Gurgiser, T. Mölg, and G. Kaser (2016): Climatic controls and climate proxy potential of Lewis Glacier, Mt Kenya. <i>The Cryosphere</i> , vol. 10, pp. 133–148. --- Kruss PD. (1983): <i>Climate Change in East Africa: a numerical simulation from the 100 years of terminus record at Lewis Glacier, Mount Kenya</i> . <i>Zeitschrift für Gletscherkunde und Glazialgeologie</i> , vol. 19, pp. 43–60. --- Mölg, T., N.J. Cullen, D.R. Hardy, G. Kaser, L. Nicholson, R. Prinz, and M. Winkler (2013): East African glacier loss and climate change: Corrections to the UNEP article "Africa without ice and snow". <i>Environmental Development</i> , vol. 6, pp. 1-6. ---- Thielke, A. and T. Mölg (2019): Observed and simulated Indian Ocean Dipole activity since the mid-19th century and its relation to East African short rains. <i>International Journal of Climatology</i> , vol. 39, pp. 4467-4478. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
126555	38	18	38	18	Change "to" to "on" [Trigg Talley, United States of America]	NOTED: text has been revised and text modified.
126557	38	19	38	19	Remove "driven" [Trigg Talley, United States of America]	NOTED: text has been revised and text modified.
126559	38	20	38	20	Remove "their" [Trigg Talley, United States of America]	NOTED: text has been revised and text modified.
67083	38	21	38	21	bewteen 1906 and recent decades' seems odd: can the period be specified better? [Regine Hock, United States of America]	NOTED: text has been revised and text modified.
88075	38	21	38	21	It is unclear what “recent decades” means for the Rwenzori. Mölg et al. (2013) provide a summary plot for glacier shrinkage on all three massifs and would allow to specify a more precise date. [Georg Kaser, Austria]	NOTED: text has been revised and text modified.
11819	38	21	38	21	the Jackson et al., 2016, reference is not a peer-reviewed source. It’s an abstract from a small conference that did not have peer review of the abstracts. [Amy East, United States of America]	NOTED: text has been revised and text removed.
132063	38	21	38	21	It is unclear what “recent decades” means for the Rwenzori. Mölg et al. (2013) provide a summary plot for glacier shrinkage on all three massifs and would allow to specify a more precise date. --- Mölg, T., N.J. Cullen, D.R. Hardy, G. Kaser, L. Nicholson, R. Prinz, and M. Winkler (2013): East African glacier loss and climate change: Corrections to the UNEP article "Africa without ice and snow". <i>Environmental Development</i> , vol. 6, pp. 1-6. [Georg Kaser, Austria]	NOTED: text has been revised and text modified.
88077	38	21	38	24	The study of Prinz et al. (2018) is relevant for glacier shrinkage on Mount Kenya. --- Prinz, R., Heller, A., Ladner, M., Nicholson, L. I., & Kaser, G. (2018). Mapping the loss of Mt. Kenya’s glaciers: An example of the challenges of satellite monitoring of very small glaciers. <i>Geosciences</i> , 8(5), 174. [Georg Kaser, Austria]	ACCEPTED: thanks, we now include the reference

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132065	38	21	38	24	The study of Prinz et al. (2018) is relevant for glacier shrinkage on Mount Kenya. ---- Prinz, R., Heller, A., Ladner, M., Nicholson, L. I., & Kaser, G. (2018). Mapping the loss of Mt. Kenya's glaciers: An example of the challenges of satellite monitoring of very small glaciers. <i>Geosciences</i> , 8(5), 174. [Georg Kaser, Austria]	ACCEPTED: thanks, we now include the references
126561	38	22	38	22	Remove "largely" [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been revised
88083	38	22	38	24	There is no increasing trend in deglaciation of East African mountains, but glacier recession is strong since the late 19th century. See Fig 1 in Mölg et al 2013: doi 10.1016/j.envdev.2013.02.001. The largest glacier on Mt Kenya, Lewis glacier, lost 90% of its volume and 79% of its area between 1934 and 2010. (Prinz et al. 2011 doi: 10.1029/2011GL049208. If current retreat rates continue, Mount Kenya will be deglaciated in the early 2030s (Prinz et al 2018 doi: 10.3390/geosciences8050174) [Georg Kaser, Austria]	ACCEPTED: thanks, we now include the references if relevant
45055	38	22	38	24	Please check "the trend reached 40%" -- the formulation is unclear. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: text has been revised
11823	38	25	38	25	"totalizing" should be "totaling" [Amy East, United States of America]	TAKEN INTO ACCOUNT: text has been revised
126563	38	25	38	25	Replace the word "totalizing". Perhaps "amounting to"? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been revised
67075	38	27	38	28	no reference for the limited evidence? What is it? [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: text has been revised
88079	38	27	38	28	The final sentence is confusing as it makes a switch to "North Africa", an entirely different part of the continent. If snow cover in, for example, the Atlas Mountains shall appear here, at least one reference is needed. With regards to glaciers, the North Africa reference should be deleted. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
45625	38	27	38	28	Please provide a citation to support this statement. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: text has been revised
130575	38	30	38	30	"African glaciers" is too broad. Please consider "African mountain glaciers" or some more specific expression. [Panmao Zhai, China]	REJECTED: African glacier is specific enough
20961	38	30	38	30	I suggest we delete the word "Very", just to read "have significantly decreased" [Ladislav Chang'a, United Republic of Tanzania]	TAKEN INTO ACCOUNT: text has been revised
67073	38	30	38	31	avoid 'significantly' unless in statistically sense. If this is the case here then 'very' seems odd [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: text has been revised
35375	38	30	38	31	There is NOT low confidence in the trend for glacier mass loss in 21st century (there is very high confidence in trend, but medium confidence in the magnitude and timing) see Ch9.5 and other sections in 12.4 [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: text has been revised
45623	38	30	38	31	How the low confidence statement is formulated suggests that there is doubt if glacier will shrink. I think that is not accurate enough. Although the trend, the rate of shrinkage is in doubt (low or medium confidence), there is high agreement and high confidence that glaciers in low latitude regions will shrink in the future for all RCPs scenarios (please see figure 9.22). [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: text has been revised
107885	38	30	38	31	Why is there low confidence in continued decrease in African glaciers in the future? Because it hasn't been looked at sufficiently? [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: text has been revised
51849	38	30	38	32	There is medium confidence in the trend continuing over the 21st century (rather than 'low' highlighted here) in the end of section Table (p40) - please check for consistency. It would also be helpful to explain the reason for limited evidence of future decline in snow cover in North Africa with further warming. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: text has been revised
67077	38	31	38	31	this statement is not supported by any evidence above. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: text has been revised

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88081	38	31	38	31	“There is low confidence that this trend will continue over the 21st century” --- The statement is in conflict with the few quantitative projections for glacier retreat in East Africa if the current precipitation regime will persist. Mölg et al. (2003), Kaser et al. (2010) and Cullen et al. (2013) showed that the glaciers on Kilimanjaro will continue to shrink and disappear around the mid 21st century unless there is a strong increase in local snowfall on the summit (for which, to our knowledge, there is no evidence). --- MÖLG, T, D.R. HARDY, G. KASER (2003): Solar-radiation maintained glacier recession on Kilimanjaro drawn from combined ice-radiation modelling. J. of Geophysical Research, 108(D23), 4731, doi:10.1029/2003JD003546, 2003. ---- Kaser, G., T. Mölg, N.J. Cullen, D.R. Hardy, and M. Winkler (2010): Is the decline of ice on Kilimanjaro unprecedented in the Holocene? The Holocene, vol. 20, pp. 1079-1091. ---- Cullen N.J., P. Sirguey, T. Mölg, G. Kaser, M. Winkler, and S.J. Fitzsimons (2013): A century of ice retreat on Kilimanjaro: The mapping reloaded. The Cryosphere, vol. 7, pp. 419-431. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
2859	38	31	38	31	I do not understand why there is a low confidence that the decreasing trend in African glaciers will continue over the 21st century? Indeed, these very small glaciers are likely to disappear in the coming years/decades. [Antoine RABATEL, France]	TAKEN INTO ACCOUNT: text has been revised
132067	38	31	38	31	“There is low confidence that this trend will continue over the 21st century” --- The statement is in conflict with the few quantitative projections for glacier retreat in East Africa if the current precipitation regime will persist. Mölg et al. (2003), Kaser et al. (2010) and Cullen et al. (2013) showed that the glaciers on Kilimanjaro will continue to shrink and disappear around the mid 21st century unless there is a strong increase in local snowfall on the summit (for which, to our knowledge, there is no evidence). --- Mölg, T, D.R. Hardy, G. Kaser (2003): Solar-radiation maintained glacier recession on Kilimanjaro drawn from combined ice-radiation modelling. J. of Geophysical Research, 108(D23), 4731, doi:10.1029/2003JD003546, 2003. ---- Kaser, G., T. Mölg, N.J. Cullen, D.R. Hardy, and M. Winkler (2010): Is the decline of ice on Kilimanjaro unprecedented in the Holocene? The Holocene, vol. 20, pp. 1079-1091. ---- Cullen N.J., P. Sirguey, T. Mölg, G. Kaser, M. Winkler, and S.J. Fitzsimons (2013): A century of ice retreat on Kilimanjaro: The mapping reloaded. The Cryosphere, vol. 7, pp. 419-431. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text has been revised
86267	38	36	38	36	Any information on the East side of Africa, ie. Indian Ocean? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: This paragraph has been updated based on inputs from Ch 9. Values for the Indian Ocean are included
5533	38	36			There exist other bibliography reference for the reconstruction of sea level rise in the coasts in Africa, but also for the other continents : see the Anny Cazenave references [Benoit Laignel, France]	REJECTED: CH 12 exclusively uses AR6 Ch9 projections for all Sea level projections. Ch 9 projections have assessed all relevant publications in deriving their projections
86269	38	43	38	43	It seems strange to have “w.r.t. 1995-2014” as reference period. A lot of infrastructure in coastal cities was built in the decades before this period. How much of this infrastructure is already being threatened by SLR as it stands today? [Debra Roberts and the Durban WGII TSU, South Africa]	NOTED: WGI official reference period
14805	38	44	38	45	It's not clear what 'above-average contributions from... glaciers and ice sheets' means in the context of why SLR around Africa is greater than world average. Suspect this should reference regional sea level effects arising from ice sheet GIA. Clarify with a Chapter 9 author or remove. [Jeremy Fyke, Canada]	TAKEN INTO ACCOUNT: Sentence was redundant and has been removed
126565	38	50	38	50	Insert "Rise" after "Sea Level"? [Trigg Talley, United States of America]	REJECTED: Here we actually mean extreme water level and not the rise itself.
33621	39	1			Check for reference format. Change: “For RCP8.5, (Vitousek et al., 2017) show that the present 1 day 1:50 yr...” by “For RCP8.5, Vitousek et al. (2017) show that the present 1 day 1:50 yr...” [Guiomar Rotllant, Spain]	EDITORIAL: fixed
43477	39	1			Read "Vitousek et al. (2017) show that " rather than "(Vitousek et al., 2017) show that " [Cyriaque Rufin Nguimalet, Central African Republic]	EDITORIAL: fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
5535	39	4	39	5	Give a continent averaged coastlin erosion rate dot not make sense, because the variation of the erosion rate is very strong in space and in time. It is better to give a range of value: max and min. This remark is valid for the other continents: Europe, Asia, North and South America... [Benoit Laignel, France]	ACCEPTED: Ranges of observed shoreline position change rates have now been given for all sub-regions in Africa
33623	39	4			Check for reference format. Change: "Luijendijk et al., (2018) shows.. » by "Luijendijk et al. (2018) shows.. » [Guiomar Rotllant, Spain]	EDITORIAL: fixed
33625	39	4			Check for reference format. Change: "(Mentaschi et al., 2018) report a coastal... » by "Mentaschi et al. (2018) report a coastal... ». [Guiomar Rotllant, Spain]	EDITORIAL: fixed
43479	39	5			Read " Mentaschi et al. (2018) report a coastal " rather than " (Mentaschi et al., 2018) report a coastal " [Cyriaque Rufin Nguimalet, Central African Republic]	EDITORIAL: fixed
11821	39	9	39	9	delete "over the period 1974-1996", this is already mentioned earlier in the sentence [Amy East, United States of America]	ACCEPTED: corrected.
43481	39	13			Read "Vousdoukas et al. (in press) " rather than "(Vousdoukas et al., in press) " [Cyriaque Rufin Nguimalet, Central African Republic]	EDITORIAL: fixed
43483	39	21			Read "Over the 1982-2016 period" rather than "Over the period 1982-2016" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: Corrected
13879	39	23	39	23	standardize the writing format: 2.5 - 3 MHWs or 2.5-3.0 MHW [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Corrected
13881	39	27	39	27	What does N African mean? It's not understood [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Expanded to read North African
41847	39	34	39	34	Is it relevant to name this section "Ocean and lake acidity"? This section is dealing more with Ocean than lake... [JACQUES ANDRE NDIONE, Senegal]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in CH 12. A brief assessment of Ocean acidification is now given in 12.4 introduction.
419	39	34	39	34	Please refer to my comment on "lake Acidification". The study by Lauvset 2015 is based on model results and no direct observations, and do not consider coastal ocean. There are no references in the SOD text to "lake acidification" so far. Here a direct quote from Lauvset et al 2015: "Here, we only evaluate trends in the open ocean. " -> page 3 from the pdf article version. I'd suggest rewriting this. Please note that this comment aims at strenghtening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in CH 12. A brief assessment of Ocean acidification is now given in 12.4 introduction.
33627	39	35			Add space at the beginning of the sentence: "...Africa (Lauvset et al., 2015).The coastal ocean around Africa is projected to become more acidic over the...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Lake acidification has been omitted from the CIDs considered in CH 12. A brief global assessment of Ocean acidification is now given in 12.4 introduction.
86271	39	40	39	43	Please put these changes into context by mentioning the percent change. [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: Due to space limitations, only a brief assessment of Ocean acidification is now given in 12.4 introduction. Africa is not specifically mentioned in relation to Ocean acidity in this new text in 12.4 introduction.
38187	39	43	39	43	Missing space -0.02" "mol/m^3 [Junhee Lee, Republic of Korea]	NOT APPLICABLE: Due to space limitations, only a brief assessment of Ocean acidification is now given in 12.4 introduction. Africa is not specifically mentioned in relation to Ocean acidity in this new text in 12.4 introduction.
11825	39	43	39	43	need a space after "-0.02" [Amy East, United States of America]	NOT APPLICABLE: Due to space limitations, only a brief assessment of Ocean acidification is now given in 12.4 introduction. Africa is not specifically mentioned in relation to Ocean acidity in this new text in 12.4 introduction.
11827	39	46	39	46	insert "rate" after "higher" [Amy East, United States of America]	ACCEPTED: Corrected as suggested
51851	39	46	39	46	global average in Africa, contributing..' (add comma) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Corrected as suggested

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51853	39	47	39	47	coastline recession' - does this mean 'coastal erosion'? If so the latter might be a term that's more widely understood. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Coastline recession has been replaced with shoreline retreat
20963	39	54	39	54	The Wording " Literature is largery missing" is not very informative and may be confusing. It may mean is available or it exist but is currently missing. I suggest to rephrase to enhance clarity and readability. We can re-write to read " There is no suufcient literature [Ladislaus Chang'a, United Republic of Tanzania]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
131465	39	54	39	55	Please add region-specific attribute and make clear which literature this statement refers to, e.g. "Literature on climate change in Africa (...)" to prevent out-of-context misunderstandings. [Hans Poertner and WGII TSU, Germany]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
67085	40	1	40	7	remove all these acronyms here and in the following: they drastically reduce the readability of the report [Regine Hock, United States of America]	REJECTED: There are no acronyms in the section referred to
130577	40	2	40	4	Atmopheric CO2 change assessment for various regions? It is a well mixed GHGs! [Panmao Zhai, China]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
20787	40	2	40	4	Since CO2 is well mixed, projections for a given scenario are not likely to differ much over various regions or continents. Only the possible impact on fertilisation deserves to be mentioned. [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
38465	40	2	40	4	High confidence and High agreement statements have been added, but no references to the scientific papers are made. We suggest to expand the text. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
14961	40	2	40	4	Please add references to support this statement. [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction, including relevant references.
55223	40	2	40	4	Give that CO2 is a well-mixed gas with a long atmospheric lifetime, it is completely irrelevant to have this in each of the regional summaries (and accompanying figures). There is no region for which there is not "High confidence of increase" for CO2, since it is increasing at virtually the same rate everywhere on the planet, and so this provides no useful information. Please remove. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction, including relevant references.
86273	40	6	40	6	What is causing this increase or decrease? [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. However process descriptions are not within the remit of Ch 12.
63869	40	12	40	15	The confidence in projections of various CIDs in Table 12.3 are notably lower for Africa than, for example, North America (Table 12.8). While "regional gaps and limitations" are identified in Section 12.7.2, considering one of the stated objectives of this assessment is to advise areas for further research and support, would it be worth giving an assessment here by the authors of the factors contributing to the low level of confidence provided by the current body of research – whether it, for example, is the result of potential factors such as: the region's natural variability, lack of dedicated research, lack of infrastructure for data collection, or other concerns which could be identified for science policymakers? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: we have now added more justification for the Africa assessment
66429	40	12	40	23	There's some evidence that maybe there is some permafrost at at least one site in North Africa (https://www.the-cryosphere.net/11/1691/2017/) but not sure that warrants a blue box at the intersection of permafrost and North Africa? [Charles Koven, United States of America]	TAKEN INTO ACCOUNT: Thank you for highlighting this, but indeed a single site occurrence does not warrant the whole sub region to be coloured blue
33629	40	13			Why are these words capitalize?: "Permafrost and Hail". [Guiomar Rotllant, Spain]	NOTED: As they are CID types
429	40	19	40	19	I would suggest to remove lake acidity/acidifcation from table 12.3 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in CH 12

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
41849	40	19	40	23	The table 12.3 is very informative! [JACQUES ANDRE NDIONE, Senegal]	NOTED: We thank the reviewer
55221	40	19	40	23	This figure, like the many that follow, is intended as a summary/synthesis, and we appreciate the attempt to provide such a graphical representation. However, it is often difficult to draw a direct link from the preceding text to the figure contents. For example, the earlier text (pg. 38, line 28) says "There is limited evidence for snow cover decrease", yet the figure indicates that there is 'medium confidence of decrease' for the three sub-regions where it is relevant. Similar inconsistencies abound. The text on 'radiation at surface' has several medium and high confidence statements, but the figure indicates 'low confidence in direction of change'. These kinds of inconsistencies abound (e.g. pg. 50 text on radiation says medium confidence in increasing trend, whereas figure says medium confidence of decrease). It is unlikely that reviewers will point out all of these inconsistencies, so the authors have a lot of work to do. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have now ensured that there is 100% consistency among our figs, text and tables
109431	40	19	40	25	Table 12.3 "Low confidence in direction of change" can result from contrasted results in the literature but in the absence of no literature (as for air pollution), the color should be different. [Sophie Szopa, France]	REJECTED: As a summary we want to simplify the message here while in the text this should be more detailed. Low confidence can result from several factors, and the summary is just given by this white colour
86275	40	22	40	22	Table: suggest to insert a small map in the blank top left corner of the table, that demarcate the regions for easy reference. [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: This is a very good idea. We have done this to all our regional CID tables
11829	40	22	40	22	footnote 2 within Table 12.3: "average" should be "averaged" [Amy East, United States of America]	ACCEPTED: Corrected as suggested
52627	40	22			The CID summary tables such as Table 12.3 for Africa are excellent and very clear. [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: We thank the reviewer
64023	40		51		Still no clear criteria for upon which future projections are based. Also, no evident methods for data assessment are referred to. All what we have are stated information and presented data in the form of graphs. But it is advisabelt to state all the assessment techniques or at least their reference measures and statistical references, in order to provide credibility to the conclusion drawn, otherwise, the report appears as if it is the postulation of a group of scientist based on the extrapolation og the actual data. This would mean that no serious risk assessment or credible data analysis or statistics were carried out. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The criteria and process used for assessing projections are now described in detail in 12.4 introduction and a short summary is provided in 12.2.
32785	41	2	41	2	after "the Arabian Peninsula (ARP)" add "Iran Plateau" According to I. R. of Iran Meteorological Organization reports http://irimo.ir/eng/wd/600-IRIMO.html , Climatology Research Institute reports https://cri.ac.ir/index.php/fa/ , National Drought Warning and Monitoring Center (NDWMC) reports http://ndc.irimo.ir/eng/index.php and a lot of papers .. [sadegh zeyaeayan, Iran]	REJECTED: Iran Plateau is included in Western Central Asia (WCA), no need to make a separate division
33115	41	2	41	2	after "the Arabian Peninsula (ARP)" add "Iran Plateau" According to I. R. of Iran Meteorological Organization reports http://irimo.ir/eng/wd/600-IRIMO.html , Climatology Research Institute reports https://cri.ac.ir/index.php/fa/ , National Drought Warning and Monitoring Center (NDWMC) reports http://ndc.irimo.ir/eng/index.php and a lot of papers .. [Sahar Tajbakhsh Mosalman, Iran]	REJECTED: Iran Plateau is included in Western Central Asia (WCA), no need to make a separate division
23253	41	2	41	2	after "the Arabian Peninsula (ARP)" must be add " +IRAN platue [Hamideh Dalaei, Iran]	REJECTED: Iran Plateau is included in Western Central Asia (WCA), no need to make a separate division
63657	41	4	41	4	I understand that this is a stylistic choice, but when introducing the terms for the first time, they should be fully named. Instead of "Western (WSB), Eastern Siberia (ESB)" "Western Siberia (WSB), Eastern Siberia (ESB) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: corrected
11831	41	5	41	5	sounds like this should be "Russian Arctic Regions (RAR)", not Areas, given the RAR acronym [Amy East, United States of America]	ACCEPTED: corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
4591	41	8	41	8	Suggests add a summary of the projections from AR5 and Special Reports on Asia. [Rita Yu, China]	TAKEN INTO ACCOUNT: We have gone through the AR5, and the issues listed here in this paragraph are major concerns in AR5. Due to limitation of the text size, we cannot detail those statements in AR5 about this issues.
32805	41	9	41	9	thanks for refrence to the " west asia and central asia". Arid and semi- arid area in west asia and central asia are important locations as global view on climate change issue as well as drought,desertification and dust storm phenomena, consideration of its data could be helpful in sense of climate models, but there is little citation for the west asia and few references for central asia, witch great change in recent years has taken place. [sadegh zeyaeyan, Iran]	ACCEPTED: we have added some more references about west Asia.
33135	41	9	41	9	thanks for refrence to the " west asia and central asia". Arid and semi- arid area in west asia and central asia are important locations as global view on climate change issue as well as drought,desertification and dust storm phenomena, consideration of its data could be helpful in sense of climate models, but there is little citation for the west asia and few references for central asia, witch great change in recent years has taken place. [Sahar Tajbakhsh Mosalman, Iran]	ACCEPTED: we have added some more references about west Asia.
17373	41	9	41	9	Thanks for reference to the "West Asia and Central Asia". Arid and semi-arid area in West Asia and Central Asia are important locations as global view on climate change issue as well as drought, desertification and dust storm phenomena, consideration of its data could be helpful in sense of climate models, but there is little citation for the West Asia and few references for Central Asia, which great changes in recent years has taken place. [Mostafa Jafari, Iran]	ACCEPTED: we have added some more references about west Asia.
33631	41	10	41	11	Are dashes between words necessary?: "Hindu-Kush-Himalaya". Anyway use the same format all over the chapter; for instance, in L22 you are not using dashes. [Guiomar Rotllant, Spain]	ACCEPTED: changed to "Hindu Kush Himalaya (HKH)", and use HKH thereafter.
39389	41	32	41	34	What is the reason for the choice of the 98th percentile as the index for daily maximum wind? [Lourdes Tibig, Philippines]	NOTED: it is a more or less subjective option.
98147	41	55	41	55	Including summertime wet bulb globe temperature (Knutson and Ploshay 2016). [Thomas Knutson, United States of America]	REJECTED: The paper is not specific for Asia, and better cited in the Section 12.5.
104557	41	55	41	55	Text before 'China's temperature increased ...' would be added: 'The enhanced warming by 0.25°C/decade over the deserts is observed from 2002 to 2005, even during the recent warming hiatus (Zhou and Wang, 2016).' Reference: Zhou, C., and K. Wang, 2016: Land surface temperature over global deserts: means, variability and trends. J. Geophys. Res. D Atmos., 121, 2016JD025410. [Chunlüe Zhou, United States of America]	REJECTED: The added text is related to global deserts, rather than Asia specifically, and only for 3 years, not appropriate for being put here to evaluate trend.
63659	41	56	42	1	"...observed temperature in Central Asia from 1957-2005 is higher than global trends" I am puzzled here, do you mean global trend? Otherwise, if it is global trends (in plural) that means would mean it is warming the most in the whole globe, while in fact it is the Arctic (if I'm not wrong) that is warming the fastest. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: it should be global trend. but it has been removed for size-cutting.
126567	42	2	42	2	See also Pederson, N., Hessel, A. E., Baatarbileg, N., Anchukaitis, K. J., & Di Cosmo, N. (2014). Pluvials, droughts, the Mongol Empire, and modern Mongolia. Proceedings of the National Academy of Sciences, 111(12), 4375-4379. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The sentence about paleo data is removed for cutting size.
104559	42	2	42	3	Text after '(Sun et al., 2016)' would be added: ' and faster since 1979 (by 0.37°C/decade) (Zhou et al., 2018).' Reference: Zhou, C., Y. He, and K. Wang, 2018: On the suitability of current atmospheric reanalyses for regional warming studies over China. Atmos. Chem. Phys., 18, 8113-8136. [Chunlüe Zhou, United States of America]	TAKEN INTO ACCOUNT: the paper is cited.
38467	42	13	42	13	There is no region defined as "WAS". Please make sure if it is one of the standard regions analyzed in AR6 [Mansour Almazroui, Saudi Arabia]	ACCEPTED: it should be WCA.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
38471	42	14	42	14	The statement "SAS and SEA have a lower projected warming of 2-4°C (see the Atlas)" may verify with new publication by Almazroui et al. (2020) "https://link.springer.com/article/10.1007/s41748-020-00157-7" for SAS and this article may use as reference. I think the precipitation information from the latest publication by Almazroui et al. (2020) ("https://link.springer.com/article/10.1007/s41748-020-00157-7") using CMIP6 data for the South Asia may be useful here. [Mansour Almazroui, Saudi Arabia]	ACCEPTED: Almazroui et al. (2020) is cited.
69263	42	19	42	21	There's much more literatures handling E-Asian heat wave in 2018: [1] Shimo, A., Takemura, K., Wakamatsu, S., Togawa, H., Mochizuki, Y., Takekawa, M., et al. (2019). Primary factors behind the Heavy Rain Event of July 2018 and the subsequent heat wave in Japan. Sci. Online Lett. Atmos. 15, 34 13–18. doi:10.2151/sola.15A-003. [2] Imada, Y., M. Watanabe, H. Kawase, H. Shioyama, and M. Arai, 2019: The July 2018 high temperature event in Japan could not have happened without human-induced global warming, SOLA, 15A, 8-12, https://doi.org/10.2151/sola.15A-002 [Kaoru Magosaki, Japan]	TAKEN INTO ACCOUNT: due to text size limitation, 2018 heatwave is not discussed.
33633	42	19			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: it's removed for cutting size.
74317	42	21	42	30	Also refer ==> Shimo, A., Takemura, K., Wakamatsu, S., Togawa, H., Mochizuki, Y., Takekawa, M., et al. (2019). Primary factors 33 behind the Heavy Rain Event of July 2018 and the subsequent heat wave in Japan. Sci. Online Lett. Atmos. 15, 34 13–18. doi:10.2151/sola.15A-003. Imada, Y., M. Watanabe, H. Kawase, H. Shioyama, and M. Arai, 2019: The July 2018 high temperature event in Japan could not have happened without human-induced global warming, SOLA, 15A, 8-12, https://doi.org/10.2151/sola.15A-002 [Izuru Takayabu, Japan]	TAKEN INTO ACCOUNT: due to text size limitation, 2018 heatwave is not discussed.
100513	42	21	42	30	Here, it might be relevant to highlight the absence of a warming trend during hot days in the observational record over India and other intensely irrigated regions (Van oldenborgh et al., 2018; Thiery et al., 2020), and the fact that this absence has been attributed to irrigation expansion balancing out the effect of combined other anthropogenic forcing (Thiery et al., 2020). REFS: van Oldenborgh, G. J., Philip, S., Kew, S., van Weele, M., Uhe, P., Otto, F., ... & AchutaRao, K. (2018). Extreme heat in India and anthropogenic climate change. Natural Hazards and Earth System Sciences, 18(1), 365-365.; Thiery, W., Visser, A. J., Fischer, E. M., Hauser, M., Hirsch, A. L., Lawrence, D. M., ... & Seneviratne, S. I. (2020). Warming of hot extremes alleviated by expanding irrigation. Nature Communications, 11(1), 1-7. [Wim Thiery, Belgium]	ACCEPTED: the two papers are cited.
90859	42	21			There is a robust relationship between ENSO and SEA's SATs, cited "Extreme temperatures in Southeast Asia caused by El Niño and worsened by global warming" [Vivien How, Malaysia]	ACCEPTED: We note that El Niño is a major influence of extreme heat in Asia within 12.4.2.1.
126569	42	23	42	23	Add: ""... Imada et al., 2018) and this trend coincided with the 2018 extreme heat waves in Japan and Korea (Wang et al. 2019)."" Citation: Wang, S.-Y., H. Kim, D. Coumou, J.-H. Yoon, L. Zhao, and R. R. Gillies, 2019: Consecutive extreme flooding and heat wave in Japan: Are they becoming a norm? Atmospheric Science Letters, DOI:10.1002/asl.933 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: it's not cited because the sentence is fully revised.
33635	42	23	42	26	Why "Heat" word is capitalize? [Guiomar Rotllant, Spain]	ACCEPTED: corrected.
20789	42	23	42	29	Luo and Lan (2017) find a significant effect of urbanisation on duration and trend of heatwaves in southern China [philippe waldteufel, France]	ACCEPTED: it's cited.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
44103	42	27	42	28	“Medium confidence” is associated with the statement on increasing frequency of past heat extreme events in South Asia. However, there are important references which are missing from this statement. For example, over India, it is stated in a study that “heatwaves with large impacts have increased in the recent past” (https://iopscience.iop.org/article/10.1088/1748-9326/aa9388/pdf). A similar result is found over Pakistan from a study focussed on heat stress from observed data (https://www.earth-syst-dynam.net/8/1263/2017/). Most importantly, a comprehensive study over the HKH (Himalaya-Karakoram-HinduKush) region concludes that “For the past five to six decades, the HKH have shown a rising trend of extreme warm events; a falling trend of extreme cold events; and a rising trend in extreme values and frequencies of temperature-based indices” (https://link.springer.com/chapter/10.1007/978-3-319-92288-1_3). The HKH region impacts vulnerable populations including the population of least developed countries (LDCs) including Nepal, Bhutan, Bangladesh and Afghanistan. Therefore, we request the authors to reconsider the “medium confidence” statement and change it to “high confidence”. [Lamin Mai Touray, Gambia]	TAKEN INTO ACCOUNT: In Chapter 11, it stated that “there is medium confidence of heat extremes increasing in frequency in South Asia (AlSarmi and Washington, 2014; Sheikh et al., 2015; Mazdiyasi et al., 2017; Zahid et al., 2017; Nasim et al., 2018; Khan et al., 2019; Roy, 2019)”. And we also found some other results show moisture results about the changes in heat extremes. Therefore we still put medium confidence for observed changes India, but for future changes in heatwave we put “likely” for all of Asia.
29357	42	28			Some other studies could be considered for observational heat extremes for South Asia. For example, Rohini et al. (2016, https://www.nature.com/articles/srep26153) suggests that heatwave intensity and duration have increased since the 1950s over central and NE India. See also several references in the introduction of Mishra et al. (2017; https://iopscience.iop.org/article/10.1088/1748-9326/aa9388/meta). (But, note that currently Ch11 does NOT state increased frequency of heat waves for South Asia - it states, “heatwave likelihoods are not changing (van Oldenborgh et al., 2018) or even decreasing in some parts while increasing in others (Wehner et al., 2016)” on page 48. This inconsistency does need to be tackled.) [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The Rohini et al. 2016 is cited. In Chapter 11, it stated that “there is medium confidence of heat extremes increasing in frequency in South Asia (AlSarmi and Washington, 2014; Sheikh et al., 2015; Mazdiyasi et al., 2017; Zahid et al., 2017; Nasim et al., 2018; Khan et al., 2019; Roy, 2019)”. And we also found some other results show mixture results about the changes in heat extremes. Therefore we still put medium confidence for India.
38469	42	32	42	32	Again “WAS” is mentioned as a region with no explanation of abbreviation [Mansour Almazroui, Saudi Arabia]	ACCEPTED: it should be WCA.
35915	42	32	42	35	Additional reference for consideration, which examines extreme heat wave increase over North East Asia under RCP 4.5/8.5 scenarios: - Lee, J.W., Hong, S.Y., Chang, E.C., Suh, M.S. and Kang, H.S., 2014. Assessment of future climate change over East Asia due to the RCP scenarios downscaled by GRIMs-RMP. Climate dynamics, 42(3-4), pp.733-747. [Jiwoo Lee, United States of America]	TAKEN INTO ACCOUNT: The paper is a little bit old, and there are already enough papers to support the increase of heat wave.
104599	42	35	42	35	A paper is worth quoting here on detecting and attributing the increased frequency of the extreme summer heats over Shanghai region, China, by using the longest 145 years of observations and simulations from 1873 to 2017. Reference: Zhou, C., K. Wang, D. Qi, and J. Tan, 2019: Attribution of a record-breaking heatwave event in summer 2017 over Yangtze River Delta. Bull. Am. Meteorol. Soc., 100, 97-103. [Chunlüe Zhou, United States of America]	TAKEN INTO ACCOUNT: it is cited.
39391	42	38	42	41	is “likely” the uncertainty language? If so, please italicize. [Lourdes Tibig, Philippines]	ACCEPTED: it should be italicized, but removed now to cut size.
63661	42	41	42	42	I would personally prefer a quantitative measure instead of “they are currently crossed exceptionally”, so I could compare how much more is “at least several days per year” compared to today. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This is difficult to do because it is quite different for different regions in different time of future.
14815	42	42	3	4	Figure 11.7 seems to show a slightly different picture, at least more diverse for N. Asia [Marie-France Loutre, Switzerland]	TAKEN INTO ACCOUNT: Figure 11.7 is plotted based on HadEX3 data set, so indeed slightly different.
14813	42	42	4	4	a more precise reference that Chapter 2 would be welcome [Marie-France Loutre, Switzerland]	ACCEPTED: When referring to other chapters, the full section number is now quoted throughout Ch 12
33637	42	49			Describe as first cited: “MENA”. [Guiomar Rotllant, Spain]	ACCEPTED: it's removed to cut size.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
90861	42	52			Check on annual distribution of cool spell event from "Was the Singapore January 2018 Cold Spell Record-Breaking?", suggest rare cold spells might continue in the future [Vivien How, Malaysia]	TAKEN INTO ACCOUNT: we did not find the paper, and 2018 cold spell in Singapore is an exceptional case.
90863	42	52			Another note from "Asian climate change under 1.5-4C warming targets" stated that extreme high temperatures will be uniformly cooler throughout the Asian region, and the warming in extreme low temperatures will decrease significantly in high latitudes of Asia; extreme precipitation will be weaker over most of Asia but will be stronger over West Asia and western South Asia. [Vivien How, Malaysia]	TAKEN INTO ACCOUNT: we checked "Asian climate change under 1.5-4C warming targets" . The statement is a comparison between the 1.5 °C target, and the 2 °C target, rather than stating the decrease of temperatures.
45057	42	54	42	54	Please check the use of "hindered" [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: the sentence is removed now.
33639	42	54			Add comma. Change: "However the rate of such trends may be hindered by low..." by "However, the rate of such trends may be hindered by low...". [Guiomar Rotllant, Spain]	ACCEPTED: changed
74319	43	2	43	3	There are a bunch of papers which says transient cooling in the Eurasian continent. Thus we cannot say it's been "low confidence". Please refer: Mori, M., Y. Kosaka, M. Watanabe, H. Nakamura, and M. Kimoto, 2019: A reconciled estimate of the influence of Arctic sea-ice loss on recent Eurasian cooling, Nature Climate Change, https://doi.org/10.1038/s41558-018-0379-3 [Izuru Takayabu, Japan]	ACCEPTED: medium confidence is put here now.
69265	43	2	43	3	There are many papers which says transient cooling in the Eurasian continent. Thus we cannot say it is of "low confidence". Please refer to, Mori, M., Y. Kosaka, M. Watanabe, H. Nakamura, and M. Kimoto, 2019: A reconciled estimate of the influence of Arctic sea-ice loss on recent Eurasian cooling, Nature Climate Change, https://doi.org/10.1038/s41558-018-0379-3 [Kaoru Magosaki, Japan]	ACCEPTED: medium confidence is put here now.
11833	43	6	43	10	it may be worth mentioning the phenomenon of 'dzud', or extreme cold, that can affect Asian continental interior regions including Mongolia with recent profound ecological and socioeconomic consequences (mass mortality of livestock, for example). I don't think much is known about the causes but there is some concern that these could be related to climate change, through drought effects. See Middleton, N. J., & Sternberg, T. (2013). Climate hazards in drylands: a review. Earth-Science Reviews, 126, 48–57. http://dx.doi.org/10.1016/j.earscirev.2013.07.008 [Amy East, United States of America]	TAKEN INTO ACCOUNT: we checked the phenomenon of 'dzud', but it seems there is no clear description about either its changes or its causes.
88367	43	8	43	8	"Cold reduction" - poor terminology. Couldn't you just say "warmer conditions"? [Sharon Smith, Canada]	ACCEPTED: it is removed to cut size.
45059	43	8	43	10	The formulation might be confusing. One expects increased reductions and not reduced reductions ... [Christophe Deissenberg, Luxembourg]	ACCEPTED: it's removed to cut size.
33641	43	10			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: it is removed to cut size.
44105	43	12	43	13	The statement reads "extreme heat episodes have become more frequent in most regions (medium confidence)" while the statement on page 43 (line 21-22) reads "There is increased evidence and high confidence of more frequent heat extremes in Asia in the recent decades than in previous ones". This discrepancy in confidence statement makes it hard to arrive at a conclusive message. Please revise! [Lamin Mai Touray, Gambia]	ACCEPTED: changed to high confidence here now.
51855	43	12	43	13	Suggested edits: 'In Asia, temperatures have warmed throughout the last century (high confidence) and extreme heat episodes have become more frequent in most regions (medium confidence) and are projected to increase all regions of Asia under all warming scenarios, this century.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: rephrased as suggested.
2949	43	20	43	36	Please add reference: Guo X.J., Huang J.B., Luo, Y., Zhao Z.C. and Xu, Y., 2016, Projection of precipitation extremes for eight global warming targets by 17 CMIP5 models, Nat Hazards, doi: 10.1007/s11069-016-2553-0 [Zong Ci Zhao, China]	ACCEPTED: cited

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
39393	43	22	43	22	You my want to use these two papers- Xiao et al, 2016 (Robust increase in extreme summer rainfall intensity during the past four decades observed in China) and Cheong et al, 2018 (Observed and modelled temperature and precipitation extremes over Sotheast Asia from 1972 to 2010) [Lourdes Tibig, Philippines]	ACCEPTED: cited
32803	43	22	43	36	Propose to add this text to the para : " Jaber Rahimi and et. al. (2018) systematically reviewed and summarized the current available literature (n = 150) regarding the impacts of climate change on temperature and precipitation in Iran to assess our current state of knowledge. They extensive study confirmed that annual mean temperature has significantly increased by about 0.3 °C/decade over the last 50 years, while annual precipitation has insignificantly decreased by – 7 mm/decade." source:https://doi.org/10.1007/s00704-018-2395-7 [sadegh zeyaeyan, Iran]	ACCEPTED: cited
33133	43	22	43	36	Propose to add this text to the para : " Jaber Rahimi and et. al. (2018) systematically reviewed and summarized the current available literature (n = 150) regarding the impacts of climate change on temperature and precipitation in Iran to assess our current state of knowledge. They extensive study confirmed that annual mean temperature has significantly increased by about 0.3 °C/decade over the last 50 years, while annual precipitation has insignificantly decreased by – 7 mm/decade." source:https://doi.org/10.1007/s00704-018-2395-7 [Sahar Tajbakhsh Mosalman, Iran]	ACCEPTED: cited
24315	43	22	43	36	Propose to add this text to the para : " Jaber Rahimi and et. al. (2018) systematically reviewed and summarized the current available literature (n = 150) regarding the impacts of climate change on temperature and precipitation in Iran to assess our current state of knowledge. They extensive study confirmed that annual mean temperature has significantly increased by about 0.3 °C/decade over the last 50 years, while annual precipitation has insignificantly decreased by – 7 mm/decade." source:https://doi.org/10.1007/s00704-018-2395-7 [Iman BABAEIAN, Iran]	ACCEPTED: cited
39395	43	27	43	30	Which particular seasons? Uncertainty language? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: the original sentence is rephrased, and medium confidence is put for mean precipitation change.
63663	43	29	43	29	"..exhibit a drying tendency in particular seasons", it would be nice to read which seasons [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: because it is different for different places, we cannot list the seasons due to size limitation.
98149	43	30	43	30	Recommend: "In terms of detectable anthropogenic changes in precipitation over Asia (1901-2010), the most prominent features are the increasing precipitation trends across higher latitudes, along with some scattered smaller regions of detectable increases and decreases (Knutson and Zeng, 2018). For 1981-2010, some strong and significant decreasing precipitation trends are seen over a number of southern and central Asia regions, but these are mostly not simulated by CMIP5 historical runs, which in contrast simulate increasing precipitation trends over the same period (except for strong decreases simulated for southeastern China)." [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: partially rephrased as suggested.
74601	43	34	43	34	To check if it isn't published about (Teichmann et al., submitted ; ... [Moulay Driss HASNAOUI, Morocco]	NOTED: removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
44107	43	38	43	51	Please include the flood hazard information for the countries fed by HKH glaciers. Following is the excerpt from a comprehensive assessment and the reference therein, which might be useful (https://link.springer.com/chapter/10.1007/978-3-319-92288-1_3): "Previous studies identified a clear change in extreme precipitation events in the HKH in recent periods. Western China, including the TP region, experienced a major change in extreme precipitation events over the past five decades, as reported in many studies (e.g., Ren et al. 2012; You et al. 2015), consistent with the increase in annual total precipitation during the same period. Some stations over the western Himalaya and the Karakoram region have also shown a significant increase in the number of wet days and extreme rain events during the past few decades (Choi et al. 2009; Klein Tank et al. 2006). In the eastern Himalaya, though, the total amount of precipitation did not change much, and the number of rainy days decreased, which meant a higher amount of rainfall in a short period of time. This torrential rain may cause flash floods and landslides in the eastern Himalaya and hilly regions (Syed and Al Amin 2016)." [Lamin Mai Touray, Gambia]	TAKEN INTO ACCOUNT: The Hindu Kush Himalaya Assessment report is cited here. In addition to the rainfall-induced flood, the flood hazard induced by ice-melt in HKH is discussed in the section of "snow and land ice".
83721	43	38			The lake level increase for many lakes in Tibet could be mentioned here, too. It points to precip increase and severely impacts/floods important pastures. For instance: Treichler D., Kääh A., Salzmann N., Xu C-Y.(2019): Recent glacier and lake changes in High Mountain Asia and their relation to precipitation changes. The Cryosphere, 13, 2977-3005, https://doi.org/10.5194/tc-13-2977-2019 . [Andreas Kääh, Norway]	REJECTED: the paper does not mention flood, so not cited there.
100309	43	45	43	46	According to Chapter 11 (Table 11.5), there is low confidence in increase in extreme precipitation (obs) over WSB [Claudine Dereczynski, Brazil]	NOT APPLICABLE: the sentence does not exist anymore.
29359	43	47			In the discussion of changes in South Asian monsoon extremes, the time scales are not clear. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: daily extreme precipitation is considered here, but this sentence does not exist anymore.
29361	43	48			I suggest altering the wording to, "decreased frequency of moderate rainfall". [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: the sentence does not exist anymore.
13883	43	49	43	49	Change chapter by Chapter [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: the sentence does not exist anymore.
15583	43	53	43	55	The section should also mention the future increase in tropical cyclone induced precipitation rate as projected by most of the model simulation studies (Section 11.7.1.5). Below are relevant references based on the assessment of the WMO Expert Team and the UNESCO/WMO Expert Team: 1. Knutson, T. R., S. J. Camargo, J. C. L. Chan, K. Emanuel, C. H. Ho, J. Kossin, M. Mohapatra, M. Satoh, M. Sugi, K. Walsh, L. Wu, 2019b : Tropical Cyclones and Climate Change Assessment: Part II. Projected Response to Anthropogenic Warming, Bull. Amer. Meteorol. Soc., https://doi.org/10.1175/BAMS-D-18-0194.1 . 2. Cha, E.J., T.R. Knutson, T.C. Lee, M. Ying and T. Nakaegawa, 2020 : Third Assessment on Impacts of Climate Change on Tropical Cyclones in the Typhoon Committee Region – Part II : Future Projections, Tropical Cyclone Research and Review, In Press. [SAI MING LEE, China]	NOT APPLICABLE: To avoid overlapping, the section about "Heavy precipitation and pluvial flood" refers to Chapter 11 only.
39397	43	53	44	5	You may want to consider Supari et al, 2020 paper (Multi-model projection of precipitation extremes in Southeast Asia based on CORDEX-SEA simulations) [Lourdes Tibig, Philippines]	ACCEPTED: it is cited in the subsection of "Mean precipitation".
74327	44	2	44	2	Is the region definition of HKH here, consistent with all other parts of AR6? It looks to represent high elevation region here, but HKH includes also Pakistan or Myanmar, where the altitude is no higher than Tibetan plateau. Reference=>Wester et al (2019), https://doi.org/10.1007/978-3-319-92288-1 , Published for the Hindu Kush Himalayan Monitoring and Assessment Programme (HIMAP). [Izuru Takayabu, Japan]	NOT APPLICABLE: the sentence does not exist anymore.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
24425	44	2	44	3	Following text may be added here. A high-resolution (20-km grid) AGCM projects an east-west contrast in surface climate change over the Tibetan Plateau (TP) where over the western TP surface temperature increases are higher, an increasing rate of precipitation is greater, soil moisture becomes wetter, and runoff increases more than over the eastern TP (Kitoh and Arakawa, 2016). Kitoh, A., and O. Arakawa, 2016: Reduction in the east-west contrast in water budget over the Tibetan Plateau under a future climate. Hydrol. Res. Lett., 10, 113-118, doi:10.3178/hrl.10.113. [Akio Kitoh, Japan]	REJECTED: the text is not directly related to flood, and a little too long due to size limitation, so it not cited here.
33643	44	2			Change: "However for the Hindu-Kush-Himalaya..." by "However, for the Hindu Kush Himalaya...". All over the chapter. [Guiomar Rotllant, Spain]	NOT APPLICABLE: the sentence does not exist anymore.
11835	44	3	44	3	models' needs an apostrophe [Amy East, United States of America]	NOT APPLICABLE: the sentence does not exist anymore.
33645	44	5	44	18	Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: the sentence does not exist anymore.
43485	44	10			Read "1976–2005 period " rather than "period 1976–2005" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: the sentence does not exist anymore.
29363	44	12			Where is SW Asia and does it have a monsoon? Is this Afghanistan, Iran and the Arabian peninsular, for example? [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: it is removed.
38189	44	14	44	15	Current statements read like the 50-72% of basins experiences some increase, whereas the Bajracharya paper states the the discharge increases >50% at the outlet of basins. Also, I cannot find a reference where the 72% upperlimit come from. [Junhee Lee, Republic of Korea]	NOTED: the paper is cited in a general way regarding glacier lake outburst floods: "the threat of glacier lake outburst floods will increase due to deglaciation caused by climate change in the HKH Region (Bajracharya et al., 2018)".
83729	44	17			Mention here, or else, in particular river ice break-up (ice -jam floods? Has quite some impact in Siberia. [Andreas Käbb, Norway]	ACCEPTED: river ice issues is now mentioned in "snow and land ice" subsection about "Lake and river ice". Climate warming leads to a significant reduction in the ice phenomena period and ice regime hazard reduction in Russian lowland rivers (Agafonova et al., 2017).
33647	44	20	44	21	Add an extra parenthesis at the end of the sentence: "There is limited evidence about landslides changes in Asia (limited number of studies (Gariano and Guzzetti, 2016)).". [Guiomar Rotllant, Spain]	NOT APPLICABLE: the sentence does not exist anymore.
44109	44	20	44	23	This section is quite short and cites "limited evidence". We hope that the following text will be a helpful addition to this section from a HKH perspective: "Torrential rain may cause flash floods and landslides in the eastern Himalaya and hilly regions (Syed and Al Amin 2016). [Syed, M. A., & Al Amin, M. (2016). Geospatial modeling for investigating spatial pattern and change trend of temperature and rainfall. Climate, 4(2), 21.]; Intense monsoon rainfall in northern India and western Nepal in 2013, which led to landslides and one of the worst floods in history, has been linked to increased loading of GHG and aerosols (Cho et al. 2016) [Cho, C., Li, R., Wang, S. Y., Ho, J., & Robert, Y. (2016). Anthropogenic footprint of climate change in the June 2013 Northern India flood. Climate Dynamics, 46, 797–805.]; Floods and landslides are the most frequently occurring natural hazards, particularly during the monsoon season (Gaire et al. 2015) [Gaire, S., Castro Delgado, R., & Arcos González, P. (2015). Disaster risk profile and existing legal framework of Nepal: Floods and landslides. Risk Management and Healthcare Policy, 8, 139–149.]. They accounted for nearly half of the events recorded in the countries of the HKH region (Vaidya R.A et al. 2019) [Vaidya R.A. et al. (2019) Disaster Risk Reduction and Building Resilience in the Hindu Kush Himalaya. In: Wester P., Mishra A., Mukherji A., Shrestha A. (eds) The Hindu Kush Himalaya Assessment. Springer, Cham] [Lamin Mai Touray, Gambia]	ACCEPTED: the section is revised with suggested text.
43487	44	20			Read " due to limited number of studies " rather than " (limited number of studies " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: the sentence does not exist anymore.
11837	44	21	44	21	remove the "s" at the end of "precipitation". [Amy East, United States of America]	ACCEPTED: changed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45061	44	21	44	23	Do you imply a causality here? "However, due to an increase ..." instead of "However, together with an increase ..."? [Christophe Deissenberg, Luxembourg]	ACCEPTED: changed
39399	44	21	44	23	Which several areas of Asia. It is understood these are areas that have areas which permafrost thaw, but naming the areas will enhance the value of the information. [Lourdes Tibig, Philippines]	ACCEPTED: names the areas are specified now.
98151	44	25	44	26	Based on the findings in Knutson and Zeng (2018), detectable decreases in precipitation have not been found over most of Western Central Asia, but rather over just parts of Western Central Asia. Of the regions with adequate precipitation data for trend analysis in West Central Asia, most do not have detectable trends in annual precipitation. Detectable decreasing trends are perhaps a little more prevalent for 1981-2010 trends than for century-scale trends in this region, but on the other hand, the CMIP5 models typically don't simulate decreasing trends in this region over 1981-2010 except near Pakistan. [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: Yes, the text has been corrected: "Aridity in West Central Asia and parts of South Asia increased in recent decades (medium confidence), as documented in Afghanistan (Qutbudin et al., 2019), Iran (Zarei et al., 2016; Zolfaghari et al., 2016; Pour et al., 2020), most parts of Pakistan (Ahmed et al., 2018, 2019a)".
8655	44	25	44	38	Need of homogenise with the assessment of drought trends based on observations in Asia. In ch. 12 it is stated more drought trends in this region than in ch. 11. I think necessary to detail in Ch. 12 what are the metrics used for the assessment. This is not trivial since depending of the drought metric the assessment of the drought trends can be strongly different (see separation between different drought metrics in Ch. 11 pages 79-82). This comment is also valid for other continents. For example, the assessment in South America includes the metrics used making easierr to establish comparisons among chapter's assessment making overall report much more consistent. [Sergio Vicente-Serrano, Spain]	TAKEN INTO ACCOUNT: the text has been revised: "Aridity in West Central Asia and parts of South Asia increased in recent decades (medium confidence), as documented in Afghanistan (Qutbudin et al., 2019), Iran (Zarei et al., 2016; Zolfaghari et al., 2016; Pour et al., 2020), most parts of Pakistan (Ahmed et al., 2018, 2019a)".
45003	44	25	44	42	It may be confusing that "Increasing aridity and increasing droughts have been observed over most of Western Central Asia (Li et al., 2017; Knutson and Zeng, 2018; Qutbudin et al., 2019) and the Arabian Peninsula (low confidence)" at L25-27, and "Aridity and droughts are projected to increase in Western Central Asia and the Arabian Peninsula (medium confidence, medium agreement)". Which is it the correct, low confidence or medium confidence? [Moeka Yamaji, Japan]	TAKEN INTO ACCOUNT: The first sentence talks about the observed, and the second sentence talks about projection. Now both are revised.
23255	44	26	44	29	it is unclear that on this category that you mede, IRAN Is blong to wich part of ASIA? It is so important that you not to this problem. [Hamideh Dalaei, Iran]	TAKEN INTO ACCOUNT: Iran is considered as part of WCA. The sentence is rephrased.
32787	44	26	44	31	there are many references that show " drought severity has 29 overall increased in hyper-arid, arid and semi-arid regions of Iran". Then strongly suggest to change "low confidence" to "High confidence" for Iran. National Drought Warning and Monitoring Center (NDWMC) reports, http://ndc.irimo.ir/eng/index.php , climatological research institute reports, https://cri.ac.ir/index.php/fa/ , (Zolfaghari et al. 2014) DOI: 10.1007/s12517-016-2379-9, Emadodin I,et al 2019, Drought and Desertification in Iran. Hydrology. 6(3):66 .and a lot of references .. [sadegh zeyaeyan, Iran]	TAKEN INTO ACCOUNT: the text has been revised: "Aridity in West Central Asia and parts of South Asia increased in recent decades (medium confidence), as documented in Afghanistan (Qutbudin et al., 2019), Iran (Zarei et al., 2016; Zolfaghari et al., 2016; Pour et al., 2020), most parts of Pakistan (Ahmed et al., 2018, 2019a)".
33117	44	26	44	31	there are many references that show " drought severity has 29 overall increased in hyper-arid, arid and semi-arid regions of Iran". Then strongly suggest to change "low confidence" to "High confidence" for Iran. National Drought Warning and Monitoring Center (NDWMC) reports, http://ndc.irimo.ir/eng/index.php , climatological research institute reports, https://cri.ac.ir/index.php/fa/ , (Zolfaghari et al. 2014) DOI: 10.1007/s12517-016-2379-9, Emadodin I,et al 2019, Drought and Desertification in Iran. Hydrology. 6(3):66 .and a lot of references .. [Sahar Tajbakhsh Mosalman, Iran]	TAKEN INTO ACCOUNT: the text has been revised: "Aridity in West Central Asia and parts of South Asia increased in recent decades (medium confidence), as documented in Afghanistan (Qutbudin et al., 2019), Iran (Zarei et al., 2016; Zolfaghari et al., 2016; Pour et al., 2020), most parts of Pakistan (Ahmed et al., 2018, 2019a)".

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
29365	44	30	44	31	<p>Is the low confidence in drying over South Asia in the last half century consistent with the findings of Chapter 8? The appropriate text on page 50 therein is:</p> <p>"During the second half of the 20th century a significant decline in summer monsoon precipitation over India, accompanied by a weakening of the large-scale summer monsoon circulation, has been observed (Bollasina et al., 2011; Mishra et al., 2012; Abish et al., 2013; Krishnan et al., 2013, 2016; Saha et al., 2014; Singh et al., 2014; Roxy et al., 2015; Guhathakurta et al., 2017). This decline is corroborated by an increasing trend in the frequency and duration of monsoon breaks ('dry spells') (Singh et al., 2014) and significant decreases in soil moisture across different parts of India during the post-1950 (Niranjan Kumar et al., 2013; Ramarao et al., 2015, 2018; Krishnan et al., 2016)."</p> <p>This doesn't seem to be of low confidence. The authors should discuss the consistency with Chapter 8. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]</p>	<p>TAKEN INTO ACCOUNT: The section about aridity and droughts has been greatly revised, and we put medium confidence for drying over many parts in South Asia. In the section "Aridity", we put "Drought severity and aridity overall increased in ... many parts of India (Matin and Behera, 2017; Ramarao et al., 2019; Roxy et al., 2015) (medium confidence)".</p> <p>In section of "Hydrological drought", we put "there were strong trends toward drying of soil moisture in north-central India (Ganeshi et al., 2020) and intensified droughts in northwest India, parts of Peninsular India, and Myanmar (Malik et al., 2016) (medium confidence)".</p>
29367	44	38			<p>Is there really an observed trend of delayed SASM onset? Has this topic been identified in Chapter 8? [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]</p>	NOT APPLICABLE: the sentence does not exist anymore.
90865	44	38			<p>Note:Aridity and droughts are likely to happen (vulnerable) at the "Least developed countries (LDCs)" in Asia [Vivien How, Malaysia]</p>	NOT APPLICABLE: the sentence does not exist anymore.
126571	44	39	44	39	<p>Add: "... confidence). For subtropical Asian islands that rely on typhoons as the major rainfall source, diminished typhoon activities can trigger or exacerbate drought (Lin and Wang, 2018).""</p> <p>Citation: Lin, Y.-H., and S.-Y. Wang, 2018: Multidecadal variability in the subseasonal peak of low-level convergence over the Pacific warm pool. Atmosphere (Special Issue on Monsoons), doi:10.3390/atmos9050158 [Trigg Talley, United States of America]</p>	REJECTED: The paper did not present direct results regarding rainfall or drought.
131467	44	45	44	47	<p>Elaborate on statement: Drying trend is expected despite increased precipitations. Can the precipitation be further qualified? [Hans Poertner and WGI TSU, Germany]</p>	NOT APPLICABLE: the sentence does not exist anymore.
11839	44	46	44	46	<p>remove the "s" at the end of "precipitation". [Amy East, United States of America]</p>	NOT APPLICABLE: the sentence does not exist anymore.
13885	44	49	44	49	<p>Change 8.5 by RCP8.5 [Maria Amparo Martinez Arroyo, Mexico]</p>	ACCEPTED: changed.
29369	44	50	44	52	<p>In addition to the glacier melt and shrinkage contributing to summer runoff decrease, the authors may also wish to consider the conversion from winter snowfall to rainfall (due to increased altitude with warming of the freezing level). [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]</p>	NOTED: this is a good suggestion, but we did not find any report about this issue.
102677	44	52	44	52	<p>This is confusing. If the drought indices decrease, do the droughts increase in severity? [Philippe Tulkens, Belgium]</p>	ACCEPTED: this sentence is removed.
11841	44	55	44	55	<p>should read "High fire incidence is strongly..." [Amy East, United States of America]</p>	NOTED: the sentence is removed.
55225	44	55	45	2	<p>Suggest to add this to the end of the paragraph (p45, line 13) High rates of fire occurrence also occur during short-lived wind events, such as Foehn winds, as seen in Iran (Mofidi et al., 2015: https://doi.org/10.1007/s11069-014-1440-9) and also Korea. Such wind events are likely to compound existing droughts to increase wildfire activity (low confidence). [Nancy Hamzawi, Canada]</p>	ACCEPTED: it's added.
74329	44	55	45	13	<p>Here the description comes from almost one literature, Sun at al (2019). Is that enouh for AR6 to conclude by using only one literature? [Izuru Takayabu, Japan]</p>	ACCEPTED: several more papers are added.
63665	45	6	45	7	<p>"The regional mean fire saeson length increases by 6.2 days and 9.5 days..the median fire season length is projected to be longer than 50 days by the end of 21th century" compared to which time period?; [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	NOTED: The text is removed to cut size.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11843	45	8	45	8	"fire incidence" (no 's') [Amy East, United States of America]	NOTED: The text is removed to cut size.
51857	45	15	45	15	Suggested addition: 'In conclusion there is high confidence in projections of increasing..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: the sentence is revised with medium confidence.
100311	45	15	45	18	It is important to write here "projections" [Claudine Dereczynski, Brazil]	ACCEPTED: the sentence is revised.
51859	45	17	45	17	Suggested addition to clarify these are projections: 'Projected trends in droughts have contrasting patterns..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: the sentence is revised with medium confidence.
11845	45	23	45	25	over what time frame does this slowdown refer to? [Amy East, United States of America]	TAKEN INTO ACCOUNT: the sentence is revised according to results of several publications, "approximately -0.1 m/s/decade since 1950s"
39401	45	23	45	29	Please do the synthesis with the uncertainty language. [Lourdes Tibig, Philippines]	ACCEPTED: put high confidence here.
13887	45	27	45	27	standardize the format of the units: m/s/decade or m s ⁻¹ decade ⁻¹ [Maria Amparo Martinez Arroyo, Mexico]	NOTED: the original sentence is revised.
90867	45	34			Cross citing "Future projections of the near-surface wind speed over eastern China based on CMIP5 datasets" [Vivien How, Malaysia]	ACCEPTED: cited
39403	45	40	45	42	Uncertainty language in this statement? [Lourdes Tibig, Philippines]	ACCEPTED: medium confidence added.
110145	45	40	45	53	This is all covered in far greater detail in chapter 11. I'm not sure what value recasting this here brings to the assessment as a whole. [Peter Thorne, Ireland]	NOTED: necessary repetition
15585	45	40	45	53	For the review of past trends of TC activity in the western North Pacific, suggest making reference to the following assessment report/paper mandated by UNESCAP/WMO Typhoon Committee Expert Team: Lee, T.C., T.R. Knutson, T. Nakaegawa, M. Ying and E.J. Cha, 2020 : Third Assessment on Impacts of Climate Change on Tropical Cyclones in the Typhoon Committee Region – Part I : Observed Changes, Detection and Attribution, Tropical Cyclone Research and Review, In Press, https://doi.org/10.1016/j.tcr.2020.03.001 . [SAI MING LEE, China]	ACCEPTED: cited
102679	45	41	45	41	Category 4-5 on the Saffir-Simpson scale? Maybe state this, as different basins have different TC classification systems. Perhaps help the reader a bit by saying "Category 4-5 (wind speeds greater than 58 m/s)"? [Philippe Tulkens, Belgium]	ACCEPTED: added
33649	45	42			Change: "However there is..." by "However, there is...". [Guimar Rotllant, Spain]	ACCEPTED: changed
15587	45	45	45	50	Suggest also including the following reference which reported that TCs making landfall over East China have tended to be more destructive in recent decades: Li, C.Y., W. Zhou, C.M. Shun and T.C. Lee, 2017 : Change in Destructiveness of Landfalling Tropical Cyclones over China in Recent Decades, J. Climate, 30, 3367-3379, http://dx.doi.org/10.1175/JCLI-D-16-0258.1 [SAI MING LEE, China]	ACCEPTED: cited.
24499	45	45	45	51	There is description of north-westward shift in TC tracks in the WNP. However there is no description of north-westward shift in the references shown in this paragraph. Furthermore, This description is opposite to 11.7.1.5, Chapter11 (North Pacific. Several studies project either poleward or eastward expansion of TC occurrence over the western North Pacific region, and more TC occurrence in the central North Pacific). Additionally there is no reference of Altman et al., 2018 in the references. [Nobuhito Mori, Japan]	NOTED: the north-westward shift is described in Lee et al., 2020. Altman et al. 2018 is put in reference. Lee, T.-C., Knutson, T. R., Nakaegawa, T., Ying, M., and Cha, E. J. (2020). Third assessment on impacts of climate change on tropical cyclones in the Typhoon Committee Region – Part I: Observed changes, detection and attribution. Trop. Cyclone Res. Rev. 9, 1–22. Altman, J., Ukhvatkina, O. N., Omelko, A. M., Macek, M., Plener, T., Pejcha, V., et al. (2018). Poleward migration of the destructive effects of tropical cyclones during the 20th century. Proc. Natl. Acad. Sci. U. S. A. 115, 11543–11548
39405	45	45	45	51	Try starting the statement with "There is high confidence that there has been a significant..." [Lourdes Tibig, Philippines]	ACCEPTED: changed as suggested.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
74321	45	51	45	52	There's another research that the signal of decrease in propagation speed of TC has still not appeared, though it may appear in the future. Please refer, Yamaguchi et al (2020). Yamaguchi, M., J. C. L. Chan, I.-J. Moon, K. Yoshida and R. Mizuta, 2020: Global warming changes tropical cyclone translation speed, Nature Communications, 11, 47, doi:10.1038/s41467-019-13902-y [Izuru Takayabu, Japan]	ACCEPTED: cited.
98153	45	51	45	52	The significant decrease in TC translation speed in this basin reported by Kossin et al. 2016 may be more of an artifact of observational changes or internal climate variability, according to more recent follow-up work on this topic by Moon et al., and Lanzante. Refs: Moon, I.-J., Kim, S.-H., Chan, J.C.L., 2019. Climate change and tropical cyclone trend. Nature 570, E3eE5. https://doi.org/10.1038/s41586-019-1222-3 . Lanzante, J.R., 2019. Uncertainties in tropical-cyclone translation speed. Nature 570, E6eE15. https://doi.org/10.1038/s41586-019-1223-2 . [Thomas Knutson, United States of America]	ACCEPTED: considering the controversy about the slowdown of TC translation speed, the original sentence is removed. Instead, a more recent publication by Yamaguchi et al (2020) is cited, which showed that "TC translation speeds at the higher latitudes would decrease".
69267	45	51	45	52	There is another research that the signal of decrease in propagation speed of the TC has still not appeared, though it may appear in the future. Please refer to, Yamaguchi, M., J. C. L. Chan, I.-J. Moon, K. Yoshida and R. Mizuta, 2020: Global warming changes tropical cyclone translation speed, Nature Communications, 11, 47, doi:10.1038/s41467-019-13902-y [Kaoru Magosaki, Japan]	ACCEPTED: cited.
24467	45	52	45	53	The similar analysis for Typhoon Haiyan struck Philippines in 2013 was conducted considering preindustrial and present climate conditions following reference. Takayabu, I., K. Hibino, H. Sasaki, H. Shiogama, N. Mori, Y. Shibutani and T. Takemi (2015) Climate change effects on the worst-case storm surge: a case study of Typhoon Haiyan, Environmental Research Letters, Vol.10, 064011, 9p. [Nobuhito Mori, Japan]	NOTED: this paper is about the scenarios in the past, not the projections for the future. So, not cited.
39407	45	52	45	53	This finding should be part of finding in lines 40-42. [Lourdes Tibig, Philippines]	NOTED: lines 52-53 and lines 40-42 describe situations in different regions. We would like to cover the whole area.
102681	45	55	45	55	Either: "TCs will decrease in frequency" or "TC numbers will decrease" [Philippe Tulkens, Belgium]	ACCEPTED: changed
98155	45	55	46	2	You will need to coordinate with Ch. 11 on this, but I think that high confidence in projected increase in maximum TC windspeeds is too high. It should be either medium or medium-to-high, as there is not a clear detectable anthropogenic signal yet in observations for WNP basin TC intensity (Knutson et al. 2019). Ref: Knutson, T., Camargo, S. J., Chan, J. C. L., Emanuel, K., Ho, C.-H., Kossin, J., et al. (2019). Tropical Cyclones and Climate Change Assessment: Part II. Projected Response to Anthropogenic Warming. Bull. Am. Meteorol. Soc.,BAMS-D-18-0194.1. doi:10.1175/BAMS-D-18-0194.1. [Thomas Knutson, United States of America]	ACCEPTED: we put medium confidence here.
15589	45	55	46	9	For the review of projections of TC activity in the western North Pacific, suggest making reference to the assessment report/paper mandated by UNESCAP/WMO Typhoon Committee Expert Team which includes a summary of the projected % changes in different TC metrics for a 2oC global warming scenario. Salient points include : (i) For TC genesis/frequency, most recent studies projected a reduction of TC numbers (median: -10%), but an increase in the proportion of very intense TCs (Cat. 4-5) (median : +10%). (ii) Most TC intensity projection studies agree on an increase in intensity of TCs (median : +5%). (iii) All available projections for TC related precipitation indicated an increase in TC related precipitation (median : +17%). Reference: Cha, E.J., T.R. Knutson, T.C. Lee, M. Ying and T. Nakaegawa, 2020 : Third Assessment on Impacts of Climate Change on Tropical Cyclones in the Typhoon Committee Region – Part II : Future Projections, Tropical Cyclone Research and Review, In Press. [SAI MING LEE, China]	ACCEPTED: cited
102683	46	1	46	1	alsch = Walsch? [Philippe Tulkens, Belgium]	NOTED: removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11847	46	1	46	1	"Walsh", not "alsh" [Amy East, United States of America]	NOTED: removed.
102685	46	3	46	3	Why not list this number as m/s? + also: 96 kt is equivalent to Category 3 on Saffir-Simpson scale, perhaps include this as well [Philippe Tulkens, Belgium]	ACCEPTED: changed
33651	46	5			Add a space: "... (Mclay et al., 2019). There...". [Guiomar Rotllant, Spain]	ACCEPTED: changed
24469	46	6	46	9	A similar downscaling of typhoon and related storm surge for Japan using regional climate model is performed in Ninomiya et al. (2017). Ninomiya, J., N. Mori, T. Takemi and O. Arakawa (2017) SST ensemble experiment-based impact assessment of climate change on storm surge caused by pseudo-global warming - Case study of Typhoon Vera in 1959, Coastal Engineering Journal, World Scientific, 59, 1740002, 20p. [Nobuhito Mori, Japan]	NOTED: there is no indication of the scenario of their projections in the paper, so it is not cited..
39409	46	11			"remains" should be in plural form. [Lourdes Tibig, Philippines]	ACCEPTED: changed
100035	46	18	46	27	Increase in the rates of sand encroachment is a growing and less explored issue (https://www.nature.com/articles/s41598-017-01796-z) and can probably be mentioned here. [Lydia Sam, Sweden]	NOTED: the paper is about geomorphology, so not mentioned here.
43489	46	18			Read "slightly in some areas " rather than "slightly in the some areas " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: changed
90869	46	18			Cross citing "Sand and Dust Storms in Asia and the Pacific" published by UNSECAP [Vivien How, Malaysia]	ACCEPTED: cited
126573	46	21	46	21	Remove the extra "associated" [Trigg Talley, United States of America]	ACCEPTED: changed
33653	46	21			Erase second "associated": "...the 21st Century has been associated associated to drought conditions...". [Guiomar Rotllant, Spain]	ACCEPTED: corrected.
43491	46	21			Read "the 21st Century has been associated to drought " rather than "the 21st Century has been associated associated to drought " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: changed
11849	46	25	46	27	is this decrease over East Asia because of land-use changes, specifically agricultural soil conservation measures? [Amy East, United States of America]	NOTED: there should be some linkage, but no publication is found to support that.
15591	46	29	46	30	The statement "There is high confidence that tropical cyclones will have a decreasing frequency but an increasing intensity" may not be in line with the discussion in findings in Section 11.7.1.5 and the discussion in the previous paragraph of Section 12.4.2.3 that there is medium confidence that future TC numbers will decrease in frequency but there is high confidence of an increase in TC intensity. [SAI MING LEE, China]	ACCEPTED: changed as: There is medium confidence that tropical cyclones will have decreasing frequency and increasing intensity overall.
51861	46	30	46	31	Suggested edit if accurate: '...will have a decreasing frequency overall, but an increasing intensity (i.e. a higher frequency of higher intensity events).' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: changed as: There is medium confidence that tropical cyclones will have decreasing frequency and increasing intensity overall.
39411	46	30	46	31	Would you consider revising the statement to " Tropical cyclones, however are likely to have increasing intensity, but decreasing frequency." [Lourdes Tibig, Philippines]	ACCEPTED: changed as: There is medium confidence that tropical cyclones will have decreasing frequency and increasing intensity overall.
38193	46	36	36	49	There are some reports that observed trend in snow cover at WE Siberia, Central Asia, RAR, and eastern Europe has seasonality in a way that the snow cover develops and retreats earlier in recent decade compared to the end of 20th century (e.g., Yeo et al., 2017 and others) in association with arctic warming, which are not mentioned here. Yeo, S.-R., W. M. Kim, and K.-Y. Kim, 2017: Eurasian snow cover variability in relation to warming trend and Arctic Oscillation. Climate Dynamics, 48, https://doi.org/10.1007/s00382-016-3089-4 . [Junhee Lee, Republic of Korea]	ACCEPTED: cited

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
2861	46	36	46	47	You should refer to the recentmost study by Shean et al. (Shean, D. E., Bhushan, S., Montesano, P., Rounce, D. R., Arendt, A., & Osmanoglu, B. (2020). A Systematic, Regional Assessment of High Mountain Asia Glacier Mass Balance. <i>Front. Earth Sci</i> , 7, 363.) [Antoine RABATEL, France]	ACCEPTED: cited
88085	46	36	47	4	It would be more useful to refer to the respective Ch9 assessment than repeating single references. [Georg Kaser, Austria]	Noted: This section is revised significantly, and CH9 is cited when necessary.
203	46	36	47	38	12.4.2.4 Snow and Ice Future extreme wet snowfall in East Asia (Japan) is also discussed in Ohba and Sugimoto (2020) by using state-of-the-art climate model simulation. The temperature warming causes the qualitative changes in snowfall (i.e., snowfall tends to be wetter in midlatitude). Ohba and Sugimoto (2020) shows that the rate of dry/wet snowfall can be change in future in Japan, and the heavy wet snowfall can be enhanced over the mountainous and northern part of Japan (i.e., the region of heavy wet snowfall will move to higher altitudes and higher latitudes). Please consider my proposal to add the following reference. Ohba, M., and S. Sugimoto 2020: Impacts of climate change on heavy wet snowfall in Japan, <i>Climate Dynamics</i> , 54, 3151–3164. doi:10.1007/s00382-020-05163-z. https://link.springer.com/article/10.1007/s00382-020-05163-z [Masamichi Ohba, Japan]	ACCEPTED: it's cited in the section of "Heavy snow and ice storm".
112979	46	36	47	49	Nothing reported on Karakoram Anomaly and associated hazards [Muhammad Amjad, Pakistan]	ACCEPTED: Karakoram is mentioned directly now.
88087	46	37	46	39	This should be stated as an anomaly but not in the second sentence of the paragraph. Compare with Ch9. [Georg Kaser, Austria]	ACCEPTED: changed
11851	46	40	46	40	seems odd to report 97.52% to four significant figures. [Amy East, United States of America]	ACCEPTED: removed
33655	46	40			Avoid starting a sentence with a number: "97.52% of glaciers in the Tianshan Mountains in northwest China showed...". [Guiomar Rotllant, Spain]	ACCEPTED: removed
33657	46	42			What means H.W. in "(H. W. Chen et al., 2016)". If they are the initials of the name of Chen, then erase. [Guiomar Rotllant, Spain]	ACCEPTED: removed
33659	46	44			What means H. in "(H. Deng et al., 2019)". If it is the initial of the name of Deng, then erase. [Guiomar Rotllant, Spain]	ACCEPTED: removed
83723	46	46			I think the Kunlun Shan - Karakoram - Pamir glacier mass balance anomaly is meanwhile quite certain and established. See Brun et al. 2017, Kääh et al. 2015, which you cite already, and Treichler D., Kääh A., Salzmann N., Xu C-Y. (2019): Recent glacier and lake changes in High Mountain Asia and their relation to precipitation changes. <i>The Cryosphere</i> , 13, 2977-3005, https://doi.org/10.5194/tc-13-2977-2019 . All these studies agree pretty well in amounts and geographic pattern. [Andreas Kääh, Norway]	ACCEPTED: changed, it should be variability, rather than uncertainty.
11853	46	47	46	48	the meaning of "variability in western disturbances" is unclear. What does this refer to? [Amy East, United States of America]	NOTED: removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45627	46	51	47	4	<p>There is a misconception about how the future mass balance change of the HMA is expressed in Chaturvedi et al. 2014, and how it is used here. Chaturvedi et al. say that the mass balance, which could be positive or negative, will decrease by six times, so it will be even more negative than what is now. This means that glacier mass loss will increase (by six times) instead of decrease, as mentioned here.</p> <p>There is an inconsistency in the degree of confidence given to the future rate of mass loss here and what we conclude in chapter 9 section 9.5.1.3 and what it was done in Chapter 2 of SROCC. Although, future projections over the High Mountain of Asia (HMA; RGI regions 13, 14 and 15) shown a similar picture (Figure 9.22 and table 9.3), due to different uncertainty sources, we agree with SROCC Chapter 2 to give medium confidence to the rate of mass loss for all the different regions (please take a look at section 9.5.1.3 or Marzeion et al for a detail discussion).</p> <p>Marzeion, B. et al. Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change. Earth's Futur. (submitted). [Lucas Ruiz, Argentina]</p>	<p>ACCEPTED: we agree with Marzeion et al., (2020) that large uncertainties remain in projections of glacier mass loss on regional scales, and give medium confidence. we use another statement by Chaturvedi et al. 2014 for better understanding: "10.6% and 27 % of the glaciers in Karakoram and Himalaya mountains could eventually disappear by the end of the century under RCP2.6 and RCP8.5 respectively "</p>
45063	47	2	47	3	<p>There is high confidence 1 that the rate of glacier mass loss of the Karakoram and Himalaya region will about double ($-12 \pm 2 \text{ Gt a}^{-1}$) and decline at six times the rate by ($-35 \pm 2 \text{ Gt a}^{-1}$) by 2081-2100 under RCP2.6 and RCP8.5 respectively. There is high confidence that by 2081-2100 the rate of glacier mass loss of the Karakoram and Himalaya region will about double under RCP2.6 ($-12 \pm 2 \text{ Gt a}^{-1}$) respectively be multiplied by 6 under RCP8.5 ($-35 \pm 2 \text{ Gt a}^{-1}$). [Christophe Deissenberg, Luxembourg]</p>	<p>TAKEN INTO ACCOUNT: we use another statement by Chaturvedi et al., (2014) for better understanding: "10.6% and 27 % of the glaciers in Karakoram and Himalaya mountains could eventually disappear by the end of the century under RCP2.6 and RCP8.5 respectively "</p>
33661	47	3			<p>Add a comma before the parenthesis: "...respectively (Chaturvedi et al.,...." [Guiomar Rotllant, Spain]</p>	<p>ACCEPTED: changed</p>
83725	47	7			<p>An important study for that is Huss, M., Hock, R. Global-scale hydrological response to future glacier mass loss. Nature Clim Change 8, 135–140 (2018). https://doi.org/10.1038/s41558-017-0049-x [Andreas Kääh, Norway]</p>	<p>ACCEPTED: cited</p>
24143	47	15	47	17	<p>Thousands of new lakes are predicted to form as a consequence of continued glacier retreat (Linsbauer et al., 2016). As many of these lakes will develop at the immediate foot of steep icy peaks with degrading permafrost and decreasing slope stability, the risk of far-reaching floods from landslides into such water bodies is systematically increasing (Haeberli et al., 2017). References: (1) Linsbauer, A., Frey, H., Haeberli, W., Machguth, H., Azam, M.F., Allen, S., 2016. Modelling glacier-bed overdeepenings and possible future lakes for the glaciers in the Himalaya–Karakoram region. <i>Annals of Glaciology</i> 57(71). doi:10.3189/2016AoG71A627. (2) Haeberli, W., Schaub, Y. Huggel, C., 2017. Increasing risks related to landslides from degrading permafrost into new lakes in de-glaciating mountain ranges. <i>Geomorphology</i> 293, 405-417. http://dx.doi.org/10.1016/j.geomorph.2016.02.009. (3) Kapitsa, V., Shahgedanova, M., Machguth, H., Severskiy, I. and Medeu, A., 2017. Assessment of evolution and risks of glacier lake outbursts in the Djungarskiy Alatau, Central Asia, using Landsat imagery and glacier bed topography modeling. <i>Natural Hazards and Earth System Sciences</i>, Vol. 17, pp. 1837–1856. Available at: http://doi.org/10.5194/nhess-17-1837-2017. [Wilfried Haeberli, Switzerland]</p>	<p>ACCEPTED: The text is used. But it is doubtful to say there will be thousands of new lakes according to a recent paper by Wang et (2020), who showed that , compared with 1990s, the number of lakes decreased by 2.22%, whereas total lake area expanded by 25% in Tibet Plateau. Wang, S., Che, Y. & Xinggang, M. Integrated risk assessment of glacier lake outburst flood (GLOF) disaster over the Qinghai–Tibetan Plateau (QTP). <i>Landslides</i> (2020). https://doi.org/10.1007/s10346-020-01443-1</p>
83727	47	16			<p>I agree with the rising numbers of lakes, but is there evidence that more river floods will/could lead to more lake outburst floods? I am not aware of observational evidence for that, at least. It sounds as like a reasonable guess, but IPCC should assess evidences. [Andreas Kääh, Norway]</p>	<p>NOTED: Indeed it hard to collect statistically significant evidences to support the statement. We assess the risk now.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
44111	47	17	47	17	Please include similar information for the HKH region. Here is a text suggestion which could be helpful: "A 2014 inventory for the HKH region revealed more than 8200 glacial lakes and an overall lake area of more than 830km ² (Chen et al. 2017) [Chen, F., Zhang, M., Tian, B., & Li, Z. (2017). Extraction of glacial Lake outlines in Tibet plateau using landsat 8 imagery and google earth engine. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 10(9), 4002–4009.]" [Lamin Mai Touray, Gambia]	REJECTED: this literature only reported about a status in 2014, without information about change. We have to cut size of the text in SOD.
88369	47	19	47	22	"Permafrost thawing is increasing" would imply an acceleration in the rate of thawing and that isn't really supported by the information in the rest of the sentence. This should probably be revised to "Permafrost is thawing in Asia....." Additional revision suggested "... active layer thicknesses in Siberia and Russian Far East generally increased from late 1990s to....". Also, updated information is available in Romanovsky et al. (2019 - most recent published State of Climate report) [Sharon Smith, Canada]	ACCEPTED: revised as suggested.
24145	47	19	47	26	Permafrost is also widespread in Asian mountains (Gruber et al., 2017). Long-term Permafrost degradation affects slope stability. Large rock-ice avalanches are likely to occur at increasing frequencies. This is especially dangerous where new lakes form at the foot of the corresponding peaks (Haeberli et al., 2017). References: (1) Gruber, S., Fleiner, R., Guegan, E., Panday, P., Schmid, M.-O., Stumm, D., Wester, P., Zhang, Y. and Lin, Z., 2017. Review article: Inferring permafrost and permafrost thaw in the mountains of the Hindu Kush Himalaya region. The Cryosphere, Vol. 11, pp. 81-99. Available at: http://doi.org/10.5194/tc-11-81-2017 . (2) Haeberli, W., Schaub, Y. Huggel, C., 2017. Increasing risks related to landslides from degrading permafrost into new lakes in de-glaciating mountain ranges. Geomorphology 293, 405-417. http://dx.doi.org/10.1016/j.geomorph.2016.02.009 . [Wilfried Haeberli, Switzerland]	ACCEPTED: added, but (Haeberli et al., 2017) is cited in the previous section for ice.
99957	47	19	47	26	In addition to Siberian permafrost, the high-mountain permafrost in periglacial regions of Hindu Kush-Himalaya also deserves a mention here. There is a huge uncertainty around the mountain permafrost and its present and future contribution to the regional hydrology. [Bhardwaj Anshuman, Sweden]	ACCEPTED: permafrost in mountains is added.
88371	47	23	47	26	Reference for this statement on reduction of permafrost extent? Based on Ch 9 results? This statement likely only refers to the upper 3 m so it is not the true permafrost extent (permafrost can be several 100 m thick) and if based on ch 9 it is the volume of permafrost in the upper 3 m. What is meant by near-term future? [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: The estimation comes from Wang et al., Sci Rep. 2019; 9: 3295, for north hemisphere. This part is revised now, and their result is replaced by other results specific for Asia.
55227	47	24	47	25	23-25% decrease in permafrost extent is stated. But isn't this just the decrease in extent of the very upper few metres (ie near-surface permafrost as defined in the glossary). As stated, makes it sounds like this isn't the case. The "near-surface" qualifier needs to be added. Also, "in the near-term future" is incredibly vague. Give the specific time period from modelling. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: The estimation comes from Wang et al., Sci Rep. 2019; 9: 3295, for north hemisphere. This part is revised now, and their result is replaced by other results specific for Asia.
45629	47	24	47	26	Please provide a citation to support this statement. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The estimation comes from Wang et al., Sci Rep. 2019; 9: 3295, for north hemisphere. This part is revised now, and their result is replaced by other results specific for Asia.
74323	47	27	47	38	There's much more literatures appeared till the end of 2019. They are, Kawase, H., T. Yamazaki, S. Sugimoto, T. Sasai, R. Ito, T. Hamada M. Kuribayashi, M. Fujita, A. Murata, M. Nosaka, and H. Sasaki, 2019: Changes in extremely heavy and light snow-cover winters due to global warming over high mountainous areas in central Japan, PEPS, accepted [Izuru Takayabu, Japan]	ACCEPTED: cited.
69269	47	27	47	38	There is much more literatures available by the end of 2019: Kawase, H., T. Yamazaki, S. Sugimoto, T. Sasai, R. Ito, T. Hamada M. Kuribayashi, M. Fujita, A. Murata, M. Nosaka, and H. Sasaki, 2019. Changes in extremely heavy and light snow-cover winters due to global warming over high mountainous areas in central Japan, PEPS, are accepted. [Kaoru Magosaki, Japan]	ACCEPTED: cited.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11855	47	28	47	38	see above comment that the 'dzud' extreme cold phenomenon was mentioned by Middleton and Sternberg (2013) as a possible consequence of climate change (especially drought) in central Asia, and may be worth mentioning here as a speculative possibility even if such a climate-change link is not confirmed yet. Also Sternberg (2018). [Amy East, United States of America]	TAKEN INTO ACCOUNT: we checked the phenomenon of 'dzud', but it seems there is no clear description about either its changes or its causes. Therefore we ignore this due to size limitation.
38219	47	29	49	4	"Sea of Japan" (mentioned in 3 times) be changed to "East Sea" [Junhee Lee, Republic of Korea]	ACCEPTED: changed.
23795	47	29	49	4	"Sea of Japan" (mentioned in 3 times) be changed to "East Sea" [KyungOn Boo, Republic of Korea]	ACCEPTED: changed.
78901	47	42	47	42	As shown in Chapter 10 (10.4.1.2.2), the East Asia summer monsoon has a recovering trend since the 2000s. [jian li, China]	TAKEN INTO ACCOUNT: Maybe the link between monsoon and hail days are weak, therefore we removed the phrase about the cause of hail day decrease.
86299	47	43	47	43	0.214 the number of days per decade? [Debra Roberts and the Durban WGII TSU, South Africa]	ACCEPTED: added, "hail days".
90871	47	43			Besides during summer moonsoon, damaging hail occur occasionally in premonsoon thurderstorm over nothern India, but other part of india is light and infrequent.[Cite "Some Aspects of Thunderstorm over India during Pre-Monsoon Season: A Preliminary Report" [Vivien How, Malaysia]	TAKEN INTO ACCOUNT: we checked the paper, but it is hard to link it to climate change.
90873	47	47			Include study "Avalanche character and fatalities in the high mountains of Asia" to discuss briefly on avalanche characteristics [Vivien How, Malaysia]	TAKEN INTO ACCOUNT: we checked the paper, but it is hard to link it to climate change.
45631	47	51	47	52	Land ice cover (which is glacier area) is directly correlated with glacier mass change. There is not need to separed them as they were different CIDs. [Lucas Ruiz, Argentina]	ACCEPTED: removed.
114881	48	3	48	12	Human-induced subsidence is an important contribution to relative sea-level rise in Asia's coasts - more so than other parts of the coast. Nicholls (2018) (Figure 2.3) synthesises observed subsidence across large Asian coastal cities. Nicholls, R.J. (2018) Adapting to Sea-Level Rise. In: Zommers, Z. and Alverson, K. (eds.) Resilience: the Science of the Adaptation to Climate Change. Elsevier pp. 13-29. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: RSL rise projections provided here are directly taken from Ch 9 and therefore only partially accounts for local land subsidence. As far as we are aware there are no gridded global data sets on land subsidence available to date. For the RSL CID in every continental section we have now added the following sentence: These RSLR projections may however be underestimated due to potential partial representation of land subsidence in their assessment (Section 9.6.3.2). We have also added. Nicholls, R. J. (2015). "Adapting to Sea Level Rise," in Coastal and Marine Hazards, Risks, and Disasters, eds. J. F. Shroder, J. T. Ellis, and D. J. Sherman (Boston: Elsevier), 243–270.
39413	48	3	48	18	No uncertainty language in the findings on sea level rise in Asia? [Lourdes Tibig, Philippines]	ACCEPTED: uncertainty language has been added.
63667	48	5	48	5	It seems that while RSL is defined (as relative sea level rise), the definition of GMSL is left out [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: it is defined earlier in 12.3 and also in Ch 9.
1801	48	10	48	10	What is "building mass compaction?" I presume this is supposed to be sediment compaction? [Torbjorn Tornqvist, United States of America]	ACCEPTED: changed to "sediment compaction under building mass"
43493	48	10		11	Read "(e.g., the Mekong delta in Vietnam (Minderhoud et al., 2019))" rather than "(e.g., the Mekong delta in Vietnam (Minderhoud et al., 2019)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: rephrased.
38195	48	11	48	11	Missing closing parenthesis after (Wang et al., 2017b)". [Junhee Lee, Republic of Korea]	NOTED: removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
1803	48	11	48	12	Please make it explicit what the numbers refer to; is the negative number (-4.5) subsidence? And apparently there are portions of the Chinese coast that are currently experiencing uplift? Also, note that these numbers are very small compared to rates reported by Minderhoud et al. (2017, ERL), among others, that are an order of magnitude higher. [Torbjorn Tornqvist, United States of America]	TAKEN INTO ACCOUNT: Yes, the negative indicate subsidence. Minderhoud et al (2017)'s estimates are also now added.
3155	48	11	48	12	In "Vertical land movement of between -4.5 ± 1.0 mm/yr and 1.4 ± 1.3 mm/yr has been measured across 25 stations along China's coastline(Qu et al., 2019)", the number of station should be 18, and not 25. I suggest reference "the Vertical motions of tide gauge stations near the Bohai Sea and Yellow Sea (Liu et al.,2015) ". [Hui Wang, China]	TAKEN INTO ACCOUNT: The results by Qu is rephrased now. The 25 stations is mentioned in the abstract of Qu (2019), but indeed it should be 18. Liu et al. (2015) is not added, because they only discussed about the vertical movement which is already covered by Qu.
33663	48	11			Add an extra parenthesis at the end of the sentence: "al., 2019) and Shanghai, China (Wang et al., 2017b)". [Guiomar Rotllant, Spain]	ACCEPTED: changed
1805	48	14	48	16	Are you sure you want to say RSL here? This paragraph only discusses oceanic effects; RSL rise in SE Asia, especially in the most densely populated coastal zones, is often dominated by a high subsidence component due to shallow sediment compaction and fluid extraction. [Torbjorn Tornqvist, United States of America]	TAKEN INTO ACCOUNT: RSL rise projections provided here are directly taken from Ch 9 and therefore only partially accounts for local land subsidence. As far as we are aware there are no gridded global data sets on land subsidence available to date. For the RSL CID in every continental section we have now added the following sentence: These RSLR projections may however be underestimated due to potential partial representation of land subsidence in their assessment (Section 9.6.3.2).
114883	48	14	48	18	Do these numbers include future subsidence scenarios? Probably not but this is unclear to the reader. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: RSL rise projections provided here are directly taken from Ch 9 and therefore only partially accounts for local land subsidence. As far as we are aware there are no gridded global data sets on land subsidence available to date. For the RSL CID in every continental section we have now added the following sentence: These RSLR projections may however be underestimated due to potential partial representation of land subsidence in their assessment (Section 9.6.3.2).
14807	48	17	48	18	It's not clear what 'above-average contributions from... glaciers and ice sheets' means in the context of why SLR around Asia is greater than world average. Suspect this should reference regional sea level effects arising from ice sheet GIA. Clarify with a Chapter 9 author or remove. [Jeremy Fyke, Canada]	ACCEPTED :Process drivers and modes of variability that cause CIDs are not the focus of CH12. Such process descriptions are within the remit of Ch9. Sentence has been deleted.
24471	48	20	48	22	Similar study for 100-yr storm surge level has been conducted in relation to the characteristics of typhoons and storm surges bu Mori et al. (2019). Mori, N., T. Shimura, K. Yoshida, R. Mizuta, Y. Okada, M. Fujita, T. Temur Khujanazarov, E. Nakakita (2019) Future changes in extreme storm surges based on mega-ensemble projection using 60-km resolution atmospheric global circulation model, Coastal Engineering Journal, Taylor & Francis, 61:3, pp.295-307. doi:10.1080/21664250.2019.1586290 [Nobuhito Mori, Japan]	REJECTED: In Ch 12 we specifically assess ETWL which combines RSLR, tide, surge and wave setup. This reference is only about surge and more appropriate for Ch 9. We have forwarded the reference to Ch 9.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
24473	48	20	48	22	The description of 1:100 yr ELS is misunderstanding in this paragraph. If ELSs include tide, there are many locations over 3 m in the East Asia and South East Asia from Japan, Taiwan, Philippines and other locations. The pure surge heights in 1:100 yr may depends on location. The recent historical records of the storm surge in Osaka, Japan and Layte in Philippines are over 2.5 m. See TPXO Atlas (https://www.tpxo.net/global/tpxo9-atlas) Mori, N., T. Yasuda, T. Arikawa, T. Kataoka, S. Nakajo, K. Suzuki, Y. Yamanaka, A. Webb (2019) 2018 Typhoon Jebi post-event survey of coastal damage in the Kansai region, Japan, Coastal Engineering Journal, Taylor & Francis, pp.278-294. Kumagai, K., N. Mori and S. Nakajo (2016) Storm surge hindcast and return period of a Haiyan-like super typhoon, Coastal Engineering Journal, World Scientific, Vol.58, No.1, pp.1640001-1 - 1640001-15. [Nobuhito Mori, Japan]	ACCEPTED: This was a mistake. The sentence has now been updated based on both Vousdoukas et al (2018) and Kirezci et al (2020)
5537	48	20	48	34	It lacks the impact on the deltas. This remark is valid for the coastal zones for the other continents, but particularly for the Asia who has the big deltas. [Benoit Laignel, France]	NOTED: Flooding of Deltas is commonly due to combined effect of high riverflows and ETWL. Compound events are dealt with in Ch 11 and is outside the remit of Ch 12. However we have now added a statement on the flooding of the Deltas in both observation and projections.
39415	48	20	48	34	This looks more like a literature review. Please synthesize and do the uncertainty language [Lourdes Tibig, Philippines]	ACCEPTED: The paragraph has been revised and includes uncertainty language now
13889	48	22	48	22	Delete a parenthesis in (2018)). [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: Corrected
33665	48	22			Erase the second parenthesis: "...can be as large as 10 m Vousdoukas et al. (2018)).". [Guiomar Rotllant, Spain]	NOT APPLICABLE: the sentence does not exist anymore.
43495	48	22			Read " (Vousdoukas et al., 2018)" rather than " Vousdoukas et al. (2018))" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: the sentence does not exist anymore.
1807	48	24	48	34	This paragraph makes for rather awkward reading; would it be possible to capture this information in a table? [Torbjorn Tornqvist, United States of America]	ACCEPTED: The paragraph has been revised and more readable now
69271	48	24	48	34	The description of ELSs in this paragraph seems to rely basically on a single source (Vousdoukas et al. (2018)). The ensemble of different studies would are not reflected and thus, clarification of the uncertainty of projections and modeling is lacking. [Kaoru Magosaki, Japan]	ACCEPTED: Assessment has been expanded to include more references now
74603	48	28	48	28	return periods smaller than 1:1 years(2100): 1:1 years doesn't have a sense in terms of return periods (it doesn't exist in my opinion); need to think about and discuss this matter with experts [Moulay Driss HASNAOUI, Morocco]	ACCEPTED: we do not refer to 1:1 yr anymore
1809	48	36	48	37	I assume the authors mean "progradation" rather than "accretion" here? Note that accretion is commonly understood to refer to the vertical dimension. [Torbjorn Tornqvist, United States of America]	ACCEPTED: changed to shoreline progradation
69273	48	36	48	39	There are some researches done in Japan: Udo, K. and Y. Takeda, Projections of future beach loss in Japan due to sea-level rise and uncertainties in projected beach loss, Coastal Engineering Journal, Vol. 59, 1740006, 2017. and Udo, K., R. Ranasinghe, and Y. Takeda, An assessment of measured and computed depth of closure around Japan, Scientific Reports, Vol. 10, 2987, 2020. Also, there are some papers handling coastal erosion in South East Asia: Ritphring, S., C. Somphong, K. Udo, and S. Kazama, Projections of future beach loss due to sea level rise for sandy beaches along Thailand's coastlines, Journal of Coastal Research, Sp. Iss. 85, pp.541-545, 2018. and in Africa: Sharaan, M. and K. Udo, Projections of future beach loss along the Mediterranean Coastline of Egypt due to sea-level rise, Applied Ocean Research, Vol. 94, 101972, 2020. [Kaoru Magosaki, Japan]	ACCEPTED: Udo et al., 2017 and Ritphring et al., 2018 are now cited.
1811	48	36	48	46	Note that Nienhuis et al. (2020, Nature) report that many low-elevation coastal zones in SE Asia are currently growing. [Torbjorn Tornqvist, United States of America]	ACCEPTED: added
39417	48	36	48	46	Same comment as above [Lourdes Tibig, Philippines]	NOT APPLICABLE: the sentence does not exist anymore.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33667	48	36			Erase comma: "Luijendijk et al., (2018)...". [Guiomar Rotllant, Spain]	ACCEPTED: erased
43497	48	36			Read "Luijendijk et al. (2018) show a continent averaged " rather than "Luijendijk et al., (2018) shows a continent averaged " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: the sentence does not exist anymore.
114885	48	41	48	43	China's coast will accrete with high confidence? This will depend on RSL and sediment supply which may change . Some of these statements need to be caveated? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have better nuanced this sentence now
43499	48	43			Read "presented by Voudoukas et al. (in press) " rather than "presented by (Voudoukas et al., in press) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: rephrased
9269	48	48	48	50	Arabian Gulf must be change to Persian Gulf [Morteza Pakdaman, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
39419	48	48	49	1	Same as above [Lourdes Tibig, Philippines]	NOT APPLICABLE: the sentence does not exist anymore.
32783	48	49	48	49	The term "Arabian Gulf" must change to "Persian Gulf, as IPCC is a UN related organization should use official name recognized by UN(United Nations, 2006) and Document AD/311/1/GEN:dated 5 march 1991, Document ST/CS/SER.A/29/ADD.1: dated 24january 1992,Resolution UNLA45/ 8/2/ dated 10 august 1984,Resolution UNAD311/Qen dated 5 March 1971,Document CAB/1/87/63 dated 16 february 1987 UNESCO,as "Persian Gulf". Even the reference used in the text mentioned this fact as footnote.IPCC report is not a journal or unofficial report, and has to follow UN official recognized name which off course is not offending anybody. [sadegh zeyaayan, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
19529	48	49	48	49	as IPCC is a UN related organization should use official name recognized by UN(United Nations, 2006) and Document AD/311/1/GEN:dated 5 march 1991, Document ST/CS/SER.A/29/ADD.1: dated 24january 1992,Resolution UNLA45/ 8/2/ dated 10 august 1984,Resolution UNAD311/Qen dated 5 March 1971,Document CAB/1/87/63 dated 16 february 1987 UNESCO,as "Persian Gulf". Even the reference used in the text mentioned this fact as footnote.IPCC report is not a journal or unofficial report, and has to follow UN official recognized name which off course is not offending anybody. [Hamideh Dalaei, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
33113	48	49	48	49	The term "Arabian Gulf" must change to "Persian Gulf, as IPCC is a UN related organization should use official name recognized by UN(United Nations, 2006) and Document AD/311/1/GEN:dated 5 march 1991, Document ST/CS/SER.A/29/ADD.1: dated 24january 1992,Resolution UNLA45/ 8/2/ dated 10 august 1984,Resolution UNAD311/Qen dated 5 March 1971,Document CAB/1/87/63 dated 16 february 1987 UNESCO,as "Persian Gulf". Even the reference used in the text mentioned this fact as footnote.IPCC report is not a journal or unofficial report, and has to follow UN official recognized name which off course is not offending anybody. [Sahar Tajbakhsh Mosalman, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
21115	48	49	48	49	term "Arabian Gulf" must be change to "Persian Gulf" [Iman BABAEIAN, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
18627	48	49	48	49	The term "Arabian Gulf" does not exist. If it is to mean the gulf south of Iran and north of the Arabian Peninsula, the correct term for this is the "Persian Gulf." This is according to many approved documents of the United Nations. Also, as this is well considered in the whole manuscripts of this and other chapters, the use of the Persian Gulf's incorrect term causes discrepancies with the rest of the report. [Hossein Khajehpour, Iran]	NOT APPLICABLE: the sentence does not exist anymore.
63669	48	51	48	55	If the base case is in 2.5-3 MHWs per year, it seems more straightforward and easier to comprehend if the frequency increase is written as 0.05 and 0.2 MHW per year, as opposed to 0.5 and 2 MHW *per decade* [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: the paragraph has been completely revised
55229	49	1	49	2	In fact, the Harris (1988) definition says nothing about erosion in the definitions of thermokarst or thermokarst terrain, though the term is now commonly applied to slope processes in ice-rich terrain. [Nancy Hamzawi, Canada]	Not applicable: Misplaced comment and we cannot identify what it refers to.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
421	49	9	49	10	Please refer to my comment on "lake Acidification". The study by Lauvset 2015 is based on model results and no direct observations, and do not consider coastal ocean. There are no references in the SOD text to "lake acidification" so far. Here a direct quote from Lauvset et al 2015: "Here, we only evaluate trends in the open ocean." -> page 3 from the pdf article version. I'd suggest rewriting this. Please note that this comment aims at strengthening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	NOT APPLICABLE: Lake acidification has been omitted from the CIDs considered in CH 12.
90875	49	9			Considering Ocean Acidification Modelling from NOAA's Geophysical Fluid Hydamics Laboratory (??) to translate climate information and address ocean acidification issues [Vivien How, Malaysia]	NOT APPLICABLE: Due to space limitations, only a brief assessment of Ocean acidification is now given in 12.4 introduction.
51863	49	25	49	25	suggested edit: 'at a rate higher than the global average..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: The sentence does not exist anymore.
29229	49	31	49	44	In section 12.4.2.6 (Air pollution over Asia), not only PM2.5 in China but also its severity in India (e.g., Chen et al., 2020) and O3 increase in China (e.g., Lu et al., 2018) would be worth mentioned. References: Chen, Y., Wild, O., Conibear, L., Ran, L., He, J., Wang, L., and Wang, Y. (2020), Local characteristics of and exposure to fine particulate matter (PM2.5) in four indian megacities, Atmos. Environ: X 5, 100052. doi:10.1016/j.aeaoa.2019.100052. Lu, X., Hong, J., Zhang, L., Cooper, O. W., Schultz, M. G., Xu, X., Wang, T., Gao, M., Zhao, Y., and Zhang, Y. (2018), Severe surface ozone pollution in China: A global perspective, Environ. Sci. Technol. Lett., 5, 487-494. DOI:10.1021/acs.estlett.8b00366. [Yugo Kanaya, Japan]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
24427	49	33	49	40	Air pollution in India needs to be addressed, because Indian cities are most impacted by air pollution. [Akio Kitoh, Japan]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
109435	49	33	49	44	My understanding is that this section should discuss the effect of climate change on air pollution whereas it deals with the respective effects of aerosol decrease and climate change on increased haze event observed over recent decades in China, these references are not relevant in this section. This section should rather discuss papers such as Yuxuan et al.2013, Lee et al.2015 and Hong et al.2019 [Sophie Szopa, France]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
38375	49	33	49	44	The literature in this part is insufficiently reviewed, with the conclusions of air pollution in China only being listed, which readily leads to ambiguity. Since the application of derived satellite data, there have been many research literatures on air pollution in Asia. It is suggested to supplement and modify this part. References: 1. India State-Level Disease Burden Initiative Air Pollution Collaborators. 2019.The impact of air pollution on deaths, disease burden and life expectancy across the states of India: the Global, Burden of Disease Study 2017. Lancet Planet Health. 3: e26–39 2. Donkelaar A., Martin R., Brauer M. et al. 2016. Global Estimates of Fine Particulate Matter using a Combined Geophysical-Statistical Method with Information from Satellites, Models, and Monitors. Environ. Sci. Technol. 50, 3762–3772 [Yaming LIU, China]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
41851	49	37	49	37	The reference "J. Zhang et al., 2017" needs correction; please delete the "J" and it should be "Zhang et al., 2017" [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction. This reference is not cited therein
126575	49	40	49	40	Add: ""... 2019). However, greenhouse gases that stabilize winter atmosphere in the Indo-Gangetic Plains has Increased PM Loading and AOT (Fosu et al. 2017)."" Citation: Fosu, B., S.-Y. Wang, S.-H. Wang, R. Gillies, and L. Zhao, 2017: Greenhouse Gases Stabilizing Winter Atmosphere in the Indo-Gangetic Plains May Increase Aerosol Loading. Atmospheric Sciences Letters, DOI: 10.1002/asl.739 [Trigg Talley, United States of America]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
131469	49	42	49	42	This statement is too vague and needs backing: "Air pollution evolution mostly depends on air pollutant emissions policies." [Hans Poertner and WGII TSU, Germany]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
44113	49	42	49	44	Following is the excerpt from https://link.springer.com/chapter/10.1007/978-3-319-92288-1_10 explaining the impacts of air pollution for the HKH region which should be reflected in the text: "The levels of PM are very high in many cities in the region for which data exists, including Islamabad, Pakistan (Parekh et al. 2001) and Delhi and Kolkata, India (Gurjar et al. 2016). A large population in the region is exposed to air pollution that is higher than the WHO annual standard of 20 µg/m ³ for PM ₁₀ and 10 µg/m ³ for PM _{2.5} (WHO 2005). Putero et al. (2015) reported annual PM ₁₀ concentration of 169 ± 113 µg/m ³ for Kathmandu during the year 2013. Kathmandu, Nepal has annual average PM _{2.5} concentrations of 49 µg/m ³ in 2013, exceeding Nepal's own 24-h ambient standard of 40 µg/m ³ (http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/)." [Lamin Mai Touray, Gambia]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
131471	49	42	49	44	This appears to be a contradiction, unless it can be justified that what seems to be evident globally does not apply to Asia. [Hans Poertner and WGII TSU, Germany]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction. The sentence in question does not exist anymore
30639	49	42	49	44	About the impact of climate change on PM _{2.5} , the text should refer to Section 6.4.2 of Chapter 6. I do not agree with the conclusion of "However, from the literature there is limited evidence of an effect of climate change on air pollution in Asia". Many papers have published in the past several years which were not reviewed. I can help to write a short paragraph if needed. [Hong Liao, China]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction.
126577	49	46	49	46	See this reference for implications for carbon sequestration from recent drought: Lu, C., Tian, H., Zhang, J., Yu, Z., Pan, S., Dangal, S. et al (2019) Severe long-lasting drought accelerated carbon depletion in the Mongolian Plateau. Geophysical Research Letters, 46, 5303-5312. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The CO ₂ assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
20791	49	46	49	49	Same remark as for page 40 lines 2-4 [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The CO ₂ assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
38377	49	48	49	50	It is not appropriate to discuss the attribution of local CO ₂ concentration change following the characterization of the long-term CO ₂ change, a conclusion that would mislead policy-makers. Moreover, the seasonal change of CO ₂ concentration, which is mainly subject to natural variability, should not be attributed to human activities only. In addition, the literature (Nomura et al., 2017), which only uses the data from 2010 to 2014, hence insufficient for analysis of carbon emission sources, is suggested to be deleted. [Yaming LIU, China]	TAKEN INTO ACCOUNT: The CO ₂ assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
131473	49	53	49	54	Elaborate on the policies: what do these policies entail and who is in charge? [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The CO ₂ assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
109433	49		49		Wang and Chen 2016 is missing from the Reference list [Sophie Szopa, France]	ACCEPTED: added
38379	50	1	50	4	This chapter should not discuss the attribution of carbon intensity. By convention that IPCC assessment reports should avoid mentioning countries, it is suggested to delete 'particularly in Russia and China'. [Yaming LIU, China]	TAKEN INTO ACCOUNT: The CO ₂ assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. In this short coverage we do not refer to any specific countries.
24429	50	6	50	14	Observation of downward infrared radiation at the surface is effective for the evaluation of global warming. An increasing trend at a rate of about 0.3 W/m ² per year during the period from 1993 to 2018 is observed (JMA, 2019). JMA, 2019: Climate Change Monitoring Report 2018. Japan Meteorological Agency, pp.79-80. [Available from http://www.jma.go.jp/jma/en/NMHS/indexe_ccmr.html] [Akio Kitoh, Japan]	TAKEN INTO ACCOUNT: The Radiation assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
91121	50	9	50	9	You may want to refer here to Section 7.2.2.3 Changes in Earth's surface energy budget, where the changes in surface solar radiation are discussed in more depth. [Martin Wild, Switzerland]	TAKEN INTO ACCOUNT: The Radiation assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. Readers are pointed to Ch 7 for more details

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
29371	50	9			The phrase "with potential interaction with air pollution" might be better phrased as, "caused by air pollution". [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: The Radiation assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. The phrase in question does not appear therein
91123	50	10	50	10	"multimodel-mean response": Be more specific, what type of models, I assume CMIP5? [Martin Wild, Switzerland]	NOT APPLICABLE: The Radiation assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. The phrase in question does not appear therein
29373	50	11	50	14	This sentence should perhaps be posted with the previous one a few lines ago, to connect the past trends together. At present lines 10-11 on future projections interrupt this discussion on past trends. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: The Radiation assessment has now been changed to a brief and general assessment and moved to 12.4 introduction. The phrase in question does not appear therein
29375	50	25	50	33	The inclusion of air pollution in this table is rather strange. Surely this is predominantly defined by whatever the emissions are in mid-century of RCP8.5, and therefore are known with some confidence? While meteorology does have a role to play in air pollution, emissions are more of an input to climate models rather than an output used to drive the various socioeconomic impacts. [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Climatic effect on Air pollution is complicated to assess and hence we now indicate low confidence in direction of change in all regions
431	50	27	50	27	I would suggest to remove lake acidity/acidification from table 12.4 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidity has been removed from the CH 12 assessment
39421	50	27	50	33	Table 12.4 is quite informative, but a more rigid review is in order. Before this is finalized. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: Table is now fully consistent with assessment text and Figures
45005	50	30	50	30	The black frame at the top right of the Table 12.4 is missing. [Moeka Yamaji, Japan]	ACCEPTED: All CID change tables have been made consistent
91131	50	30	50	31	Table 12.4 : surface radiation is projected to increase in East Asia, not decrease (wrong color code) [Martin Wild, Switzerland]	ACCEPTED: changed
85079	50	30	50	33	Comment provided by Jennifer Weeks: Could these CID vs. Region tables indicate what the confidence is based on, i.e. number of studies or the outcome of studies? It needs to be clear how the colours are assessed in all the tables. [Stacey New, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The assessment approach is full described in 12.4 introduction and a summary is given in 12.2
63737	50	33	52	33	In page 12 Lines 25-31 it is said that Cross-Chapter Box 12.1 "describes heat waves in East China, using a recently observed extreme event to illustrate how health, working conditions and agricultural climate indices are changing due to climate change". I do not see that any relevant information about health, working conditions and agriculture. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
11857	51	1	52	33	Cross-Chapter Box 12.1: Throughout this box text, unless used as a proper noun within the phrase East Asia Heat Extreme, "heat" should be lowercase (lines 11, 13, 16, 29 of p. 51, and lines 2, 9, 11, 15, 19, 23, 29, 32 of p. 52). [Amy East, United States of America]	NOT APPLICABLE: Box is no longer in Ch 12.
41853	51	2	52	33	Is it possible to have a synthesis map of the "Cross-Chapter Box 12.1: East Asia 2013 Heat Extreme Case Study"? According to my perspective, this would be very useful! In addition, this Cross-Chapter Box 12.1 should include the consequences, like the number of deaths due to heat event, etc. [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: Box is no longer in Ch 12.
64025	51	4			Cross-chapters are advised to be added by the end of the chapter as an annex rather than being just located in the middle with initiated numbering. We can see that authors initiated 12.1 numbering for the cross chapter, whereas we are in 12.4 section. This would be confusing, so either add it as an annex by the end of the chapter or just refer to it as an example and mention the acknowledgment to authors by the end of the chapter, while keeping the cross chapter as it is with a continuous numbering relative to its position within the report. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
110147	51	4			I may be misremembering but wasn't this also a chapter 10 case study? If so they should be merged and only one of the two should remain because having such overt redundancy would be asking for trouble. If chapter 10 looked at the same region but a distinct diagnostic they should be cross-linked as a reader interested in one will, all else being equal, be interested in the other? [Peter Thorne, Ireland]	NOT APPLICABLE: Box is no longer in Ch 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
40967	51	11	51	13	The glossary has a definition for heat wave ("A period of abnormally hot weather. Heatwaves and warm spells have various and in some cases overlapping definitions."). Do you also want to add this definition for 'heat extreme'? [TSU WGI, France]	NOT APPLICABLE: Box is no longer in Ch 12.
33669	51	11	52	33	Why "Heat" is capitalized in these sentences?: "A Heat extreme is generally defined as a...", "...the Heat extreme is given..." and "...typhoons, and Heat extremes.". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Box is no longer in Ch 12.
63723	51	12	51	12	Please define Sectors [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
63725	51	15	51	17	Last sentence is not clear. Substitute the sentence by a more clear one, as e.g.: This box includes the context, the description, and the future projections of the east Asia 2013 heat extreme event. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
63729	51	19	51	19	Remove "Background". If the section is only entitled "Context" is ok [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
63727	51	19	51	26	The paragraph is not clear enough. Rewrite the paragraph. Here an example: East Asia (including east China, Japan and Korea) is dominated by the East Asia Monsoon and three atmospheric circulations, i.e., the western North Pacific subtropical high (WNPSH), the East Asian jet stream (EAJS), and the South Asian high (SAH), all playing relevant roles in the summer climate of the region. This region, densely populated, experienced an extremely hot summer in 2013, being the hottest summer recorded to date. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
63731	51	28	52	4	Text is messy and do not synthesize relevant information. Change all. Here a suggestion to improve the text: -In June and August of 2013, a heat extreme event was recorded in East Asia. This extreme event was characterized by 31 days of temperatures higher than 35°C, being 1.9-3°C higher than previous years (Zhou et al. 2014; CMA, 2014; Min et al., 2014; Imada et al., 2014). - The heat extreme event was more intense in urban areas, where the "heat island" effect increased the temperature 1.22°C, compared with non-urban area (Wang et al., 2017c). - The heat extreme event was connected to local and short-term atmospheric anomalies (Wang et al., 2016): the WNPSH and SAH were characterized by active convective heating and intensification (Imada et al. 2014) and the westward-enhanced WNPSH and poleward-displaced EAJS extended the heat wave northward, covering a large area of East Asia (Wang et al., 2016). -Climate change played a significant role in raising the chance of the heat wave occurring: This event would occur once every 270 years under pre-industrial climate conditions, and would occur every 4 years in current climate change scenarios. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
13891	51	32	51	32	Change 35C by 35°C [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Box is no longer in Ch 12.
33671	51	33			Avoid starting a sentence with a number: "344 stations among 756 stations provided by the China Meteorological...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Box is no longer in Ch 12.
33673	51	48	51	51	Check reference format: "(WANG et al., 2016)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Box is no longer in Ch 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
39423	51	52	52	2	The statement "The 2013 EA heat extreme was mainly caused by natural variability of the atmosphere, but anthropogenic climate change played a significant role in raising the chance of the heat wave occurring " is quite confusing to readers who are new to attribution studies of (single) extreme events. The cited references have different ways of indicating their findings. For example, Zhou et al, 2014 study indicated a discernible impact of anthropogenic forcing with 47.23%-contribution to the magnitude, while Imada et al, 2014 says anthropogenic climate change played a significant role in increasing the probability of events such as the heat wave in Japan, and Min et al, 2014, in assessing the human contribution to the summer 2013 Korean heat wave concluded that extreme heat events become ten times more likely due to human influence. [Lourdes Tibig, Philippines]	NOT APPLICABLE: Box is no longer in Ch 12.
64027	51		60		All conclusions by the end of each subtopic of 12.4.3. Australia are highly generalized. Conclusions must be more precise and justified by evidence, not just a statement of information. So that it would be referenced and cited later on and would be credible and reliable and bias free. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
33675	52	2			Change semi-colon by a dot: "...in the 2013 climate (Sun et al., 2014b); The Heat extreme had a dramatic impact on society and the...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Box is no longer in Ch 12.
43501	52	2			Read "in the 2013 climate (Sun et al., 2014b). The Heat extreme " rather than "in the 2013 climate (Sun et al., 2014b); The Heat extreme " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Box is no longer in Ch 12.
26449	52	4	52	4	Was this extreme Asian heatwave associated with increased frequency of wildfires? If yes, how did these affect the region [Mare Sundström, Sweden]	NOT APPLICABLE: Box is no longer in Ch 12.
39425	52	6	52	25	Please synthesize the future projections and if possible, put uncertainty language. [Lourdes Tibig, Philippines]	NOT APPLICABLE: Box is no longer in Ch 12.
63733	52	6	52	25	Text is messy and do not synthesize relevant information. Change all. Use similar parameters to compare Japan, Korea and China. Do not focus mainly in China. Here a suggestion to improve the text: The magnitude of warming in East Asia is approximately 0.2 °C higher than the global mean under 1.5 and 2°C of global warming conditions above temperatures in the pre-industrial period (Li et al., 2018b). Model projections show that the frequency and intensity of heat extremes increase rapidly as the global mean temperature increases. Heat extremes are projected to be more frequent, longer, and hotter in the 21st century under 1.5 and 2°C warming conditions in China, Japan and Korea (Lin et al., 2018b, Imada et al., 2019, Hong et al., 2019). Projections in Heat extreme severity are more uncertain in later parts of the century, although there is a high confidence in the increase of hazard characteristics (Leng et al., 2015). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
107887	52	23	52	25	This last sentence is hard to parse. Why is there more uncertainty later in the century aside (I assume) because of increase emission uncertainty. Sentence needs to be reworded to make it easier to understand. [Linda Mearns, United States of America]	NOT APPLICABLE: Box is no longer in Ch 12.
63735	52	27	52	33	Text is messy and do not synthesize relevant information. Change all. An example: Heat extreme events have multiple impacts, are taking place currently and will increase in the future, even with moderate mitigation scenarios. Eastern Asia has to develop effective adaptation measures to avoid the harmful impact of climate drivers. Model projections help to understand the heat extremes, including their intensity, duration, spatial extent and temporal variability. This understanding is key to develop adaptation measures for each sectoral asset. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Box is no longer in Ch 12.
66037	52	40	52	47	Suggest considering an assessment of New Zealand in its own right, since in this chapter it gets little coverage. Currently, grouping Australia and New Zealand as 'Australasia' is flawed and potentially misleading, however, it is mitigated somewhat by including sub-regions. [Kushla Munro, Australia]	REJECTED: Grouping Australia and New Zealand together into Australasia is a top level decision that is also used in AR6 WG2 and also in other IPCC reports (for e.g. AR5). Note that NZ is however treated as a completely separate sub region within Australasia while Australia is subdivided into 4 different sub regions.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66041	53	6	53	13	Please include in this paragraph reference to the downscaled projections prepared by several Australian states (VIC, QLD, NSW, ACT, SA and TAS). [Kushla Munro, Australia]	REJECTED: Peer reviewed publications corresponding to this comment could not be found.
63739	53	22	53	40	For clarity for the readers, explain CMIP, SSPs and RCP or indicate where they are defined (with chapter within AR6) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: These are all defined in Chapter 1
100313	53	24	53	24	Is it possible to include the regions divisions (NAU, CAU, SAU, NZ) in the Figure 12.10? [Claudine Dereczynski, Brazil]	ACCEPTED: Chapter wide decision was made not to indicate sub regions in these regional figures. But following this comment the sub regions are indicated now in all CID Tables in Ch 12.
43503	53	29		30	Read "presented by Vousdoukas et al. (in press)." rather than "presented by (Vousdoukas et al., in press)." [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured
43505	53	37			Read "from Vousdoukas et al. (in press)" rather than "from (Vousdoukas et al., in press)" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured
32459	53	45	53	46	Australia's temperature has increased by nearly 1.5C not 1C since 1910 (see upcoming State of the Climate Report for Australia) [Robert Colman, Australia]	ACCEPTED: Updated
6819	53	46	53	46	Delete "top". It adds nothing - "ten warmest" says it all. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Text has been deleted to satisfy length requirements
13893	53	48	53	49	Indicate if (Atlas.14 and Atlas.37) are figures or sections [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
32461	53	54	53	55	I'd express this differently. Australia's temperature will continue to rise, unless emissions are reduced to RCP2.6 or below. Need to talk about scenarios here. [Robert Colman, Australia]	TAKEN INTO ACCOUNT: End century and mid century projections for SSPs 1-2.6, 2-4.5 and 5-8.5 are now given (from Interactive Atlas)
33677	54	6	54	7	Change: "For New Zealand, (Ministry for the Environment, 2018) projects an increase of mean temperature.." by "For New Zealand, The Ministry for the Environment (2018) projects an increase of mean temperature..". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence has been restructured
43507	54	6		7	ead " Ministry for the Environment (2018) projects an " rather than " (Ministry for the Environment, 2018) projects an " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured
13895	54	38	54	38	it is suggested to include the units 275 [240-310] days [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Extreme heat projections are now given in terms of the NOAA HI. Units are days above 41 degrees.
11859	55	16	55	16	"wet", lowercase [Amy East, United States of America]	ACCEPTED: Corrected
32463	55	16	55	17	There has not been attribution of increases of rainfall in the North to anthropogenic causes. [Robert Colman, Australia]	TAKEN INTO ACCOUNT: Knutson and Zeng (2018) show that (their figs 3-5) significant parts of NAU are zones where models with GHG and obs show same order trend, or where obs are wetter than models. This is not true for central SAU, so the reference to South Central Coast in this sentence has been deleted. Knutson and Zeng (2018) has been cited here now to support this statement.
98157	55	16	55	18	A reference to support this statement would be Knutson and Zeng (2018). I'm not aware that the Atlas has this type of D&A regional details. Also detectable decreases in mean precipitation, attributable at least in part to anthropogenic forcing, have been reported for parts of southwest Australia (Delworth and Zeng 2014; Knutson and Zeng 2018), southeast Australia, and Tasmania (Knutson and Zeng 2018). [Thomas Knutson, United States of America]	ACCEPTED: Reference to Atlas has been deleted and Knutson and Zeng (2018) has been added here.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
32469	55	16	55	33	Need to discuss southern Australian cool season drying. This is particularly marked in the SW of western Australia. Projections suggest further cool season drying, but are less clear in summer. (See CSIRO and Bureau of Meteorology, 2015). [Robert Colman, Australia]	TAKEN INTO ACCOUNT: This is discussed under Aridity (the dry part of this CID category)
32465	55	18	55	18	There has not been attribution of increases of rainfall in the south central coast (whatever that means) to anthropogenic causes. [Robert Colman, Australia]	ACCEPTED: Reference to South Central Coast has been deleted. Knutson and Zeng (2018) has been cited.
13897	55	22	55	22	It is suggested to indicate if it is an section Atlas.37 [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: It is an Atlas Figure (now Figure Atlas.23).
32467	55	26	55	27	There are not projected increases in these areas -- at least not without significant caveats. Indeed northern rainfall projections remain uncertain as to sign. See Narsey et al, 2020 Climate Change Projections for the Australian Monsoon From CMIP6 Models GRL (accepted), and references therein. [Robert Colman, Australia]	TAKEN INTO ACCOUNT: Narsey et al (in press) shows that there is no conclusive evidence of precipitation increase during Australian Monsoon (DJF) under SSP5-8.5 in 2050-2099 relative to 1950-1999. The statement in these lines is more general and supported by the Atlas.
13899	55	31	55	31	Change (Liu et al., 2018a) by Liu et al. (2018a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed
33679	55	31			Check for reference format. Change: "(Liu et al., 2018a)... » by "Liu et al. (2018a)... ». [Guiomar Rotllant, Spain]	ACCEPTED: fixed
43509	55	31			Read " Liu et al. (2018a) project that " rather than " (Liu et al., 2018a) project that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
100315	55	35	55	45	For consistency with the rest of the text, this paragraph would have only observed trends, not projectctjons [Claudine Dereczynski, Brazil]	NOT APPLICABLE: Text has been forwarded to Ch 11 where extreme precip is assessed in FGD
33681	55	45			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
63995	56	12	56	12	Please change the word "susceptibility " because it is not in the list of uncertainty language described in IPCC guideline [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Sentence now reads "The potential for land and rockslide susceptibility increases with...."
110149	56	18	57	12	This was a specific case study in chapter 10 and yet I do not see any cross-reference here.It is very odd and inviting a reader to play spot the difference to have two such substantive and overlapping assessments in separate chapters [Peter Thorne, Ireland]	ACCEPTED: The Case study in Ch 10 has now been cited
100317	56	18	57	12	I think it woul be better to merge "Aridity and Droughts", as in Africa and Asia [Claudine Dereczynski, Brazil]	REJECTED: Advise from Droughts thematic group was to treat Aridity and Droughts separately.
98159	56	21	56	25	In addition, Knutson and Zeng (2018) find some evidence for detectable anthropogenic decreases in annual mean rainfall along parts of coastal southeast Australia and Tasmania (1901-2010 and 1951-2010 trends). For New Zealand, limited evidence for detectable anthropogenic decreases in precipitation have been reported by Harrington et al. (2014) for part of the North Island and by Knutson and Zeng (2018) for a few gridpoints in New Zealand based on trends in the GPCC global dataset and CMIP5 models (and also with some gridpoints showing detectable increases). Ref: LJ Harrington, S Rosier, SM Dean, S Stuart, A Scahill, 2014: The role of anthropogenic climate change in the 2013 drought over North Island, New Zealand. Bull. Am. Meteorol. Soc 95, S45-S48. [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: Comment forwarded to Atlas where a detailed assessment of mean precipitation is presented. Ch 12 only provides a summary of what is there in the Atlas.
33683	56	22	56	23	Check for reference format. Change: "...precipitation over the past century have been reported for southwest Australia by (Delworth and Zeng, 2014) and (Knutson and Zeng, 2018)." By : "...precipitation over the past century have been reported for southwest Australia by Delworth and Zeng (2014) and Knutson and Zeng (2018)." [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence has been restructured
43511	56	22		23	Read " by Delworth and Zeng (2014) and Knutson and Zeng (2018)." rather than " by (Delworth and Zeng, 2014) and (Knutson and Zeng, 2018). [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63741	56	24	56	25	which are the above trends? all trends for australia and New Zealand? then, this is contradictory with the first sentence that says: "a significant decrease in precipitation has been observed". What is the basis of this statistics? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: These sentences in relation to aridity in NZ have been modified in consultation with Atlas
63743	56	24	56	25	Figure Atlas.37 is Central America, not Australasia. Should be Atlas.34 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Atlas is no longer cited in the modified sentence
33685	56	28			Check for reference format. Change: "Projections by (Lin et al., 2018a) show that aridity..." by "Projections by Lin et al. (2018a) show that aridity...". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
43513	56	28			Read "Projections by Lin et al. (2018a) " rather than "Projections by (Lin et al., 2018a) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
33687	56	30	56	31	Check for reference format. Change: "Averaged over Australia, (Alexander and Arblaster, 2017) project..." by "Averaged over Australia, Alexander and Arblaster (2017) project...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence has been deleted (moved to Ch 11)
43515	56	30		31	Read "Alexander and Arblaster (2017) project an increase" rather than "(Alexander and Arblaster, 2017) project an increase" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been deleted (moved to Ch 11)
38197	56	32	56	32	Redundant period. scenarios..". [Junhee Lee, Republic of Korea]	NOT APPLICABLE: Sentence has been deleted (moved to Ch 11)
13901	56	32	56	32	Delete a point in scenarios.. [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Sentence has been deleted (moved to Ch 11)
43517	56	32			Read " scenarios. " rather than " scenarios.. " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been deleted (moved to Ch 11)
33689	56	35	56	36	Check for reference format. Change: "These projections are in line with those presented in (CSIRO and BOM, 2015)." By "These projections are in line with those presented in CSIRO and BOM (2015)." [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence has been deleted
102687	56	38	56	38	How is "water availability" defined? [Philippe Tulkens, Belgium]	NOT APPLICABLE: Sentence has been deleted
63745	56	38	56	39	would be more interesting to know the values for the 2.0°C warming. 2.3°C is not a reference [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Sentence has been deleted
33691	56	41	56	42	Please, re-write this sentence, it is confusing: "With respect to droughts, below-average rainfall has occurred in 17 of the last 20 April to October periods since 1999 in southern Australia (CSIRO and BOM, 2018)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Droughts section has been completely re-written following advice from the Droughts thematic group. The sentence in question does not exist anymore.
74605	56	49	56	50	To check if it isn't published about (Coppola et al., submitted, b ; ...) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: Droughts section has been completely re-written following advice from the Droughts thematic group. Reference is now updated everywhere relevant
33693	56	49	56	51	Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: Droughts section has been completely re-written following advice from the Droughts thematic group. Reference is now updated everywhere relevant
43519	56	50		51	Read "used by Coppola et al. (submitted, b)" rather than "used by (Coppola et al., submitted, b)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: Droughts section has been completely re-written following advice from the Droughts thematic group. Reference is now updated everywhere relevant
43521	57	3			Read " Ferguson et al. (2018) project no change " rather than " (Ferguson et al., 2018) project no change " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33695	57	3			Check for reference format. Change: "For the Murray-Darling basin, (Ferguson et al., 2018) project..." by "For the Murray-Darling basin, Ferguson et al. (2018) project...". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
33697	57	5			Are you sure of this abbreviation "drought conditions (DI)"? [Guiomar Rotllant, Spain]	ACCEPTED: Corrected to drought index (DI)
43523	57	9			Read "by the Ministry for the Environment (2018) indicate " rather than "by the (Ministry for the Environment, 2018) indicate " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Droughts section has been completely re-written following advice from the Droughts thematic group. The sentence in question does not exist anymore.
33699	57	9			Check for reference format. Change: "...given by the (Ministry for the Environment, 2018) indicate..." by "...given by the Ministry for the Environment (2018) indicate...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Droughts section has been completely re-written following advice from the Droughts thematic group. The sentence in question does not exist anymore.
63747	57	14	57	43	text should be updated and mention the very recent wildfire episode in Australia. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT:2019 fire has been mentioned in text
110151	57	14	57	43	Would it be worth including the recent bushfire season? Will literature exist on the required timescale to do so? At a minimum the observations could I guess be included. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT:2019 fire has been mentioned in text
126579	57	14	57	51	In the Wildfire section, should there be some mention of the 2019-2020 Australian wildfires? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT:2019 fire has been mentioned in text
33701	57	15	57	16	Check for reference format. Change: "(Sharples et al., 2016) report..." by "Sharples et al. (2016) report...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Relevant text has been deleted
43525	57	15		16	Read " Sharples et al. (2016) report a decline" rather than " (Sharples et al., 2016) report a decline" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Relevant text has been deleted
43527	57	17			Read " Dowdy and Pepler (2018) examined atmospheric " rather than " (Dowdy and Pepler, 2018) examined atmospheric " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: corrected
33703	57	17			Check for reference format. Change: "(Dowdy and Pepler, 2018) examined..." by "Dowdy and Pepler (2018) examined...". [Guiomar Rotllant, Spain]	ACCEPTED: corrected
102689	57	19	57	19	This section needs to be checked for spelling errors; this line; The southern half of both islands, or the southern half of the North Island and the whole of South Island? [Philippe Tulkens, Belgium]	NOT APPLICABLE: The Wind section has been restructured and sentence in question does not exist anymore
88489	57	19	57	19	To be consistent with what that paper shows, suggest changing "decreased" to "changes in". [Andrew Dowdy, Australia]	ACCEPTED: Corrected
43529	57	20			Read " CSIRO and BOM (2018) and Dowdy (2018) found " rather than " (CSIRO and BOM, 2018) and (Dowdy, 2018) found " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: Corrected
33705	57	20			Check for reference format. Change: "(CSIRO and BOM, 2018) and (Dowdy, 2018) found that..." by "CSIRO and BOM (2018) and Dowdy (2018) found that..." [Guiomar Rotllant, Spain]	ACCEPTED: Corrected
33707	57	24			Add comma between words: "However attribution". [Guiomar Rotllant, Spain]	ACCEPTED: Corrected
126581	57	25	57	25	Add: "... 2019), likely because that the climate warming effect on Australia's wildfire has reached a tipping point (Son et al. 2020 submitted)."" Citation: Son, R., H. Kim, S.-Y. Wang, J.-H. Jeong, S.-H. Woo., J.-Y. Jeong, B.-D. Lee, S.-H. Kim, and J.-H. Yoon, 2020: Wildfire risk under 1.5? and 2.0? warming world. Submitted to Natural Communications (Jan 2020) [Trigg Talley, United States of America]	REJECTED: Paper is not published at 12 Feb 2021
43531	57	31			Read "Abatzoglou et al. (2019) found " rather than "(Abatzoglou et al., 2019) found " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
33709	57	31			Check for reference format. Change: "... (Abatzoglou et al., 2019) found... » by "...Abatzoglou et al. (2019) found... ». [Guiomar Rotllant, Spain]	ACCEPTED: fixed
43533	57	35			Read " Di Virgilio et al. (2019) and Clarke et al. (2019) have " rather than " (Di Virgilio et al., 2019) and (Clarke et al., 2019) have " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33711	57	35			Check for reference format. Change: "... (Di Virgilio et al., 2019) and (Clarke et al., 2019) have..." by "... Di Virgilio et al. (2019) and Clarke et al. (2019) have...". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
43535	57	39			Read "Watt et al. (2019) projected that " rather than "(Watt et al., 2019) projected that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: Corrected
33713	57	39			Check for reference format. Change: "In New Zealand, (Watt et al., 2019) projected..." by "In New Zealand, Watt et al. (2019) projected...". [Guiomar Rotllant, Spain]	ACCEPTED: Corrected
43537	58	3			Read " m s-1 " rather than " ms-1 " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
43539	58	4			Read " m s-1 " rather than " ms-1 " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
87993	58	23	58	51	winds and storms in Australia has been reviewed in Walsh, K., White, C.J. McInnes, K. L., Holmes, J., Schuster, S., Richter, H., Evans, J. P., Di Luca, A. and Warren, R. A. 2016: Natural Hazards in Australia: storms, wind and hail. Climatic Change. DOI: 10.1007/s10584-016-1737-7. Dowdy, A.J., Pepler, A., Di Luca, A., Cavichia, L., Mills, G., Evans, J.P., Louis, S., McInnes, K.L. and Walsh, K., 2019. Review of Australian east coast low pressure systems and associated extremes. Climate Dynamics, 53(7): 4887-4910. [Kathleen McInnes, Australia]	ACCEPTED: these references are now added under TCs
33715	58	25			Add comma between words: "However the". [Guiomar Rotllant, Spain]	NOT APPLICABLE: The TC section has been substantially reduced and changed as TCs are assessed in CH11. Sentence doesn't exist anymore.
43543	58	31		32	Read "Torres-ALavez et al. (submitted) project a statistically " rather than "(Torres-ALavez et al., submitted) project a statistically " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: The TC section has been substantially reduced and changed as TCs are assessed in CH11. Sentence doesn't exist anymore.
43541	58	31			Read "(relative to 1985 – 2005) " rather than "(relative to (1985 – 2005) " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: The TC section has been substantially reduced and changed as TCs are assessed in CH11. Sentence doesn't exist anymore.
33717	58	31			Change: "Also (Torres-ALavez et al., submitted)..." by "Also, Torres-ALavez et al. (submitted)..." [Guiomar Rotllant, Spain]	NOT APPLICABLE: The TC section has been substantially reduced and changed as TCs are assessed in CH11. Sentence doesn't exist anymore.
63749	58	37	58	51	Include a possible explanation of why CMIP5 and CMIP6 are not consistent. Focus more with CMIP6, as most of the text refers to CMIP5. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This was a mistake and it has now been resolved
43545	58	41			Read " Kumar et al. (2015) project a tendency " rather than " (Kumar et al., 2015) project a tendency " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: This has been rephrased
33719	58	41			Check for reference format. Change: "Australia, (Kumar et al., 2015) project..." by "Australia, Kumar et al. (2015) project...". [Guiomar Rotllant, Spain]	ACCEPTED: This has been rephrased
63997	58	44	58	44	maximum wind speeds for 2074-2100 over Australia. Please put the unit for wind speed. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: Units are not necessary in this sentence
43547	58	48			Read "reported in CSIRO and BOM (2015)" rather than "reported in (CSIRO and BOM, 2015)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: This has been rephrased
33721	58	48			Check for reference format. Change: "CMIP5 based changes reported in (CSIRO and BOM, 2015)." By "CMIP5 based changes reported in CSIRO and BOM (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: This has been rephrased

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63751	59	1	59	20	This section needs to focus or restructure. To guide the reader: say the importance of snow and land ice in Australia and New Zealand. E.g. what is the importance (e.g. volume) of glaciers in NZ? The snow in Australia is seasonal or perennial? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Cryo CID sections have been updated by new CAs from Ch 9
83731	59	1			Mention here, or under the landslides title, rock avalanches due to permafrost thaw in New Zealand? See SROCC chapter 2. [Andreas Käab, Norway]	ACCEPTED: SROCC has been cited under landslides wrt to permafrost thaw contributions
33723	59	4	59	5	Add a space between the number and unit: "1000m". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Mean snow depth has been moved to Atlas. Sentence no longer exists.
88089	59	10	59	17	please cross check with Ch 9 where a more comprehensive and more updated assessment of regional glacier changes is made. [Georg Kaser, Austria]	ACCEPTED: Glacier text has been updated by CAs from Ch 9
45065	59	13	59	13	"Under future warming ... shouldn't you state under which scenario? [Christophe Deissenberg, Luxembourg]	NOT APPLICABLE: Mean snow depth has been moved to Atlas. Sentence no longer exists.
45633	59	13	59	20	Why only RCP 8.5 and just for the Tropical Andes of Peru are used to assess future change in snow cover or glacier volume? Global modeling efforts (see figure 9.22 and table 9.3) show that the Tropical Andes New Zealand glacier volume will decrease by -30% and -75 % (mean values for RCP 2.6 and RCP 8.5, respectively) at the end of the century. It is worth to be mentioned in the summary sentence. [Lucas Ruiz, Argentina]	ACCEPTED: Glacier text has been updated by CAs from Ch 9
33725	59	14			Add a comma in between: "2070 respectively". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Mean snow depth has been moved to Atlas. Sentence no longer exists.
51865	59	16	59	20	Suggest to include: 'New Zealand is projected to lose up to 88 +/-5% of its glacier volume by the end of the 21st century' in the summary paragraph on lines 19-20. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: This doesn't align well with the style of other boldface summary statements in the Chapter
63753	59	26	59	26	Please define SLR [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Corrected
63755	59	32	59	32	what "wrt 119-2014" mean? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Corrected
63757	59	33	59	33	RSL is the same as the previous SLR? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The different Sea level related abbreviations are defined in CH 9 and also in 12.3. RSL is Relative sea level, not the same as SLR.
63761	59	35	59	49	Explain 1:100 yr or use other words. Once every 100 years? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: This is standard terminology
63763	59	35	59	49	Sentence too long and too technical. Please be more clear (write for general public) and do not focus in details [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: Probably a misplaced comment. There are many sentences in the indicated phrases so we cannot identify precisely what the comment refers to

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63759	59	36	59	36	Remove "(a high end)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Parentheses have been removed
87983	59	38			Figure 4f of [O'Grady, J. O., McInnes, K. L. Hemer, M. A., Hoeke, R. K., Stephenson, A. and Colberg, F. 2019: Extreme Water Levels for Australian Beaches using Empirical Equations for Shoreline Wave Setup. J Geophysical Research-Oceans. 124. https://doi.org/10.1029/2018JC014871] provide storm surge + tide + wave setup values for Australia's coast [Kathleen McInnes, Australia]	ACCEPTED: Suggested reference has been added
87985	59	51	60	1	regarding erosional tipping points in Australia, Sharples et al, (2020) analysed a 70-year air photo and beach profile record for swell-dominated Ocean Beach (western Tasmania) to to show an abrupt change of long-term shoreline position variability circa 1980, from episodic erosion and accretion since at least 1947 to persistent recession with no recovery up to the present (Sharples, C., Walford, H., Watson, C., Ellison, J. C., Hua, Q., Bowden, N., et al. (2020). Ocean Beach, Tasmania: A swell-dominated shoreline reaches climate-induced recession tipping point? Mar. Geol. 419, 106081. doi:10.1016/j.margeo.2019.106081.) [Kathleen McInnes, Australia]	REJECTED: Too much of a site specific observation to mention here
323	59	52	59	55	Ranasinghe 2016 twice in one sentence seems a bit over the top. I find a lot of global surveys (which are only crudely relevant regionally) to be over-cited in this chapter. Suggest it is important to find region-specific references wherever they exist. Good example of what I mean is the use of Luijendijk and Mentaschi in this section. [Patrick Nunn, Australia]	TAKEN INTO ACCOUNT: Unfortunately there aren't a sufficient volume of studies that would cover our sub regions adequately. Referencing has been fixed.
43549	59	53		54	Read "Luijendijk et al. (2018) show a" rather than "Luijendijk et al. (2018) shows a" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured
43551	60	4		5	Read "by Vousdoukas et al. (in press)" rather than "by (Vousdoukas et al., in press)" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Sentence has been restructured
63765	60	8	60	10	What is exceedance probability recession? why is important to include this example of this particular beach? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Sentence was misplaced and has now been deleted
87987	60	39	60	45	This study also provides useful projections of MHW globally. Frölicher, T. L., E. M. Fischer and N. Gruber, 2018: Marine heat waves under global warming. Nature, 560 (7718), 360-364, doi:10.1038/s41586-018-0383-9. [Kathleen McInnes, Australia]	ACCEPTED: The reference is now cited
63767	60	40	60	40	what "1 (2) °C" and "2 (5) °C" means? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Sentence has been restructured
433	60	47	60	52	Please refer to my comment on "lake Acidification". There are no references in the SOD text to "lake acidification" so far. I'd suggest rewriting this. Please note that this comment aims at strengthening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	NOT APPLICABLE: Lake acidification has been omitted from the CIDs considered in CH 12
63769	60	52	60	52	define pts or use the complete word. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section deleted. Ocean acidity is now treated in a global sense in 12.4 introduction
33727	60	54			Put "2" in superindex: "5-10 Mol/m ² ". But it might be a 3, no? [Guiomar Rotllant, Spain]	NOT APPLICABLE: Section deleted. Ocean acidity is now treated in a global sense in 12.4 introduction

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51867	61	8	61	8	"Marine Heatwaves and Ocean acidification are also expected to increase over the 21st century (high confidence)" - suggest it would be useful here to make the link between these projected changes and projected impacts for coral reefs and other marine ecosystems.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: Impacts are exclusively discussed in WGII report
109437	61	13	61	20	The air pollution is the change of surface concentrations of pollutants, this paragraph discusses the change of tropospheric ozone column which says nothing about surface ozone change and in the cited paper is not solely due to climate change. [Sophie Szopa, France]	NOT APPLICABLE: Section deleted. Air pollution is now treated in a global sense in 12.4 introduction
63999	61	14	61	14	Please define what is DU. I cannot figure it out. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section deleted. Air pollution is now treated in a global sense in 12.4 introduction
20793	61	22	61	26	Same remark as for page 40 lines 2-4 [philippe waldteufel, France]	NOT APPLICABLE: Section deleted. CO2 is now treated in a global sense in 12.4 introduction
66039	61	38	62	3	Suggest simplifying this and the corresponding regional tables by omitting Atmospheric CO2, since this is increasing everywhere with only limited regionality (other than hemispheric gradients). Similarly, suggest omitting sea-level rise from the tables since it can be discussed in the text. [Kushla Munro, Australia]	TAKEN INTO ACCOUNT: CO2 (as a CID) has been removed from regional sections and assessed in a global context in 12.4 intro. However, for the sake of completeness of tables, we have retained CO2 in the CID table. With respect to Sea level rise, in CH 12 we assess RSL change which is different from region to region and hence we retain it in text and in the CID table.
435	61	40	61	40	I would suggest to remove lake acidity/acidification from table 12.5 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in CH 12
126583	62	1	62	1	In Table 12.5 and Section 12.4.3.2, it is remarkable that Sand and dust storms are ranked as ""not broadly relevant"" for Central and Southern Australia and not directly discussed in this section alongside drought, wildfire, river and pluvial flood. This topic warrants its own subsection: Sand and dust storms. Australia is recognized to be the largest dust source in the Southern Hemisphere. Land use and land cover change have increase dust emissions in Australia in the past 200 years (Marx et al., 2014). While projections suggest a decrease in severe winds, changes in vegetation due to increased aridity (medium confidence (12-56)) and drought (high confidence (12-56)) could be expected to result in increased wind erosion and dust emission across the regions. Increased wind erosion and dust emission are expected to affect the resilience of agriculture and ecosystems to climate stressors as well as degrading air quality (Leys et al., 2018). Previous research has shown wind erosion and dust event frequencies in central and south-eastern Australia to be highly sensitive to drought, ENSO and Pacific Decadal Oscillation (e.g., McTainsh et al., 1989; McTainsh et al., 1998; Webb et al., 2009). It would be reasonable to expect, as evidenced by the conditions this summer, that wind erosion and dust storms in Australia could increase in frequency, extent, and severity (Love et al., 2018). Citations: McTainsh, G.H., Burgess, R., Pitblado, J. R., 1989. Aridity, Drought and Dust Storms in Australia (1960-84). Journal of Arid Environments 16, 11-22. McTainsh, G.H., Lynch, A. W., Tews, E. K., 1998. Climatic controls upon dust storm occurrence in eastern Australia. Journal of Arid Environments 39, 457-466. Webb, N.P., McGowan, H.A., Phinn, S.R., McTainsh, G.H., Leys, J.F., 2009. Simulation of the spatiotemporal aspects of land erodibility in the northeast Lake Eyre Basin, Australia, 1980-2006. Journal of Geophysical Research 114, F01013, doi:01010.01029/02008JF001097, 002009. Marx, S.K., McGowan, H.A., Kamber, B.S., Knight, J.M., Denholm, J., Zawadzki, A., 2014. Unprecedented wind erosion and perturbation of surface geochemistry marks the Anthropocene in Australia. Journal of Geophysical Research 119, 1-17. Leys, J.F., Strong, C.L., Heidenreich, S., Koen, T., 2018. Where she blows! A ten year dust climatology of western New South Wales Australia. Geosciences 8, 232. Love, B.M., Leys, J.F., Strong, C.L., McTainsh, G.H., 2019. Dust climatology of Mildura, Victoria,	ACCEPTED: A section on sand and dust storms has been added and the CID table has been updated accordingly

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14967	62	6			A reference to complement the information over CSA in particular for the Andes: doi: 10.3389/feart.2020.00061 [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: The article by Pabón-Caicedo et al. (2020). Observed and Projected Hydroclimate Changes in the Andes. Front. Earth Sci., 17 March 2020. is now part of the current assessment. https://doi.org/10.3389/feart.2020.00061
85367	62	11	62	11	Just an editorial note difficult to catch if you're not familiar with the region. It should read "Río de La Plata" instead of "La Plata" basin. [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: "Río de La Plata" is now used throughout the text.
100427	62	11	62	14	This paragraphs should refer to {Atlas.2} section [Lincoln Alves, Brazil]	REJECTED: We have now cited Technical Annex VI in section 12.4.4, particularly in the caption of figure 12.8.
33729	62	11	62	14	Why not to include Caribbean?: "In this assessment, the CSA region is divided into the following eight sub-regions: 12 southern Central America (SCA), north western South America (NWS), northern South America (NSA), 13 South American Monsoon (SAM), north eastern South America (NES), south western South America 14 (SWS), south eastern South America (SES), and southern South America (SSA).". In fact, CAR is cited below. [Guiomar Rotllant, Spain]	NOTED: The CAR region in Ch 12 is fully assessed within the Small Islands section.
100319	62	11	62	14	According to Figure Atlas.2, there are 3 regions in Central Almerica: NCA, SCA and CAR. So, "Central and South America"has 3 regions in Central America + 7 regions in South America [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: The NCA subregion is considered in the North America section. Literature for the CAR subregion is assessed in the Small Islands section, particularly in the Caribbean small island states and territories.
100877	62	15	62	16	HereTechnical Annex VI where modes of variability and their teleconnections are defined and described should be referred. [Corti Susanna, Italy]	TAKEN INTO ACCOUNT: Reader's attention is pointed to the Technical Annex VI where modes of variability and their teleconnections are described and discussed.
33731	62	16			MJO? Please, describe this abbreviation. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The description of the main modes of variability for the CSA region is now included in the Atlas. The text 'Madden-Julian Oscillation' accompanies the acronym (MJO) therein.
126585	62	18	62	19	The North American Monsoon is a process outside this section's region. Actually, ITCZ does modulate the seasonal and timing of CSA region including the TS/TC in the EPAC and wet period over NWSA and the Amazon basin. Perhaps authors meant the South American Monsoon, which is a term recently coined but meets some monsoonal definition. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The intensity of the North American Monsoon System plays a key role in the hydroclimatic dynamics of the NCA subregion, which is no longer considered in the CSA region. The text is now presented in the North America section.
33733	62	18			ITCZ? Please, describe this abbreviation, when first cited. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The description of the main modes of variability for the CSA region is now included in the Atlas. The text 'Inter-Tropical Convergence Zone' accompanies the acronym (ITCZ) therein.
13903	62	21	62	21	Change 2° by 2°C [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: In the new version of the assessment report, the text now reads 'between 2-6°C'.
86303	62	21	62	23	Is this for the whole of Central and South America? [Debra Roberts and the Durban WGII TSU, South Africa]	TAKEN INTO ACCOUNT: 'Overall/region-as-a-whole' statements are narrowed down in the main text to highlight subregions of interest when necessary.
100429	62	21	62	24	See Atlas.5.5.2 - overlaps need to be reviewed and, where necessary, inconsistencies reconciled. [Lincoln Alves, Brazil]	The new version of the assessment report has no overlaps between Ch 12 and the Atlas. In the text for CSA, a few summary sentences are now included to facilitate the reading.
14965	62	32	63	9	I would shorten this text given that mostly describes the main outcomes of model validation over Central and South America. I'm sure chapter 10 will cover this in a better detail. [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: The sentence 'Both global and regional models show a good representation of mean CSA climate with warm bias for global models and cold for the regional with both sharing a tendency of dry bias' is no longer included in the new version of the assessment. As the reviewer correctly mentions, an in-depth discussion of model validation is presented in Ch10 of this assessment report.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63881	63	1	63	1	The reference list is showing Coppola et al., submitted A and B. To my understanding it is either duplicated in the reference list or the title of A or B is wrong. Please check references and then cite the correct one [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33735	63	1	63	52	Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guimar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
74607	63	3	63	3	To check if it isn't published about (Coppola et al., submitted, b ; ...) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43553	63	22			Read "presented by Vousdoukas et al. (in press)" rather than "presented by (Vousdoukas et al., in press)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
126587	63	24	63	24	Define the time slice with specific years to guarantee and ease replicability. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Figure caption includes the following text: 'mid-century (2041-2060) and historical (1995-2014) time periods for the CMIP6 ensemble and scenario SSP5-8.5'. We argue that such information guarantees and eases replicability.
43555	63	29			Read "from Vousdoukas et al. (in press)" rather than "from (Vousdoukas et al., in press)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
63883	63	41	63	41	Chapter 2 Figure 2.47 does not exist. Please link the correct figure [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The figure is no longer cited in the main text of Ch12.
100431	63	43	63	43	Replace Atlas to Atlas.5.5.2.2 [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: The correct number of all sections within this chapter and across all chapters of the assessment report have been corrected and currently reflect the latest version of the report.
98161	63	45	63	45	Add here that: "Detectable warming (1901-2010 and 1951-2010) with at least some contribution from anthropogenic forcing has been inferred for most of the gridpoints in CSA that have adequate data for trend analysis (Knutson et al. 2013). [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 no longer considers observed trends in mean temperature conditions. Such trends are currently assessed and discussed in the Atlas.
131475	63	45	63	45	Elaborate on what sort of variability prevents trend estimation. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: The words year-to-year and interannual were added to the phrase to reinforce the idea that trend estimation in mean temperature is hindered by variability.
100435	63	47	63	47	should be checking for similar consistencies (calibrated uncertainty language) with Atlas.5.5.2.4 (Pag. 76, Line 8) [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: Consistency with the statements in the Atlas was ensured.
100433	63	48	63	48	Replace Atlas to Atlas.5.5.2.2 [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: The Atlas chapter was cited as a whole to avoid problems with section numbers.
74609	63	49	63	50	To check if it isn't published about (Teichmann et al., submitted) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
100437	63	50	63	50	Replace Atlas to Atlas.5.5.2.4 [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: The Atlas chapter was cited as a whole to avoid problems with section numbers.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
74611	63	52	63	52	To check if it isn't published about (Coppola et al., submitted, b) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
126589	63	54	63	54	Suggest adding a bit of context for the malaria mosquito survival (above the threshold the mosquito chances of survival increases). Also suggest citing accordingly. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This information is fully described in the Technical Annex. In the new version of our assessment, the text was modified. The +21.5°C threshold is not only and specifically for malaria mosquito survival. Temperatures above such a threshold are favourable for the successful incubation of many pathogens (viruses, parasites) inside mosquito vectors, and thus they are suitable for and favour the transmission of many vector-borne diseases (dengue, malaria, zika, leishmaniasis, to mention a few).
33737	64	13			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
74613	64	19	64	20	To check if it isn't published about (Coppola et al., submitted, b ; Schwingshackl et al., submitted) and separate between references b ; instead of) ([Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33739	64	19	64	20	Check for reference format. Change: "(Coppola et al., submitted, b) (Schwingshackl et al., submitted)" by "(Coppola et al., submitted b; Schwingshackl et al., submitted)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43557	64	19		20	Read "(Coppola et al., submitted, b; Schwingshackl et al., submitted)" rather than "(Coppola et al., submitted, b) (Schwingshackl et al., submitted)" [Cyrilique Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
63891	64	22	64	22	SAM more than 200 days exceed 35°C (long, median, cmip5 and 6) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The revised version of this CID is now presented in the corresponding figure of this chapter.
74615	64	24	64	24	To check if it isn't published about (Schwingshackl et al., submitted ; ...) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33741	64	35	64	37	. Change: "Over these regions Heating Degree Days is consistently projected to decrease by 5 degree days per year in the Amazon and Caribbean region, up to 20-30 degree days in NSA, SWS and SES, across projection ensembles in future RCP8.5/SSP5-8.5 scenarios (Coppola et al., submitted, b)." by "Over these regions, Heating Degree Days is consistently projected to decrease by 5 degree days per year in the Amazon and Caribbean region, up to 20-30 degree days in NSA, SWS and SES, across projection ensembles in future RCP8.5/SSP5-8.5 scenarios (Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Sentence has been deleted.
63893	64	41	64	42	SAM more than 200 days exceed 35°C (long, median, cmip5 and 6) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Sentence has been deleted.
51869	64	42	64	42	suggested addition: 'prevail for more...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Sentence has been deleted.
3213	64	46	67	7	A recent review paper about observed and projected hydroclimate changes in the Andes can be usefull to be mentioned here: Pabón-Caicedo et al (2020, doi: 10.3389/feart.2020.00061) [Jhan Carlo Espinoza, France]	TAKEN INTO ACCOUNT: The article by Pabón-Caicedo et al. (2020). Observed and Projected Hydroclimate Changes in the Andes. Front. Earth Sci., 17 March 2020. https://doi.org/10.3389/feart.2020.00061 . is now part of the current assessment.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
100439	64	48	64	50	should be checking for similar consistencies with Atlas.5.5.2.2 [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: Consistency with the statements in the Atlas was ensured.
68639	64	48	64	55	The following paper may be cited here: Nakaegawa, T., A. Kitoh, S. Kusunoki, H. Murakami, and O. Arakawa. Hydroclimate change over Central America and the Caribbean in a global warming climate projected with 20-km and 60-km mesh MRI atmospheric general circulation models Papers in Meteorology and Geophysics. 65, 15-33. [Tosiyuki Nakaegawa, Japan]	TAKEN INTO ACCOUNT: The article by Nakaegawa et al. (2014). Hydroclimate change over Central America and the Caribbean in a global warming climate projected with 20-km and 60-km mesh MRI atmospheric general circulation models. Papers in Meteorology and Geophysics. 65, 15-33, is now part of the current assessment.
98163	64	50	64	50	Add here that: "The increases over southeastern South America are particularly identified as being detectable (unusual compared to modeled natural variability) and at least partly attributable to anthropogenic forcing by Knutson and Zeng (2018)." [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 no longer considers observed trends in mean conditions. Such trends are currently assessed and discussed in the Atlas.
63897	64	50	64	50	The reference is not helpful at all. The atlas has 251 pages. Please be more specific. For instance reference an appropriate figure in the atlas. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Specific sections of the Atlas chapter were cited in the main text.
74617	64	54	64	54	To check if it isn't published about ... ; Teichmann et al., submitted) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
38199	65	1	65	1	Missing white space. 8.5scenario. --> 8.5 scenarios. [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: The text is no longer included in Ch12 (it has been placed in the Atlas chapter).
13905	65	1	65	1	Change RCP4.5 and 8.5scenario by RCP4.5 and RCP8.5 scenario [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: The text has been modified and now reads as follows: '... for both RCP4.5 and RCP8.5'.
100441	65	1	65	3	This paragraph could go into Atlas.5.5.2.4 (overlaps need to be reviewed) [Lincoln Alves, Brazil]	TAKEN INTO ACCOUNT: Consistency with the statements in the Atlas was ensured.
29377	65	2			Change "weaker then" to "weaker than" [Andrew Turner, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The text is no longer included in the current version of Chapter 12.
74619	65	3	65	3	To check if it isn't published about (Ashfaq et al., submitted ; ...) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
63901	65	5	65	5	I think the heading "river and pluvial flood" is misleading. The paragraph discusses mainly precipitation extremes. Thus, I am proposing the title "Extreme precipitation" similar to the "extreme heat" title in the subchapter before. In addition, the paragraph on river discharge and flooding could be grouped with the landslide paragraph. This merged subchapter could have the title "Terrestrial flooding and landslides". [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Extreme precipitation is now exclusively handled in Ch 11.
3215	65	5	65	19	Over the Amazon basin a contrasted change in rainfall intensity has been recently reported (Espinoza et al., 2019a. doi: 10.1007/s00382-020-05132-6). These rainfall changes are related to major changes in the regional hydrological regime into the Amazon river and main tributaries (e.g. Barichivich et al., 2018 doi:10.1126/sciadv.aat8785; Molina-Carpio et al., 2017 10.1080/02626667.2016.126786; Espinoza et al., 2009 Journal of Hydrology, 375, 297-311. and Espinoza et al., 2019b. doi: 10.3389/feart.2020.00064.) [Jhan Carlo Espinoza, France]	TAKEN INTO ACCOUNT: The articles by Segura et al. (2020, doi: 10.1007/s00382-020-05132-6), Barichivich et al. (2018, doi:10.1126/sciadv.aat8785) and Espinoza et al. (2019, doi: 10.3389/feart.2020.00064) are now part of the assessment report but they are not included in the new version of Ch12 as they mostly focus on mean conditions, which are discussed in the Atlas.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63899	65	5	65	32	Please consider changing the first and second paragraph. First, describing general South America pattern and then discuss region-specific spatial pattern. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: Paragraphs will not be switched. The first paragraph in the text documents the observed evidence. The second paragraph is related to projections. Ch 12 team agreed on documenting first the evidence and then list the key aspects of future projections.
13907	65	9	65	10	Standardize the format in the R50mm and R90p indexes [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: These indices are no longer included in Ch12. They are assessed and discussed in the new version of Ch11.
126591	65	9	65	11	Figure 12.11 doesn't support this statement. Overall, the highlighted features are hard to visualize and the resolution of the data may not allow to express this situation with any confidence. May need to reconcile the idea from previous research with those shown herein. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Statements on projections for mean precipitation (drying signal for SCA, NES and SWS, and the NSA-SES dipole) are now aligned with those presented in figure 12.4.
84059	65	13	65	15	Both studies, Bartiko et al. 2019 (DOI: 10.1080/02626667.2019.1619081) and Chagas and Chaffe 2018 (DOI: 10.1029/2018WR022947), provide valuable evidences of changes in flood regimes in Brazil [Marco Tulio Cabral, Brazil]	TAKEN INTO ACCOUNT: The articles by Bartiko et al. (2019, doi: 10.1080/02626667.2019.1619081) and Chagas and Chaffe (2018, doi: 10.1029/2018WR022947) are now part of the assessment.
126593	65	19	65	19	Add: ""... 2018). Coastal Peru experiences a tendency towards more frequent and stronger variations in precipitation (Son et al. 2019)."" Citation: Son, R., S.-Y. Wang, W.-L. Tseng, C. W. B. Schuler, E. Becker, and J.-H. Yoon, 2019: Climate diagnostics of the extreme floods in Peru during early 2017. <i>Climate Dynamics</i> , 54, 935-945. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The article by Son et al. (2019 - <i>Climate diagnostics of the extreme floods in Peru during early 2017. Climate Dynamics</i> , 54, 935-945) is now part of this assessment report.
126595	65	21	65	22	Figure 12.11 does not support this description. A more precise description would be "except for the western slopes of the Andes in the southern cone". [Trigg Talley, United States of America]	ACCEPTED: The text has been modified but is no longer included in Ch12. It is now presented in Ch11.
68637	65	21	65	32	The following paper may be cited here: Fábrega, J., T. Nakaegawa, R. Pinzón, K. Nakayama, O. Arakawa, SOUSEI Theme-C modeling group. Hydroclimate projections for Panama in the 21st Century. <i>Hydrological Research Letters</i> , 7, 23-29. doi: 10.3178/hrl.7.23 Nakaegawa and Vergara, First projection of the climatological river discharge of the Magdalena River basin in a changing climate, <i>HRL</i> , 4, 50-54 [Tosiyuki Nakaegawa, Japan]	TAKEN INTO ACCOUNT: The articles by Fábrega et al. (Hydroclimate projections for Panama in the 21st century. <i>Hydrological Research Letters</i> , 7, 23-29, doi: 10.3178/hrl.7.23) and Nakaegawa and Vergara (First projection of the climatological river discharge of the Magdalena River basin in a changing climate, <i>HRL</i> , 4, 50-54) are not part of this assessment report.
14969	65	25	65	26	Kitoh et al. (2011) should be updated with a more recent reference, given that it was already used in AR5 [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: More recent references are now included in the assessment report and accompany the findings by Kitoh et al. (2011).
33743	65	25			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33745	65	26	65	27	Change: "Extreme precipitation increase in NWS is also found by Cai et al., (2018), and by Carril et al., (2016); Cavalcanti et al., (2015) in the La Plata basin." By "Extreme precipitation increase in NWS is also found by Cai et al. (2018), and by Carril et al. (2016) and Cavalcanti et al. (2015) in the La Plata basin.". [Guiomar Rotllant, Spain]	ACCEPTED: The text was modified in the new version of the assessment report but is no longer included in Ch12. It has moved to the discussion on changes in extreme events (Ch11).
126597	65	28	65	30	Figure 12.11 and caption are labeled as 99th percentile. If figure caption is correct, then change "98th percentile" for "99th percentile". [Trigg Talley, United States of America]	ACCEPTED: The text was modified in the new version of the assessment report but is no longer included in Ch12. It has moved to the discussion on changes in extreme events (Ch11).
33747	65	31			Unit format, homogenize. Change: "2.5 to 10.0 mm/day" by "2.5 to 10.0 mm day ⁻¹ ". [Guiomar Rotllant, Spain]	ACCEPTED: The text was modified in the new version of the assessment report but is no longer included in Ch12. It has moved to the discussion on changes in extreme events (Ch11).
84061	65	34	65	41	We strongly recommend Borges and Chaffe 2019 (DOI: 10.1007/s10584-019-02430-9). They developed a synthesis method, based on the IPCC framework, and applied it for a collection of 42 peer-reviewed articles. Among many conclusions, south of Brazil may experience more floods in the future. [Marco Tulio Cabral, Brazil]	TAKEN INTO ACCOUNT: The article by Borges and Chaffe (2019, doi: 10.1007/s10584-019-02430-9) is now part of this assessment report.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
23665	65	34	65	41	Using a multimodel approach, Bozkurt et al. (2018) showed that the probability density functions (PDFs) of 3-day peak runoff for central Chile's basins indicate very little or no change in the shape of the distribution under RCP2.6. On the other hand, RCP8.5 shows a robust increase in the likelihood of maximum runoff values, and hence, floods, by mid-century and by the end of the century. They also concluded that the estimated return periods of 3-day peak runoff events indicate a decrease (increase) in return periods (values). For instance, by mid-century, peak flows with 50-year return periods will be greater than the reference period peak flows with 100-year return period in central Chile. Bozkurt, D., Rojas, M., Boisier, J.P., Valdivieso, J., 2018. Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios. Climatic Change, 150, 131-147, doi:10.1007/s10584-018-2246-7. [Deniz Bozkurt, Chile]	TAKEN INTO ACCOUNT: The article by Bozkurt et al. (2018; Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios. Climatic Change, 150, 131-147, doi:10.1007/s10584-018-2246-7) is now part of this assessment report.
13909	65	36	65	36	delete the point in yr. [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: The period (dot) was removed from the text.
33749	65	36			Change: "An increase of 7.5% and 12% of the 100 yr. return..." by "An increase of 7.5% and 12% of the 100 yr return...". [Guiomar Rotllant, Spain]	ACCEPTED: The period (dot) was removed from the text.
13911	65	39	65	39	change 1.5, 2 and 3°C by 1.5°C, 2°C and 3°C [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: The text has been modified as suggested.
100321	65	49	65	51	I think it would be better to write in this paragraph only about observed trends [Claudine Dereczynski, Brazil]	ACCEPTED: The first sentence was misplaced in the main text. It belonged to the section on projections. It was moved to the respective paragraph in the new version of this assessment report.
33751	65	51			Check for reference format. Change: "... (Coppola et al., 2014a; Giorgi et al., 2014b; Llopart et al., 2014)(Teichmann et al. 2013). » by "... (Teichmann et al. 2013 ; Coppola et al., 2014a; Giorgi et al., 2014b; Llopart et al., 2014)». [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
23667	66	5	66	7	By following the Boisier et al. 2018, Bozkurt et al. 2018 showed that the occurrence of extended droughts, such as the recently experienced mega-drought (2010–2015) in central Chile, increases from one to up to five events per 100 years under RCP8.5. Bozkurt, D., Rojas, M., Boisier, J.P., Valdivieso, J., 2018. Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios. Climatic Change, 150, 131-147, doi:10.1007/s10584-018-2246-7. [Deniz Bozkurt, Chile]	TAKEN INTO ACCOUNT: The article by Bozkurt et al. (2018; Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios. Climatic Change, 150, 131-147, doi:10.1007/s10584-018-2246-7) is now part of this assessment report.
84063	66	7	66	9	We recommend both studies, Chagas and Chaffe 2018 (DOI: 10.1029/2018WR022947); Borges et al. 2018 (DOI: 10.1002/joc.5686). Chagas and Chaffe 2018 demonstrate that in south of Brazil de CDD is increasing for several stations. Based on the agreement between several meteorological stations, Borges et al. (2018) found that CDD is increasing in central Brazil. [Marco Tulio Cabral, Brazil]	TAKEN INTO ACCOUNT: The articles by Chagas and Chaffe (2018, doi: 10.1029/2018WR022947) and Borges et al. (2018, doi: 10.1002/joc.5686) are now part of this assessment report.
33753	66	13			Homogenize unit format : 0.01 to 1.92 m3/s/year. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The unit format was homogenized throughout the main text. However, the text is no longer included in the assessment report.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
98165	66	15	66	16	I don't agree with high confidence that droughts will intensify through the 21st century in both Central America and the Amazon basin. Despite consistent indications of this in model projections, there is only very limited evidence for detectable anthropogenic decreases in rainfall in these regions for 1901-2010 or 1951-2010 trends (e.g., Knutson and Zeng, 2018). While there are more negative trends in parts of South America over 1981-2010, in most cases the CMIP5 model historical run ensemble simulated precipitation increases in those regions, calling into question the reliability of future projections of anthropogenic drying across the continent. [Thomas Knutson, United States of America]	NOT APPLICABLE: sentence has been deleted.
68527	66	15	66	22	The following paper may be cited here: Nakaegawa, T., A. Kitoh, H. Murakami, and S. Kusunoki. Maximum 5-day Rainfall Total and the Maximum Number of Consecutive Dry Days over Central America in the future climate projected by an atmospheric general circulation model with three different horizontal resolutions. Theoretical and Applied Climatology, 116, Issue 1-2, 155-168: Nakaegawa, T., A. Kitoh, S. Kusunoki, H. Murakami, and O. Arakawa. Hydroclimate change over Central America and the Caribbean in a global warming climate projected with 20-km and 60-km mesh MRI atmospheric general circulation models. Papers in Meteorology and Geophysics. 65, 15-33. Kusunoki, S., T. Nakaegawa, R. Pinzón, J. S. Galan and J. R. Fábrega, 29: Future precipitation changes over Panama projected with the atmospheric global model MRI-AGCM3.5. Climate Dynamics, [Tosiyuki Nakaegawa, Japan]	TAKEN INTO ACCOUNT: The articles by Nakaegawa et al. (Maximum 5-day rainfall total and the maximum number of consecutive dry days over Central America in the future climate projected by an atmospheric general circulation model with three different horizontal resolutions. Theoretical and Applied Climatology, 116, Issue 1-2, 155-168), Nakaegawa et al. (Hydroclimate change over Central America and the Caribbean in a global warming climate projected with 20-km and 60-km mesh MRI atmospheric general circulation models. Papers in Meteorology and Geophysics 65: 15-33) and Kusunoki et al. (Future precipitation changes over Panama projected with the atmospheric global model MRI-AGCM3.5. Climate Dynamics) are now part of this assessment report. However, the article by Kusunoki et al. (2019), which deals with projected changes in mean rainfall conditions, is not included in Ch12. The findings of the paper are documented in previous regional chapters.
84065	66	19	66	22	We strongly recommend Borges and Chaffe 2019 (DOI: 10.1007/s10584-019-02430-9). They developed a synthesis method, based on the IPCC framework, and applied it for a collection of 42 peer-reviewed articles. The study revealed a literature consensus on potential changes into a drier hydrological regime, especially for Paraná, Amazônica, Tocantins-Araguaia and São Francisco hydrographic regions. [Marco Tulio Cabral, Brazil]	TAKEN INTO ACCOUNT: The article by Borges and Chaffe (2019, doi: 10.1007/s10584-019-02430-9) is now part of this assessment report.
33755	66	32			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33757	66	32			JJA? Please, describe this abbreviation. [Guiomar Rotllant, Spain]	ACCEPTED: The acronym JJA was replaced with the text 'June-July-August' throughout the main text of Chapter 12.
63905	66	34	66	34	please introduce DJF as December January February or make sure it can be found in the glossary [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: The acronym DJF was replaced with the text 'December-January-February' throughout the main text of Chapter 12.
63907	66	34	66	35	The "central part" of the continent is imprecise. North and south America are separated between Panama and Columbia. Do you refer to North or South America? Figure.Atlas 42 shows North America. Please be more specific. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: The text 'central part of the continent' was replaced with the text 'central part of South America'.
33759	66	34			DJF? Please, describe this abbreviation. [Guiomar Rotllant, Spain]	ACCEPTED: The acronym DJF was replaced with the text 'December-January-February' throughout the main text of Chapter 12.
11861	66	50	66	50	"global", lowercase [Amy East, United States of America]	ACCEPTED: The text was modified as suggested.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11019	66	50	66	55	Specific comment. Forest fire activity has increased in recent years in central and south-central Chile. Drought conditions have been associated with the increase of large wildfires, area burned and longer fire seasons. Maximum temperatures and precipitation are key drivers of fire activity. Support evidence: 1) González, ME., S Gómez-González, A Lara, R Garreaud, I Díaz-Hormazábal. 2018. The 2010-2015 Megadrought and its influence on the fire regime in central and south-central Chile. Ecosphere DOI:10.1002/ecs2.2300; 2) Urrutia- Jalabert R, ME González, A González-Reyes, A Lara, R Garreaud. 2018. Climate variability and forest fires in central and south-central Chile. Ecosphere DOI:10.1002/ecs2.2171 [Mauro Gonzalez, Chile]	TAKEN INTO ACCOUNT: The articles by González et al. (2018; The 2010-2015 megadrought and its influence on the fire regime in central and south-central Chile. Ecosphere doi:10.1002/ecs2.2300; 2) and Urrutia-Jalabert et al. (2018; Climate variability and forest fires in central and south-central Chile. Ecosphere doi:10.1002/ecs2.2171) are now part of this assessment report.
33761	66	55			Add a comma between words: "However wildfires". [Guiomar Rotllant, Spain]	ACCEPTED: A comma was added to the text.
11021	67	1	67	2	Additional support evidence related to the need of appropriate land use management to mitigate increase future fire risk. 1) Gómez-González S, ME González, S Paula, Diaz-Hormazábal I, A Lara, M Baquerizo-Delgado. 2019. Temperature and agriculture are largely associated with fire activity in Central Chile across different temporal periods. Forest Ecology and Management 433: 535–543; 2) McWethy D. A Pauchard, R García, A Holz, ME González, TT Veblen, J Stahl, B Currey 2018. Landscape drivers of recent fire activity (2001-2017) in south-central Chile. PLoS ONE e0201195.; 3) González, ME., S Gómez-González, A Lara, R Garreaud, I Díaz-Hormazábal. 2018. The 2010-2015 Megadrought and its influence on the fire regime in central and south-central Chile. Ecosphere DOI:10.1002/ecs2.2300 [Mauro Gonzalez, Chile]	REJECTED: This is of more relevance to WGII or WGIII.
63909	67	4	67	5	On page 65 line 34-41 you discuss the flooding in South America. You are stating high confidence for longer periods of flooding in southeastern South America whereas here you state medium confidence. Please be consistent in the use of uncertainty language. I could not find any information in the text about increased flooding for SWS. When summarizing at the end of subchapters please ensure that the information was mentioned in the text before. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Consistency in the use of uncertainty language was ensured on this regard.
63911	67	5	67	7	A summary is missing for NWS, SWS and SES. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Comments for NWS, SWS and SES subregions are now included in the summary of 12.4.4.2.
67151	67	12	68	13	What does this have to do with permafrost? It's a glacier phenomenon. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
110163	67	13	67	15	But 200hPa winds have no direct relationship with surface winds so this is off topic and should be removed from the text to remain in keeping with other similar sections which discussed surface and not tropopause region winds. There are other chapters which assess such things. [Peter Thorne, Ireland]	ACCEPTED: The reference is no longer included in the new version of Ch12.
13913	67	19	67	19	Change (Augusto Sanabria and Carril, 2018) by Augusto Sanabria and Carril (2018) [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43559	67	19			Read " Augusto Sanabria and Carril (2018) indicate that" rather than " (Augusto Sanabria and Carril, 2018) indicate that" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33763	67	19			Check for reference format. Change: "(Augusto Sanabria and Carril, 2018) indicate..." by "Augusto Sanabria and Carril (2018) indicate...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110167	67	22	67	27	I would expect this text to assess the possibility of future S. Atlantic tropical storm systems impacting S. America. There have already been two according to HURDAT and these may become more frequent in future which is a critical possible regional impact and may even arguably constitute a genuine tipping point as defined by chapter 1? [Peter Thorne, Ireland]	REJECTED: Chapter 12 only includes statements on the projected changes in the frequency of tropical cyclones in the Atlantic and Pacific coasts of Central America; i.e., statements on south Atlantic tropical storm systems impacting South America are not included in the assessment.
33765	67	26	67	27	Check for reference format. Change: "tropical Atlantic (Diro et al., 2014) (Torres-ALavez et al., submitted), and a southward shift of storm tracks (Chapter 4)." By "tropical Atlantic (Diro et al., 2014; Torres-Alavez et al., submitted), and a southward shift of storm tracks (Chapter 4)." [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43561	67	26		27	Read "(Diro et al., 2014; Torres-ALavez et al., submitted)" rather than "(Diro et al., 2014) (Torres-ALavez et al., submitted)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
102691	67	27	67	27	is this southward track projected for the Atlantic/Eastern Pacific or for the South Pacific? This is unclear to me but very relevant for this story. [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT: The projected southward shift and intensification of southern storm tracks, with most effects offshore over the Southern ocean, is discussed in Chapter 4 in depth.
63913	67	29	67	30	In my opinion you should use Central and South America accordingly to the regions defined in chapter 1. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: A new version of the wind section for CSA in Chapter 12 is now available. Text has been revisited, revised and homogenised.
51871	67	30	67	31	Suggested edit: 'climate projections indicate a decrease in frequency of tropical cyclones in Central America (low confidence, limited evidence)...' - taken from line 24 of same page. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: A new version of the wind section for CSA in Chapter 12 is now available. Text has been revisited, revised and homogenised.
63915	67	30	67	32	by writing in most parts of the region you refer only to the before mentioned Central America. But the statement is true for CSA as you state on page 67 line 15-17. Please do not mix the information on cyclones (spatially constrained) and mean wind speed valid for most parts of CSA in one sentence. I disagree with the uncertainty language "medium confidence", since the text does not provide any evidence for medium confidence. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: A new version of the wind section for CSA in Chapter 12 is now available. Text has been revisited, revised and homogenised.
67141	67	37	67	38	This statement is not correct (see Appendix chapter 2 SROCC). They are not the fastest shrinking (not even close) and don't contribute most to sea-level. In fact their sea-level contribution is negligible. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88093	67	37	67	39	Ch9 provides more than one reference for this statement. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
100051	67	37	67	43	The numbers presented by Dussailant et al. 2019 must be reconciled against those presented for the same period by Braun et al., 2016 [Braun, M.H., Malz, P., Sommer, C., Farías-Barahona, D., Sauter, T., Casassa, G., Soruco, A., Skvarca, P. and Seehaus, T.C., 2019. Constraining glacier elevation and mass changes in South America. Nature Climate Change, 9(2), pp.130-136.] and those presented by Seehaus et al., 2019 for tropics. Using similar methods, Seehaus had arguably a more robust approach to quantifying & minimizing uncertainty. [Seehaus, T., Malz, P., Sommer, C., Lippel, S., Cochachin, A. and Braun, M., 2019. Changes of the tropical glaciers throughout Peru between 2000 and 2016—mass balance and area fluctuations. The Cryosphere, 13(10), pp.2537-2556.] Additionally, low-latitude geodetic mass balance measures often do not align with glaciological MB measures in tropics. [Forrest Schoessow, United States of America]	TAKEN INTO ACCOUNT: These two references were considered in our assessment but are now cited and assessed in the FGD of Chapter 9 and the Atlas.
100053	67	37	67	43	It could be useful to reference the following paper that describing cascading hazard chain interactions earlier when discussing potential for feedbacks/hazard interactions and compounding events: Gill, J.C. and Malamud, B.D., 2016. Hazard interactions and interaction networks (cascades) within multi-hazard methodologies. Earth System Dynamics, 7(3), p.659. [Forrest Schoessow, United States of America]	TAKEN INTO ACCOUNT: The article by Gill and Malamud (2016; Hazard interactions and interaction networks (cascades) within multi-hazard methodologies. Earth System Dynamics, 7(3), p.659) is considered in this assessment report but is not cited in the FGD version of Chapter 12. The reference has been shared with the corresponding team in IPCC AR6 working groups II and III.
2863	67	37	67	53	A new review paper about changes in the cryosphere in the Andes will be published in the coming weeks. Please consider it. (Masiokas, M., A. Rabatel, A. Rivera, L. Ruiz, P. Pitte, J.L. Ceballos, G. Barcaza, A. Soruco, F. Bown, E. Berthier, I. Dussailant, S. MacDonell. 2020. A review of the current state and recent changes of the Andean cryosphere. Frontiers in Earth Science, Cryospheric Sciences, in press). You should also refer to the review by Vuille et al. (2018) dedicated to the tropical Andes (Vuille, M., C. Huggel, M. Carey, W. Buytaert, A. Rabatel, D. Jacobsen, A. Soruco, M. Villacis, C. Yarleque, T. Condom, N. Salzmann, J.E. Sicart. 2018. Rapid decline of snow and ice in the tropical Andes - Impacts, uncertainties and challenges ahead. Earth-Science Reviews, 176, 195-213. doi: 10.1016/j.earscirev.2017.09.019) [Antoine RABATEL, France]	TAKEN INTO ACCOUNT: The articles by Masiokas et al. (2020; A review of the current state and recent changes of the Andean cryosphere. Frontiers in Earth Science, Cryospheric Sciences, in press) and Vuille et al. (2018; Rapid decline of snow and ice in the tropical Andes - Impacts, uncertainties and challenges ahead. Earth-Science Reviews, 176, 195-213. doi: 10.1016/j.earscirev.2017.09.019) are now part of this assessment report. The article by Vuille et al. (2018), however, is not cited in the text of Ch12 but is assessed in full detail in the Atlas.
88091	67	37	68	10	please cross check with Ch 9 where a more comprehensive and more updated assessment of regional glacier changes is made. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
67149	67	37	68	28	This entire sections does not appear sound, nor well written and would benefit from a major overhaul. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
33769	67	38	67	39	Erase dot between words: "...rise. (Dussailant et al., 2019a).". [Guiomar Rotllant, Spain]	ACCEPTED: The misplaced period (dot) was expunged from the text. However, the sentence is no longer included in the current version of Chapter 12.
33767	67	38			Check unit format, -1 in superindex: "Gt yr ⁻¹ ". [Guiomar Rotllant, Spain]	ACCEPTED: The unit format has been homogenized throughout the assessment report but the text is no longer included in the FGD version of Ch12. Such an information is now included and assessed in the Atlas.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88095	67	39	67	39	Please explain and quantify this effect, else it is hard to believe that decreasing rain may have a negative effect on glacier mass balance. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
45635	67	39	67	39	Please correct the citation of Dussailant et al. 2019 "a" and "b" are the same article, "a" point out the database and the other to the article, I do not found necessary to cite the database in this context. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
67143	67	39	67	39	Is this correct: Why would a reduction in light rainfall amounts drive less glacier melt. Rain is not part of the mass balance. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88097	67	40	67	40	since AR5 it was agreed to not use the misinterpretative term "ice caps" at all (see AR5 WG1 Glossary). Please use "glaciers". There is also no need to call them "mountain" glaciers. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
45637	67	40	67	40	Here, mountain ice caps (see WGMS or GLIMS morphological classification), a particular morphological type of glacier, are used as synonymous with glaciers. Please use ice masses or just glaciers (like Chapter 9) instead of mountain ice caps. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
67145	67	40	67	40	mountain ice caps is not proper terminology. Is this meant to refer just to ice caps (rare in the Andes) or glaciers in general? Same problem p68, line9: glacier icecaps. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
67147	67	43	67	43	Odd formulation: what is 'critical'? [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45639	67	44	67	44	<p>Barros et al. 2015, is still a valid and comprehensive reference for the climate change challenges for Argentina. Still, other more recent references support that the shrinkage of glaciers is and would be of great concern for the Andean Communities. The latest Atlas of UNESCO (Shoolmeester et al. 2018) is an updated source of references. There are two new references for Central Andes of Chile, which analyzed the role of glaciers for river runoff and the change in the last 60 years (Fariás-Barahona et al., 2020, Ayala et al. 2019).</p> <p>Ayala, Á. et al. Glacier runoff variations since 1955 in the Maipo River Basin, semiarid Andes of central Chile. <i>Cryosph. Discuss.</i> 1–39 (2019). doi:10.5194/tc-2019-233</p> <p>Fariás-Barahona, D. et al. 60 Years of Glacier Elevation and Mass Changes in the Maipo River Basin, Central Andes of Chile. <i>Remote Sens.</i> 2020, Vol. 12, Page 1658 12, 1658 (2020).</p> <p>Schoolmeester, T. et al. The Andean glacier and water atlas: the impact of glacier retreat on water resources - UNESCO Biblioteca Digital. (UNESCO and GRID-Arendal, 2018). [Lucas Ruiz, Argentina]</p>	<p>TAKEN INTO ACCOUNT: The articles by [Ayala. et al. Glacier runoff variations since 1955 in the Maipo River Basin, semiarid Andes of central Chile. <i>Cryosph. Discuss.</i> 1–39 (2019). doi:10.5194/tc-2019-233] and [Fariás-Barahona et al. 60 Years of Glacier Elevation and Mass Changes in the Maipo River Basin, Central Andes of Chile. <i>Remote Sens.</i> 2020, Vol. 12, Page 1658 12, 1658 (2020)] were considered but not cited in the FGD version of Chapter 12, because they deal mostly with ongoing changes in glacier mass balance, which is assessed in the Atlas.</p>
88099	67	44	67	45	reference missing [Georg Kaser, Austria]	NOTED: The reference by Mernild et al. (2017) was better placed in the FGD version of Chapter 12.
88101	67	45	67	46	reference missing [Georg Kaser, Austria]	NOTED: The reference by Mernild et al. (2017) was better placed in the FGD version of Chapter 12.
33771	67	55			Erase semi-column: "...southern Patagonian Andes; (Masiokas et al., 2009)),...". [Guiomar Rotllant, Spain]	ACCEPTED: The semicolon which was misplaced in the text was expunged from the revised version of Chapter 12.
45067	68	1	68	1	"These floods ...". It is unclear to what "These" relates. See p. 68 lines 12-15 [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
67153	68	1	68	1	which floods? [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
24147	68	1	68	1	Model calculations are available in the peruvian Andes of potential new lakes forming during the coming decades as a consequence of continued glacier shrinking (Colonia et al.,2017). Reference: (1) Colonia, D., Torres, J., Haeberli, W., Schauwecker, S., Braendle, E., Giraldez, C. and Cochachin, A., 2017. Compiling an inventory of glacier-bed overdeepenings and potential new lakes in de-glaciating areas of the Peruvian Andes: Approach, first results, and perspectives for adaptation to climate change. <i>Water</i> , Vol. 9, No. 336. Available at: http://doi.org/10.3390/w9050336 . [Wilfried Haeberli, Switzerland]	TAKEN INTO ACCOUNT: The article by Colonia et al. (2017; Compiling an inventory of glacier-bed overdeepenings and potential new lakes in de-glaciating areas of the Peruvian Andes: approach, first results, and perspectives for adaptation to climate change. <i>Water</i> , Vol. 9, No. 336. Available at: http://doi.org/10.3390/w9050336) is now part of the assessment report.
63917	68	1	68	1	I am missing a link between the two sentences. First, you talk about increasing glacial lakes over long time periods. Afterward, you write "these floods" but you were not talking about floods. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
38201	68	2	68	2	nivoglacial --> nivo-glacial? too technical terminology that is not previously defined. This terminology only appears in Rojas et al., 2014 written in Spanish but not amongst other papers cited. [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
11863	68	2	68	2	the same Cook et al., 2016, reference is listed twice in the reference list [Amy East, United States of America]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
33773	68	3			Add dot at the end of the sentence: "...2016b; Wilson et al., 2018; Drenkhan et al., 2019)". [Guiomar Rotllant, Spain]	ACCEPTED: The missing period (dot) was included in the revised version of Chapter 12.
88105	68	5	68	7	cross check with Ch 3, 8 and 9 [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The section on snow and ice was checked for cross-chapter consistency.
2865	68	5	68	10	For future changes in the Andean glaciers, and particularly in the tropical Andes, you should consider the 3 following papers: [Réveillet, M., A. Rabatel, F. Gillet-Chaulet, A. Soruco. 2015. Simulations of changes in Glaciar Zongo (Bolivia, 16°S) over the 21st century using a 3D full-Stokes model and CMIP5 climate projections. Annals of Glaciology, 56 (70), 89-97. doi: 10.3189/2015AoG70A113]; [Rabatel, A., J.L. Ceballos, N. Micheletti, E. Jordan, M. Braitmeier, J. Gonzalez, N. Mölg, M. Ménégoz, C. Huggel, M. Zemp. 2018. Toward an imminent extinction of Colombian glaciers? Geografiska Annaler: Series A, Physical Geography, 100 (1), 75-95. doi: 10.1080/04353676.2017.1383015]; and [Yarleque, C., M. Vuille, D.R. Hardy, O. Elison Timm, J. De la Cruz, H. Ramos, A. Rabatel. 2018. Projections of the future disappearance of the Quelccaya Ice Cap in the Central Andes. Nature Scientific Reports, 8, 15564. doi:10.1038/s41598-018-33698-z] [Antoine RABATEL, France]	TAKEN INTO ACCOUNT: The articles by Réveillet et al. (2015; Simulations of changes in Glaciar Zongo (Bolivia, 16°S) over the 21st century using a 3D full-Stokes model and CMIP5 climate projections. Annals of Glaciology, 56 (70), 89-97. doi: 10.3189/2015AoG70A113), Rabatel et al. (2018; Toward an imminent extinction of Colombian glaciers? Geografiska Annaler: Series A, Physical Geography, 100 (1), 75-95. doi: 10.1080/04353676.2017.1383015) and Yarleque et al. (2018; Projections of the future disappearance of the Quelccaya Ice Cap in the Central Andes. Nature Scientific Reports, 8, 15564. doi:10.1038/s41598-018-33698-z) are now part of this assessment report. However, they are not cited in the current version of Chapter 12 as they deal with ongoing and projected changes in glacier mass balance, which are now documented and assessed in the FGD version of the Atlas.
45641	68	5	68	10	Why only RCP 8.5 is used to assess future change in snow cover or glacier volume? Global modeling efforts (see figure 9.22 and table 9.3) show that still for RCP 2.6, Low Latitude glaciers (which include the Tropical Andes) will shrink more than 60% of the present volume, which means that even in a low emission scenario, the committed change of glaciers by the end of the century will have a tremendous impact in the water resources of this region. The data to assess the response of glaciers in other future scenarios is presented in Table 9.3 and figure 9.22 and is based mainly on the work of Hock et al. 2019 and the recent accepted Marzeion et al. Section 9.5.3 also assess the snow cover change in the Southern Andes. Marzeion, B. et al. Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change. Earth's Futur. (submitted). Hock, R. et al. GlacierMIP - A model intercomparison of global-scale glacier mass-balance models and projections. J. Glaciol. 65, 453–467 (2019). [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: Articles by Marzeion et al. and Hock et al. (2019) are now considered in the revised version of the assessment.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
23669	68	5	68	10	Bozkurt et al. (2018) showed that even under the low emission scenario, the Andes (central-southern Chile) snowpack is projected to decrease by 35–45% by mid-century. In more snowmelt-dominated areas, the projected hydrological changes under RCP8.5 go together with more loss in the snowpack (75–85%) and a temporal shift in the center timing of runoff to earlier dates (up to 5 weeks by the end of the century). Bozkurt, D., Rojas, M., Boisier, J.P., Valdivieso, J., 2018. Projected hydroclimate changes over Andean basins in central Chile from downscaled CMIP5 models under the low and high emission scenarios. Climatic Change, 150, 131-147, doi:10.1007/s10584-018-2246-7. [Deniz Bozkurt, Chile]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88103	68	6	68	6	where do you get the high confidence from? There is not a single respective reference given. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
33775	68	7	68	10	How they will rise if ice is melting?: "CMIP5 projections suggest that the Freezing Level Height in the two largest glacierized mountain ranges in Peru, the Cordillera Blanca and the Cordillera Vilcanota, will rise by 850 m under RCP8.5 by the end of the 21st century, driving a considerable shrinking of glacier icecaps and consequently a significant decrease in the total river discharge during the dry season (Schauwecker et al., 2017)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The Freezing Level Height refers to the altitude of the air 0°C isotherm, so warmer conditions move this up in the air column and therefore reduce the area where ice can remain frozen (leading to melting)
63919	68	12	68	15	This is information fits in the river and flood chapter. There is no link to permafrost. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88373	68	12	68	16	You seem to be talking more about glaciers here - link to permafrost isn't clear. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
45643	68	12	68	16	Although Glacial Lake Outburst Floods (GLOFs) could be triggered by avalanches or mass wasting related to the thawing of permafrost in mountain slopes, they are genetically linked with the glacier realm (the lakes form related wit the advance or retreat of glaciers) instead of the permafrost realm. The increase of GLOFs as CID must be located in the snow and land ice section. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
24149	68	12	68	16	This paragraph is not about permafrost and should be displaced to the glacier paragraph. It may, however be mentioned that rock/ice avalanches from steep permafrost rock walls have cause impact waves and far-reaching floods/debris flows (Carey et al., 2012; a recent event at Salkantaycocha, Santa Teresa happened in February 2020 but is not yet documented in the scientific literature. Reference: (1) Carey, M., Huggel, C., Bury, J., Portocarrero, C. and Haeberli, W., 2012. An integrated socio-environmental framework for glacier hazard management and climate change adaptation: lessons from Lake 513, Cordillera Blanca, Peru. Climatic Change, Vol. 112, No. 3, pp. 733-767. Available at: http://doi.org/10.1007/s10584-011-0249-8 . [Wilfried Haeberli, Switzerland]	TAKEN INTO ACCOUNT: The article by Carey et al. (2012; An integrated socio-environmental framework for glacier hazard management and climate change adaptation: lessons from Lake 513, Cordillera Blanca, Peru. Climatic Change, Vol. 112, No. 3, pp. 733-767. Available at: http://doi.org/10.1007/s10584-011-0249-8) is now part of the assessment report.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110171	68	18	68	19	Is a caveat required here around use of such an old scenario and therefore presumably CMIP3 generation model? Also it shouldn't, presumably be labelled an IPCC scenario? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Ch 12 team discussed how pertinent was to include the article by Rangecroft et al. (2016) given its use of previous CMIP projections. Since such an article is the only one we found on ongoing and projected changes in Andean permafrost, we decided to keep it in the current version of Chapter 12.
71193	68	19	68	23	The statement regarding the reduction of 95% of the rock glaciers in the Argentina Andes is a completely wrong interpretation of Drewes et al. (2018). Here is what Drewes et al. (2018) wrote in their paper: "We used active rock glaciers as a diagnostic of permafrost, assuming that the toes mark the 0 °C isotherm in climate scenarios for the twenty-first century and their impact on freezing conditions near the rock glacier toes. We find that, under future worst case warming, up to 95% of rock glaciers in the south- ern Desert Andes and in the Central Andes will rest in areas above 0 °C and that this freezing level might move up more than twice as much (~500 m)as during the entire Holocene (~200m)." This means that the 0°C isoline is increasing in elevation, but because of the ice-rich composition of most rock glaciers, and the latent heat effect, the rock glaciers will still persists for decades and most likely for centuries They are, however, no longer in a "stable" condition, but under degradation. But the conclusion, that the rock glaciers would be above 0°C, which means that the ground ice has melted and these rock glaciers are no longer a permafrost feature, is simply wrong and very misleading. [Lukas Arenson, Canada]	TAKEN INTO ACCOUNT: The statement was modified and now reads as follows: 'in the Argentinian Andes up to 95% of rock glaciers in the southern Desert Andes and in the Central Andes will rest in areas above 0 °C under the worst case scenario of warming (the freezing level might move up more than twice as much as during the entire Holocene) (Drewes et al., 2018)'.
45645	68	20	68	23	Why only the worse case scenario? Others scenarios are also policy relevant. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The current version of the CID table shows the summary of confidence in direction of projected changes, as aggregate characteristic changes for mid-century for scenarios RCP4.5, SSP3-4.5, SRES A1B, or above.
88375	68	21	68	22	Is it air temperature or ground surface temperature that will be above 0°C? [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88107	68	25	68	27	The very few references you use cannot result in a "high confidence" at all. Please follow the comprehensice SROCC and Ch9 assessments. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
33777	68	26			Check unit format, -1 in superindex: "Gt yr-1". [Guiomar Rotllant, Spain]	ACCEPTED: The unit format has been homogenized throughout the assessment report but the text is no longer included in the FGD version of Ch12. Such an information is now included and assessed in the Atlas.
45647	68	27	68	28	The text does not support this confidence statement in the section. Regarding glaciers, Chapter 9 assessment (see section 9.5.1) back this sentence and agree with the level of confidence. But, there is not enough data to assess with high confidence that Andean mountain permafrost is thawing under the present climate. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33779	68	34	68	37	Change unit format to "mm yr ⁻¹ " in. "Around Central and South America, over 1900-2015, a hybrid reconstruction of tide gauge and satellite data finds regional-mean relative SLR of 1.6 ± 0.5 mm/yr in the South Atlantic, 1.5 ± 0.5 mm/yr in the subtropical North Atlantic and 1.5 ± 0.7 mm/yr in the East Pacific, compared to a GMSL change of 1.6 ± 0.4 mm/yr. For the period 1993-2015, the SLR rates increased to 2.5 ± 0.3 mm/yr, 3.0 ± 0.4 mm/yr and decreased to 1.3 ± 0.7 mm/yr, respectively, compared to a GMSL change of 2.8 ± 0.3 mm/yr (Dangendorf et al., 2019)". [Guiomar Rotllant, Spain]	ACCEPTED: The unit format was homogenized throughout the main text.
14809	68	43	68	44	It's not clear what 'below-average contributions from... glaciers and ice sheets' means in the context of why SLR around Asia is greater than world average. Suspect this should reference regional sea level effects arising from ice sheet GIA. Clarify with a Chapter 9 author or remove. [Jeremy Fyke, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
67155	68	48	68	48	What is ESL? The chapter has far too many acronyms. It's not easily accessible to non-specialists. This and many acronyms should be avoided and spelled out for better readability. [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: To be consistent with Ch 9 definitions of the different types of ESLs (Extreme sea level), we now use Extreme Total Water Level (ETWL) throughout. This has been defined in 12.3 as well.
33781	68	53	68	55	Check for reference format. Change: "...(Vousdoukas et al., 2018)..." to "...Vousdoukas et al. (2018)...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43563	68	53			Read "Vousdoukas et al. (2018) project increases " rather than "(Vousdoukas et al., 2018) project increases " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
63921	68	54	68	54	What does (1.0) mean in this sentence? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The text has been removed from the current version of Chapter 12.
43565	68	55			Read "Vousdoukas et al. (2018) also show that " rather than "(Vousdoukas et al., 2018) also show that " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
74621	69	2	69	4	return periods 1:1 years doesn't have a sense in terms of return periods (it doesn't exist in my opinion); need to think about and discuss this matter with experts at least to be confirmed [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: The sentence was rephrased in the current version of Chapter 12.
85369	69	9	69	19	I very respectfully dare to argue that the information herein included could be meaningless for a regional risk assessment. The values presented are based on faulty methods, i.e., results by Vousdoukas et al. that would need to be revisited in terms of local morphology and regarding known coastal mechanics. For example, we lack a judicious analysis of sediment budgets along the coastlines of South America. Concluding that there will be coastal erosion along sandy beaches with a high confidence misleads the potential reader and masks the actual problem: we do not know where the sand is going to. We have already acknowledge that the problem is more complicated and cannot be assessed using a simplistic approach such as the one proposed by the studies referenced. Several regional analyses has been conducted that should be taken into account in the report, beyond the well intended but less accurate global assessments (e.g., Silva et al., 2014, https://bioone.org/journals/Journal-of-Coastal-Research/volume-71/issue-sp1/SI71-001.1/Present-and-Future-Challenges-of-Coastal-Erosion-in-Latin-America/10.2112/SI71-001.1.full) [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: Vousdoukas et al (2020) presents the only global scale ensemble projections of shoreline change due to both ambient trends and climate change forcing. Like all other global scale assessments (e.g. of wind, storm surge, precipitation), naturally these projections will need to be further enhanced when considering hazards and impacts at local scale. The methods used by Vousdoukas et al (2020) are robust at the scale the study is intended for and is a significant improvement on previous global scale assessments of shoreline change (e.g. Hinkel et al., 2013) cited in previous IPCC reports. The scale of interest of Ch 12 is not local, it is regional. At that scale the methods and assumptions adopted by Vousdoukas et al (2020) are valid.
33783	69	9			Check unit format, -1 in superindex: "0.26 m/yr". [Guiomar Rotllant, Spain]	ACCEPTED: The unit format was homogenized throughout the main text of Chapter 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33785	69	15	69	16	Check for reference format. Change: "...presented by (Vousdoukas et al., in press)..." by "...presented by Vousdoukas et al. (in press)..." [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
43567	69	15		16	Read " presented by Vousdoukas et al. (in press) show " rather than " presented by (Vousdoukas et al., in press) show " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.
64031	69	24			from 1982 to 2016, this is a very wide statistical bracket to build upon. with reference to the crucial climate changes that took place, considering this bracket will contain alot of outliers, thus using the " Average value" will be biased and not objective. It would be advisable to slice this bracket to smaller ones and calculate the required statistical values for each slice then take their mean. This would be more credible in projecting furture data and finding a trend. Not to mention, at least the abrupt changes in marine life and coastals as aresult of Tsunami in 2002 and how this affected the axis of rotation of earth, thus; was followed by many changes in tidal movements and thus marine life changes. Worth refering to the status quo of our planet and how it affected positively the ntire ecosystem, thus; projections will also be affected. Thereby; this report should be modified as per its furture projections expcially in what's concerning the marine life and air pollution. However; if Clear statistical data were available and precise analysis margins were considered, projecting the future while including the present data could be recapped. Not to forget that the rate of erosion of the poles was also altered, thus the precalculated increase in sea levels would differ. Be ware also that from January 2020, there is no clear assumption about all the climatic impact drivers and their progress within the perscpective of the locking and quaratine of COVID-19. Thus; all projected rates of development are affected. Thus; another risk plan assessment and response to change should be modified with a range of flexibility in either directions of the probability curve. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This comment was carefully considered. However, the IPCC's role is to assess published literature, rather than do new research. Therefore we are constrained by the methods and data used in published literature.
63923	69	37	69	37	In my opinion referencing the Atlas is not helpful since it is a massive document. Please be more specific what you are referencing in the Atlas (e.g. Figure.Atlas1) please consider this comment throughout the chapter. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: the Atlas chapter is now cited in the main text.
423	69	39	69	40	Please refer to my comment on "lake Acidification". The study by Lauvset 2015 is based on model results and no direct observations, and do not consider coastal ocean. There are no references in the SOD text to "lake acidification" so far. Here a direct quote from Lauvset et al 2015: "Here, we only evaluate trends in the open ocean." -> page 3 from the pdf article version. I'd suggest rewriting this. Please note that this comment aims at strenghtening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in Chapter 12.
63925	69	43	69	43	What it is pts? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Sentence has been corrected and moved to 12.4 introduction
33787	69	45	69	48	Check units format in "Historical losses of dissolved oxygen along the Atlantic coastlines of South America and the Pacific coast of Central America are about 5-15 Mol/m2 per decade (Schmidtko et al., 2017). By the end of the 21st century, ocean dissolved oxygen levels are projected to decrease by 0.005 Mol/m3 under RCP4.5, and by 0.01 Mol/m3 under RCP8.5 (high confidence).". [Guiomar Rotllant, Spain]	ACCEPTED: A revised and homogenous text is now included in the latest version of Chapter 12.
13915	69	55	69	55	change (Vousdoukas et al., 2018) by Vousdoukas et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: The full list of references of this new version of Ch12 has been synchronized and homogenised using the Mendeley platform.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126599	70	3	70	4	[CONFIDENCE] It is stated here that there is no assessable literature for the impact of climate change on air pollution, atmospheric CO2, and radiation at surface. If atmospheric CO2 has no assessable literature, does it make sense to indicate a high confidence of increase for the various regions for atmospheric CO2? These two should at least match up, so maybe some mention of increasing atmospheric CO2 concentrations worldwide lead to the conclusion in Table 12.6. [Trigg Talley, United States of America]	ACCEPTED: The text now reads as follows: 'No assessable literature specific to CSA could be found for the impact of climate change on air pollution, atmospheric CO2 and radiation at surface.'
9231	70	12	70	20	Please revise the meteorological and air pollution reports (and if you want, also the metadata), produced by the Secretaría de Ambiente de Quito (Environmental Office of Quito), specially for informations on air pollution (increasing) and solar radiation (also increasing). In the NWS sub region, you have left in white (low confidence in direction of change) both items. The assesment of this information may allow you to revise it, at least to orange or more. See: 1. http://www.quitoambiente.gob.ec/ambiente/index.php/informes 2. http://www.quitoambiente.gob.ec/ambiente/index.php/datos-horarios-historicos I would also suggest that UV radiation is included, as it is getting each time more intense. For air pollution in the NWS subregion, also check the information produced by the Secretaría Distrital de Ambiente de Bogotá (Environmental Office of Bogotá), in http://ambientebogota.gov.co/red-de-calidad-del-aire Many literature that rely in those databases suggests that air pollution is worsening, not only in NWS, but in many other regions of CAS [Nicolás Cuvi, Ecuador]	REJECTED: The assessment report is based on published, scientific literature. Governmental reports were not included in the overall revision.
126601	70	14	70	14	Table 12.6 doesn't show the likelihood of decrease for southwestern SA per Figure 12.11. [Trigg Talley, United States of America]	NOT APPLICABLE: Figure was completely updated.
437	70	14	70	14	I would suggest to remove lake acidity/acidification from table 12.6 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in Ch12.
63927	70	14	70	20	Severe wind and storm medium confidence for increase for North South America and Northeastern South America [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This CID category has been re-defined.
88109	70	14			Table 12.6. snow and land ice: where do you get the high confidence from without basing it on multiple evidence (references)? [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
88377	70	14			Table 12.6 Aren't the impacts related to permafrost largely associated with higher elevations - should there be a note for that? [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: The full section on snow and ice was revisited, reorganized and rewritten. Changes in and projections of snow cover are now presented in the Atlas. Ch12 only includes climatic impact drivers such as snow pack seasonality, permafrost, glacier lakes, heavy snow and ice storms, hail, and avalanches.
8005	70	25	70	29	Atlas.5.6 defines 4 European regions, also including Eastern Europe (Western part of Russia) [Bart van den Hurk, Netherlands]	TAKEN INTO ACCOUNT. Section has been removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126607	70	25	70	29	What about Arctic regions in Europe? This regionalization seems oversimplified. What are the main drivers of climate variability in the region? ENSO? NAO? MJO? AO? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT. Section has been removed.
63929	70	25	70	29	Please use the terminology for regions introduced in Chapter 1 Figure1.15 NEU, CEU, MED and EEU [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Section has been removed.
99277	70	25	70	29	there is no mention of eastern Europe in the regions. Please mention all to ensure links to WGII also in discussion individual drivers e.g. heat and eastern Europe is not mentioned. Overall in the entire section on Europe eastern Europe is only sporadically mentioned. Please ensure a more comprehensive overview for the regions or state why it is omitted [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT. Section has been removed.
126605	70	25	71	22	This introductory section for Europe is hard to read. There are grammatical errors and sentences with no purpose. It differs in structure from Africa, Asia, Australasia, and Central and South America in that it reads like a literature review of regional climate models and how good they are at reproducing changes in climatic variables. The other regions seem to follow a more logical structure that (a) introduces the region, (b) recaps AR5, and (c) summarizes what newly available models reveal. Why doesn't this section do the same? There is a big disconnect between this introductory section and the subsections on Europe that follow, most of which are easier to read. [Trigg Talley, United States of America]	Noted. The section has been revised although I wonder where are the many grammatical errors. The reason why the literature review is not present but can be found in the Atlas is because Europe has a lot of literature more compared to the other regions and therefore to use too much space for repeating what is already in the Atlas is a waste.
126603	70	25	79	53	Some of the section on Europe is very well-written, carefully researched, and refers to recent relevant literature. Other parts seem like they were written in a hurry, and not well-referenced or explained (or over-referenced and poorly explained). Would like to see more examples of how the climate impact drivers affect sectors / natural resources, etc. [Trigg Talley, United States of America]	Noted. The section has been revised for sure, but the example on how CID impact the sectors don't belong to WGI.
64033	70	25			Proper detailed definition of the climatic zones is required, the description available is geographic rather than climatic [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Section has been removed.
8007	70	29	70	32	You can refer to Atlas.5.6 [Bart van den Hurk, Netherlands]	Noted. Reference to the Atlas has been added where missed
31457	70	31	71	9	Projected climate change impact has been assessed on a regional scale for central Europe and 11 urban areas respectively based on climate indices for the period 2021–2050 using RCM 7km-simulations. Amongst others, hot days and tropical nights, heat waves and heavy precipitation events have been assessed. In line with the report, the number of heat waves, as well as the number of single hot days, tropical nights and heavy precipitation events is projected to increase in the near future. In addition, the number of frost days is significantly decreased. For most urban regions investigated the 95 percentile of air temperature is increased by 1-3°C. Due to its high resolution, results from this study can help to assess climate change on a more regional level contributing to risk assessment in vulnerable areas - in time frames which can be understood by stakeholders. Literature: Fallmann, J., Wagner, S., & Emeis, S. (2017). High resolution climate projections to assess the future vulnerability of European urban areas to climatological extreme events. Theoretical and Applied Climatology, 127(3-4), 667-683. [Joachim Fallmann, Germany]	REJECTED. The paper has been checked, but in general single model studies are not used for the assessment moreover it is based on old scenarios.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126609	70	34	71	9	This paragraph reads like a laundry list of research - which would be useful if the purpose of the section is to direct the reader to research. It basically says there has been a number of impact studies (doesn't give a number) that highlight new impact drivers (doesn't say what these are). It gives cursory mention of the science attribution of weather events to climate change, but only gives a single example. And then there's mention of HyMeX and BalteX, without any description at all of the findings of these studies -- and why they are even useful. Simplify this section by providing detail about how regional climate models have helped increase understanding of x processes in Europe. Much like the other regional sections do. [Trigg Talley, United States of America]	NOTED. Section revised but the constrain on the length doesn't allow to enter the details that are explained much better in the Atlas EU section. The reference to the Atlas has been added.
74623	71	2	71	2	To check if they aren't published about (... ; Vautard et al., submitted ; Coppola et al. Submitted) and complete expression by ";" [Moulay Driss HASNAOUI, Morocco]	noted. The papers have been accepted now
33789	71	2			To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	noted. Mendeley fixed and the right letter added
71615	71	3	71	4	A reference has been written out of the parenthesis. [Sixto Herrera, Spain]	ACCEPTED
38205	71	4	71	4	Missing period mark after Somot et al., 2018)." [Junhee Lee, Republic of Korea]	ACCEPTED
33791	71	4			Add a dot at the end of the sentence. Change: "...al., 2018) Faggian and Decimi..." by "...al., 2018) Faggian and Decimi...". [Guiomar Rotllant, Spain]	ACCEPTED
13917	71	9	71	9	delete the point in areas. [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED
33793	71	9			Erase dot before reference: "processes in specific European areas. (Ducrocq et al., 2014)". [Guiomar Rotllant, Spain]	ACCEPTED
43569	71	9			Read "in specific European areas (Ducrocq et al., 2014)." rather than "in specific European areas. (Ducrocq et al., 2014)." [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED
15717	71	11	71	11	"The model ability" : what model is referred to here ? I think this needs editing to be unambiguous. [Samuel Morin, France]	TAKEN INTO ACCOUNT. The sentence has been revised but it refers in general to GCM and RCM model studies. The reference to the Atlas should point the reader where details on the models can be found.
14971	71	11	71	16	Once again, this is information that can be found in other chapters, I would suggest to remove it given that you need to shorten the text [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT. Reference to the Atlas has been added but the short summary can still be useful for the reader.
64035	71	11			The model used should be referred to in detail for credibility of the results and conclusions built upon it. this could be in the introduction to the chapter if the same model is used in analysis of various regions or could be in the introduction of each region or in an Annex, in order to skip details in the main body of the text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. The sentence has been revised but it refers in general to GCM and RCM model studies. The reference to the Atlas should point the reader where details on the models can be found.
8009	71	12	71	12	You can refer to Atlas.5.6.3 here [Bart van den Hurk, Netherlands]	ACCEPTED
73991	71	18	71	22	The indexes in Figs 12.4-6 and 12.12 are averaged over long periods of time. That is why this information can be useful for long-term planning and decision making, but in reality decisions need to be made for shorter than decade periods. [Elena Kozlovskaya, Finland]	REJECTED. For climate change meaningful projection usually 30 years average window is considered so shorter time periods are not advised to use for any trend analysis of significance of the signal

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
96183	71	31	71	32	"Scenario SSP5-8.5": As mentioned later in the figure caption, that scenario is applied only to the CMIP6 ensemble but not to the other ensembles. Please delete or clarify. [Nicole Wilke, Germany]	ACCEPTED. Specification as been added now.
126611	71	49	71	50	Clarify what is meant by "heat from the mean warming trend". [Trigg Talley, United States of America]	ACCEPTED. Text has been rephrased.
126613	71	50	71	51	2017? Haylock et al (2008) refer to the period 1950 to 2006. How is this correct? If this is referring to a dataset, provide the correct citation. [Trigg Talley, United States of America]	NOTED. Sentence has been removed now so the reference is not longer needed.
6821	71	50	71	51	The statement that Europe has warmed by about 1.3°C since 1950 is correct, but rather misleading. Average temperatures over Europe prior to the 1970s showed large decadal variability, and were atypically high around 1950. See for example the third graph on the webpage https://climate.copernicus.eu/ESOTC/2019/surface-temperature . There was little net temperature rise over Europe for the first three quarters of the 20th century, and a temperature rise of close to 2°C over the past forty or so years. That's roughly twice as fast as the rise in global average temperature. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	NOTED. Sentence has been removed relevant information can be found in the Atlas chapter.
110175	71	52	71	54	This was the subject of a chapter 10 case study but no effort is made here to cross-reference. [Peter Thorne, Ireland]	NOTED. Sentence has been removed relevant information can be found in the Atlas chapter.
8011	71	53	71	53	Atlas.5.6.2 states that spring is the season warming fastest in Northern Europe [Bart van den Hurk, Netherlands]	ACCEPTED. Sentence has been removed and reference added to the Atlas.
108937	71	56	72	1	See also a study specifically detecting a heat stress signal in Europe in Lorenz, Ruth, Zélie Stalhandske, and Erich M. Fischer. "Detection of a climate change signal in extreme heat, heat stress, and cold in Europe from observations." <i>Geophysical Research Letters</i> 46, no. 14 (2019): 8363-8374. [Erich Fischer, Switzerland]	noted. The paper deal with heat extreme that are now all passed to CH11.
99279	72	1	72	41	The assessment of impacts here is very general, thereby not providing much relevant information. A statement like heat waves affect infrastructure with various sensitives and thresholds is not very meaningful and the reference here should be linked back to WGII chapter 13 where this is discussed in detail. To be a handshake , the links need to be established to the sections where the relevant extensive assessment is done. Similarly a decrease in winter temperature will affect energy demand. Sure, but you are not saying how so what is the information gleaned for the reader? There are many more examples along the lines in this section [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Reference on how the CID are connected with the sector are discussed in section to 12.3 where. WGII chapters cannot be referenced because they will not be available at the time of WGI publication.
63933	72	3	72	11	Please check references Coppola et al submitted A and B. It looks like there is no difference according to the reference list [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Noted. it is right but it is a Mendeley problem
109795	72	3		4	Lionello and Scarascia 2018 (doi:10.1007/s10113-018-1290-1) have used an ensemble of CMIP5 global simulations to show that the temperature in the Mediterranean region will warm 20% more than the global annual average temperature (50% more in summer) . Lionello, P., Scarascia, L. The relation between climate change in the Mediterranean region and global warming. <i>Reg Environ Change</i> 18, 1481–1493 (2018). https://doi.org/10.1007/s10113-018-1290-1 [Piero Lionello, Italy]	TAKEN INTO ACCOUNT: Text has been modified and it only refers to the Atlas. All references should be found in the Atlas now.
8013	72	4	72	4	Is figure Atlas.40 (in the SOD) [Bart van den Hurk, Netherlands]	noted. text has been modified

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
74625	72	4	72	4	To check if it isn't published about (Coppola et al., submitted, a ; ...) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been now accepted
63931	72	4	72	4	Atlas.Figure 2 seems to be wrong do you refer to figure.atlas40? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Noted. Text has been revised now and the reference is to the Atlas section instead
8015	72	4	72	11	Very long sentence. Reference to Atlas at end of paragraph can be deleted [Bart van den Hurk, Netherlands]	REJECTED. This are the kind of sectoral impact information that Ch12 should include where possible.
33795	72	4			Check for reference format. Change: "(Coppola et al., submitted, a)" by "(Coppola et al., submitted a)". [Guiomar Rotllant, Spain]	noted. reference has been removed
66581	72	5	72	5	It is not clear what "increasing gradient toward the Southern regions" really means. Is it the trend in heat extremes that increases more in southern regions than in other regions? WSDI and HWMId changes are large both in the south and in the north according to the text in the chapter (p72117-18). Or is it referring to the heat stress and the highest absolute temperatures and not the change? Also what is meant by "Southern regions"? Is it the southern half of Europe? Southern tip of the Iberian peninsula? [Kjellström Erik, Sweden]	TAKEN INTO ACCOUNT. Page and line references are wrong. Nevertheless text has been revised and explicit reference to the official AR6 regions has been made.
63935	72	5	72	5	I assume you mean sectors? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Corrected to clarify: "Future warming leads to the exceedance of different temperature thresholds relevant for vector-borne diseases (medium confidence)"
33797	72	10			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	Noted. it is right but it is a Mendeley problem
109797	72	15			Lionello and Scarascia 2020 (doi: 10.1007/s10113-020-01610-z) have used an ensemble of CMIP5 global simulations to estimate future change of temperature extremes. Warm nights will become common with a 2K global warming (42% in the North Mediterranean and 48% in the South Mediterranean) and the majority with a 4K global warming. Lionello, P., Scarascia, L. The relation of climate extremes with global warming in the Mediterranean region and its north versus south contrast. Reg Environ Change 20, 31 (2020). https://doi.org/10.1007/s10113-020-01610-z [Piero Lionello, Italy]	noted. The paper deal with heat extreme that are now all passed to CH11.
15147	72	16	72	16	Another relevant paper here may be https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017GL076222 [Alessandro Dosio, Italy]	noted. The paper deal with heat extreme that are now all passed to CH11.
43571	72	17			Read "(WSDI and HWMId; Sillmann et al., 2013a; Russo et al., 2015)" rather than "(WSDI and HWMId; Sillmann et al., 2013a;(Russo et al., 2015)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT. Editorial
33799	72	18	72	19	Check for reference format. Change: "...enhanced increases over the Southern Mediterranean and Scandinavia (Abaurrea et al., 2018); (Dosio et al., 2018); (Rohat et al., 2019) (Forzieri et al., 2016),..." by "...enhanced increases over the Southern Mediterranean and Scandinavia (Abaurrea et al., 2018; Dosio et al., 2018; Rohat et al., 2019; Forzieri et al., 2016),..." [Guiomar Rotllant, Spain]	Noted. it is right but it is a Mendeley problem
43573	72	18		19	Read "(Abaurrea et al., 2018; Dosio et al., 18 2018; Rohat et al., 2019; Forzieri et al., 2016)" rather than "(Abaurrea et al., 2018); (Dosio et al., 18 2018); (Rohat et al., 2019) (Forzieri et al., 2016)" [Cyriaque Rufin Nguimalet, Central African Republic]	Noted. it is right but it is a Mendeley problem
80233	72	25	72	26	If we understood it correctly, the extreme heat publications are valid until the end of the century and only one publication for heat stress is done by mid-century? [Lilian Fejes, Hungary]	Not applicable - Unfortunately we do not understand the comment and therefore, we cannot address it.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
108939	72	25	72	32	Further studies to support these statements include Diffenbaugh, N. S., Pal, J. S., Giorgi, F., and Gao, X. (2007), Heat stress intensification in the Mediterranean climate change hotspot, Geophys. Res. Lett., 34, L11706, doi:10.1029/2007GL030000. and Fischer, E. M., and C. Schär (2010), Consistent geographical patterns of changes in high-impact European heatwaves, Nature Geoscience, 3 (6), 398-403. [Erich Fischer, Switzerland]	REJECTED. These papers have all be published long time ago and they were are used in previous ARs. No need to include them again
8017	72	26	72	26	What are "plains areas"? [Bart van den Hurk, Netherlands]	Noted. The plain area are the opposite of mountain areas, like the Padania plain where the Po river bed is located.
74627	72	29	72	29	To check if it isn't published about (Coppola et al., submitted, a) [Moulay Driss HASNAOUI, Morocco]	noted. The paper has been accepted now
33801	72	29	72	49	Check for reference format. Change: "(Coppola et al., submitted, a)" by "(Coppola et al., submitted a)". [Guiomar Rotllant, Spain]	Noted. it is right but it is a Mendeley problem
15879	72	32	72	32	In France the evolution of climate change, according to RCP6.0 scenario, will show a significant impact of the productivity and the extent of tree species that have a significant role in the ecosystem structure and in the wood supply (Garbolino, E.; Daniel, W.; Hinojos Mendoza, G. Expected Global Warming Impacts on the Spatial Distribution and Productivity for 2050 of Five Species of Trees Used in the Wood Energy Supply Chain in France. Energies 2018, 11, 3372.) [Emmanuel Garbolino, France]	REJECTED. This paper is too much WGII domain.
74629	72	32	72	32	To check if it isn't published about (... ; Coppola et al., submitted) [Moulay Driss HASNAOUI, Morocco]	noted. The paper has been accepted now
73993	72	34	72	49	According to the risk concept that is used in this chapter, even a single day of extreme heat or single cold spell can be hazardous. Only the trends in number of cold and hot days are evaluated, but what will be that amplitude of temperature variations around the mean in the future? This information is not analysed in this report. [Elena Kozlovskaya, Finland]	REJECTED. The amplitude of temperature variation around the mean is given by the analysis of extreme temperature indices like heat wave and this is all over the place in the section and chapter but those indices are mainly dealt with in CH11 to which the section refers.
8019	72	37	72	37	"hindered" -> "masked" [Bart van den Hurk, Netherlands]	Noted. Yes this is the meaning
8021	72	38	72	38	Counteracting influence? You mean, increasing likelihood of cold spells? [Bart van den Hurk, Netherlands]	Noted. Yes this is the meaning
109799	72	41			Lionello and Scarascia 2020 (doi: 10.1007/s10113-020-01610-z) have used an ensemble of CMIP5 global simulations to estimate future change increase of temperature extremes. With a 2K global warming cold days will be rare both in the North Mediterranean (2.2%) and South Mediterranean (1.6%) and practically disappear with a 4K temperature increase. [Piero Lionello, Italy]	noted. The paper deals with heat extreme that are now all passed to CH11.
74631	72	43	72	43	To check if it isn't published about (Coppola et al., submitted, a ; ...) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted
33803	72	43			To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	noted. Mendeley fixed and the right letter added
8023	72	44	72	44	reference to atlas can be deleted [Bart van den Hurk, Netherlands]	ACCEPTED
74633	72	49	72	49	To check if it isn't published about (Coppola et al., submitted, a ; ...) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
15719	72	52	72	52	I think 'In conclusion' should be replaced by "In summary", and applied throughout wherever this applies. [Samuel Morin, France]	TAKEN INTO ACCOUNT: suggestion considered.
51873	72	55	72	55	increasing gradient' isn't very clear - does this mean a gradient of heat extremes? Upwards or downwards? Better to say increases (or decreases, if applicable) in frequency/magnitude towards the Southern regions. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED. The sentence is about frequency of heat extreme so the gradient toward the south mean that the change in frequency is higher in the south.
15721	72	55	73	3	I think the corresponding RCP should be specified, or it should be made clear that the statement made here is independent on the scenario. This is ambiguous at present, and in general, I find that the text too often remains vague in specifying the corresponding scenario. [Samuel Morin, France]	TAKEN INTO ACCOUNT. Text has been revised and specification add
51875	73	2	73	3	suggested addition: 'of this century under all scenarios and it is likely that unusually cold spells will...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT. Text has been revised and specification add
64037	73	2		3	Conclusion is very generalized, when mentioning the impact on various fields, it should be detailed. Reference it a worse impact is not a conclusion, it should be detailed how worse will it be compared to a concrete value or well defined state in the past or literature. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED. Not clear what is generalized nor what "reference it a worse impact" means.
98167	73	8	73	9	You could add here that " and in some regions these changes were found to be detectable and at least partly attributable to human influence." [Thomas Knutson, United States of America]	REJECTED. Similar sentence is written 3 lines below, so no need to add here too.
126615	73	10	73	10	Clarify that historic observations in precipitation agree with model simulations. Current wording is confusing. [Trigg Talley, United States of America]	ACCEPTED. Text has been rephrased.
74635	73	11	73	11	To check if it isn't published about (Coppolae et al., to be submitted) and verify if the e exist [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted
126617	73	11	73	11	Coppolae spelling? [Trigg Talley, United States of America]	ACCEPTED.
98169	73	13	73	14	This general statement about precipitation trends is not really true in my experience. It would be better to say that "significance in trends can more easily be obtained when considering large subregions." [Thomas Knutson, United States of America]	ACCEPTED. Text has been rephrased.
74637	73	17	73	17	To check if they arn't published about (... ; Vautard et al., submitted) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted
33805	73	19	73	25	Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
100323	73	21	73	21	Please, specify if trends are positive or negative [Claudine Dereczynski, Brazil]	NOTED. assessment has been moved to CH11
80235	73	21	74	3	We miss from this river and pluvial flood section the mention of inland water-related challenges that cause severe problems for agriculture. [Lilian Fejes, Hungary]	noted. we refer to what the literature has.
43575	73	23		25	Read "in most regions of Europe. Trambly and Somot (2018) with a negative gradient toward the Southern part " rather than "in most regions of Europe (Trambly and Somot, 2018) with a negative gradient toward the Southern part " or Read "of the Mediterranean basin. Coppola et al. (submitted, b) confirmed also" rather than "of the Mediterranean basin (Coppola et al., submitted, b) confirmed also" [Cyriaque Rufin Nguimalet, Central African Republic]	NOTED. assessment has been moved to CH11

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
109803	73	23			Lionello and Scarascia 2020 (doi: 10.1007/s10113-020-01610-z) have analysed the future contrasts within the Mediterranean region as function of the global warming and found that the simple daily precipitation Intensity index and the total precipitation during very wet days, which are already larger in the North Mediterranean than in the South Mediterranean, will increase with global warming at a rate of approximately 0.1mm/K and 5mm/K, respectively, in the North Mediterranean, with no significant change in the South Mediterranean. Lionello, P., Scarascia, L. The relation of climate extremes with global warming in the Mediterranean region and its north versus south contrast. Reg Environ Change 20, 31 (2020). https://doi.org/10.1007/s10113-020-01610-z [Piero Lionello, Italy]	NOTED. assessment has been moved to CH11
31655	73	24	73	29	I suggest to revise this statement based on Blöschl et al 2019, who give evidences that there are both increase and decrease of flood hazard depending on the actual watershed and flooding modes Blöschl, G. et al., 2019: Changing climate both increases and decreases European river floods. Nature, 573 (7772), doi:10.1038/s41586-019-1495-6. [Gonéri Le Cozannet, France]	REJECTED. The statement can stay as it is since the results from Blöschl et al 2019 are considered and referenced in the next paragraph and agree on what is written.
74639	73	25	73	25	To check if it isn't published about (Coppola et al., submitted, b) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted
74641	73	26	73	26	To check if it isn't published about (Pichelli et al., submitted) [Moulay Driss HASNAOUI, Morocco]	noted. paper has been accepted.
8651	73	29	73	32	There is a need of homgenising with chapter 11, sect 5 in which no so high confidence in flood changes based on observations is stated. [Sergio Vicente-Serrano, Spain]	TAKEN INTO ACCOUNT: Updated floods text coordinated with Ch 11 to ensure consistency.
96185	73	29	73	34	Does the confidence statement relate to all regions and to the change signals of 10 or 5%? [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT. The high confidence statement refer to the direction of change in central and western Europe, and the medium to eastern and southern. Text has been rephrased.
96187	73	29	73	34	Peak flow changes differ a lot between different regions, subensembles and data processing schemes. Specific figures could be misleading. Please skip or add more studies (https://doi.org/10.1016/j.gloenvcha.2015.09.004 , DOI 10.1007/s00477-016-1296-5, ...). [Nicole Wilke, Germany]	noted. Other studies are add in the line 42-55. The first paper Alfieri et al 2015 is already included and the second one by Osuch et al., 2017 is now cited too.
7373	73	41	73	51	This paragraph provides conflicting or at least unclear information about projected changes in flood frequency across Europe, a topic of high political and practical relevance. Specifically, the last sentence notes "a modest but significant decrease in the 100-years return period frequency of river floods" whereas the previous sentence notes a "significant increase of events with peak discharge above 100-years return period (Q100) in most of Europe". Please review the underlying literature carefully. If different studies indeed come to different results, the underlying methodological differences need to be explained and the results contextualized. [Hans-Martin Füssel, Denmark]	TAKEN INTO ACCOUNT. The paragraph reports the findings of several studies. In the first half of the paragraph are listed all those that show an increase in flood increase with indicated the regions. In the second half the Regions where a decrease is projected with the relevant references. The summary is made at the end of the "wet and dry section" with confidence statement attached. Text has been rephrased.
11865	73	42	73	42	"used" rather than "use" (subject-verb agreement) [Amy East, United States of America]	TAKEN INTO ACCOUNT. Text has been revised.
77657	73	42	73	42	Tidy citations. [Emer Griffin, Ireland]	noted. Mendeley fixed it.
13919	73	42	73	42	change Alfieri et al., (2017) and Alfieri et al., (2015) by Alfieri et al. (2017, 2015) [Maria Amparo Martinez Arroyo, Mexico]	noted. Mendeley fixed it.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
27481	73	42	73	51	Please also checked for a +2C scenario (multi hydro model approach) Roudier, P., Andersson, J.C.M., Donnelly, C. et al. Projections of future floods and hydrological droughts in Europe under a +2°C global warming. Climatic Change 135, 341–355 (2016). https://doi.org/10.1007/s10584-015-1570-4 The results show quite contrasted results between northern and southern Europe. Flood magnitudes are expected to increase significantly south of 60oN, except for some regions (Bulgaria, Poland, south of Spain) where the results are not significant. The sign of these changes are particularly robust in large parts of Romania, Ukraine, Germany, France and North of Spain. North of this line, floods are projected to decrease in most of Finland, NW Russia and North of Sweden, with the exception of southern Sweden and some coastal areas in Norway where floods may increase. The results concerning extreme droughts are less robust, especially for drought duration where the spread of the results among the members is quite high in some areas. Anyway, drought magnitude and duration may increase in Spain, France, Italy, Greece, the Balkans, south of the UK and Ireland. [Eric Brun, France]	ACCEPTED. Study has been revised.
33807	73	42			Check for reference format. Erase commas: "The work of Alfieri et al., (2017) and Alfieri et al., (2015) use...". [Guiomar Rotllant, Spain]	noted. Mendeley fixed it.
8025	73	44	73	45	It is somewhat surprising to find Europe as one of the regions with largest flood risk increases, given the relatively small size rivers, not extreme precipitation climate, and a relatively small trend in floods described by Bloschl (2017). Is there a specific reason or explanation that Europe stands out on flood risk? [Bart van den Hurk, Netherlands]	REJECTED. Europe is one of the region with most literature on actual river flooding. All the studies point on increase of flood in central Europe and decrease in east. The two signal are clearly driven by different process like extreme precipitation increase the first and snow pack melting the second (See Bloschl (2017)). The size of the river basin is not relevant for determining the exposure or not to flood. The "not extreme precipitation" statement is surprising given that the increase of extreme precipitation in central Europe is quite undoubted.
87427	73	46	73	51	The two sentences are contradictory. [Jürg Thudium, Switzerland]	TAKEN INTO ACCOUNT. The paragraph reports the findings of several studies. In the first half of the paragraph are listed all those that show an increase in flood increase with indicated the regions. In the second half the Regions where a decrease is projected with the relevant references. The summary is made at the end of the "wet and dry section" with confidence statement attached. Text has been rephrased.
11867	73	47	73	47	delete the "s": just "100-year return period" [Amy East, United States of America]	ACCEPTED. Editorial
101643	73	48	73	51	The formulation "a modest but significant decrease in the 100-years return period frequency of river floods" is unclear - is it a decrease in the return period (i.e. floods happen more often) or in the frequency (i.e. floods happen less often) or in the severity of a 100-year flood? [Birgit Bednar-Friedl, Austria]	TAKEN INTO ACCOUNT. "frequency" has been removed.
63941	73	48	73	51	In line 29-30 you were stating increased river flood hazard for Central and Western Europe, whereas now you state increasing periods between river flood events for Central European regions. The two statements are contradictory. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. The word "central" has been removed in line 49 because it was a mistake.
33809	73	53			Check for reference format. Erase comma: "Guerreiro et al., (2017),..." [Guiomar Rotllant, Spain]	EDITORIAL- professional copy-editing to be undertaken prior to publication, this kind of issues will be fixed then at the latest.
99283	74	1	74	3	exposure is more than the size of the urban area and rainfall. More context should be given to explain the example or the example removed to avoid this conclusion to be drawn [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT. The terminology was as used in the cited paper that is one of the few found on pluvial flooding. Text has been rephrased.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110179	74	5	74	5	By definition a landslide which requires gravitational potential cannot occur in a flat area. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT. Text has been rephrased.
11869	74	5	74	6	Where – what part of Europe does this refer to? One more what? Individual landslide? This is a strange sentence. It also doesn't make clear how a landslide would happen in a "flat area", since some kind of topography is needed for mass movement to occur. [Amy East, United States of America]	TAKEN INTO ACCOUNT. Text has been rephrased.
126619	74	5	74	6	Increase of landslides where? All over Europe or in a specific region? Also, this sentence is grammatically incorrect. The following sentences focus on Italy in particular and the Carpathians. If authors are only going to talk about this small area then prepare the reader and give the Carpathians / Italy as an example. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT. Text has been rephrased.
101645	74	5	74	13	Clarify differences between RCPs, time slices, and regions. Also provide information on confidence. [Birgit Bednar-Friedl, Austria]	REJECTED. not clear where the comment refers to.
5739	74	5	74	13	Please explain how a landslide can occur in flat, low altitude areas. Alternative: explain why you consider the effect of pluvial floods (soil erosion and lateral transfer in lowlands) here as a landslide. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT. Text has been rephrased.
126621	74	5	74	13	Are there not going to be landslides anywhere else in Europe as a result of climate change? This section reads very poorly after the previous sections. Makes very little reference to enough recent, relevant research. [Trigg Talley, United States of America]	Noted. Literature on Landslide is quite poor, difficult to find more.
13921	74	8	74	8	Change 8.5 by RCP8.5 [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
33811	74	9			Check for reference format. Change: "A decrease of landslide is projected by (Peres and Cancelliere, 2018) in..." by "A decrease of landslide is projected by Peres and Cancelliere (2018) in...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
43577	74	9			Read "projected by Peres and Cancelliere (2018)" rather than "projected by (Peres and Cancelliere, 2018)" [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT. Editorial
13923	74	10	74	10	Change 8.5 by RCP8.5 [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
11871	74	13	74	13	reference is incomplete, needs a year listed [Amy East, United States of America]	noted. Mendeley fixed it.
33813	74	13			Check for reference format. Add year "(Jurcescu et al.)". [Guiomar Rotllant, Spain]	noted. Mendeley fixed it.
17413	74	15	74	15	Additionally, projections show an increase in spring and summer droughts in continental Europe. In contrast, droughts are expected to decrease in winter in Northern Europe. (Spinoni et al., 2018; DOI: 10.1002/joc.5291) [Sabine Egerer, Germany]	TAKEN INTO ACCOUNT. Text has been added.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
8657	74	15	74	15	<p>Need of detailing the metric in which this assessment in the Mediterranean it is based. The comment on precipitation trends it is inconsistent with recent studies that do not show long-term precipitation trends in the region. See Ch. 11 (page 80 1-6). There are also regional long-term studies that do not find long-term trends over the period stated in Italy, Spain, Portugal and the East of the Mediterranean (Brunetti et al., 2006; Camuffo et al., 2013; Esteban-Parra et al., 1998; Reiser and Kutiel, 2011; González-Rouco et al., 2001; Paulo et al., 2016; Prohom et al., 2016) but also precipitation reconstructions show similar signal (Hanel et al., 2018) . There is an increase in the severity of droughts but it is based on the increased trend of the atmospheric evaporative demand (e.g. Vicente-Serrano et al. 2014 Env Res Lett; Stagge et al. 2017 Sci Reports) but not based on changes in precipitation. This comment is also valid for P74-50.</p> <p>Hanel M, Rakovec O, Markonis Y, Máca P, Samaniego L, Kyselý J, Kumar R. 2018. Revisiting the recent European droughts from a long-term perspective. Scientific Reports 8(1). DOI: 10.1038/s41598-018-27464-4.</p> <p>Paulo A, Martins D, Pereira LS. 2016. Influence of Precipitation Changes on the SPI and Related Drought Severity. An Analysis Using Long-Term Data Series. Water Resources Management, 5737–5757.</p> <p>González-Rouco JF, Jiménez JL, Quesada V, Valero F. 2001. Quality control and homogeneity of precipitation data in the southwest of Europe. Journal of Climate 14(5): 964–978. DOI: 10.1175/1520-0442(2001)014<0964:QCAHOP>2.0.CO;2.</p> <p>Reiser H, Kutiel H. 2011. Rainfall uncertainty in the Mediterranean: Time series, uncertainty, and extreme events. Theoretical and Applied Climatology 104(3–4): 357–375.</p> <p>Esteban-Parra MJ, Rodrigo FS, Castro-Diez Y. 1998. Spatial and temporal patterns of precipitation in Spain for the period 1880-1992. International Journal of Climatology 18(14): 1557–1574. Camuffo D, Bertolin C, Diodato N, Cocheo C, Barriendos M, Dominguez-Castro F, Garnier E, Alcoforado MJ, Nunes MF. 2013. Western Mediterranean precipitation over the last 300 years from instrumental observations. Climatic Change 117(1–2): 85–101. DOI: 10.1007/s10584-012-0539-9.</p> <p>Prohom M, Barriendos M, Sanchez-Lorenzo A. 2016. Reconstruction and homogenization of the</p>	TAKEN INTO ACCOUNT: Updated drought text coordinated with Ch 11 to ensure consistency.
87429	74	15	74	18	<p>These statements strongly contradict Section 11.6.2.1 (Observed Precipitation deficits), concerning also the summary. [Jürg Thudium, Switzerland]</p>	TAKEN INTO ACCOUNT: Updated drought text coordinated with Ch 11 to ensure consistency.
82175	74	15	74	26	<p>Affected sectors are missing. Drought impacts have been observed not only in the Mediterranean region. Many projects and publications exists that analyse the impacts of droughts on agriculture and forestry in whole Europe. [Borbála Gálos, Hungary]</p>	NOTED. Section has been revised and align with CH11. The link between drought and sector is assessed in section 12.3 where the sectoral impacts as discussed. That was the chapter wide decision on climate information relevant to drought impacts. Specific impacts and risks of droughts on agriculture and forestry are assessed in WGII.
101647	74	15	74	35	<p>Synthesize results for Southern Europe in a better way (being specific about warming levels, time periods, subregions if results apply to specific regions only) and provide information also for Northern, Eastern and Central Europe. [Birgit Bednar-Friedl, Austria]</p>	REJECTED. The results are reported according to literature where scenarios are used. The availability of literature is biased toward the Mediterranean region and this is reflected in the paragraph.
126623	74	15	74	38	<p>What about soil moisture drought (https://doi.org/10.1038/s41558-018-0138-5)? This section seems very thin on detail compared to earlier sections on temperature/precipitation/streamflow, etc. And it could refer back to those sections. Does not make good reference to enough recent, relevant research. [Trigg Talley, United States of America]</p>	TAKEN INTO ACCOUNT. Section has been revised and coordinated with CH11 that now is comprehensive also for soil moisture drought assessment.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
109801	74	15			concerning droughts, Lionello and Scarascia 2020 (doi: 10.1007/s10113-020-01610-z) have shown that the maximum number of consecutive dry days is already larger in the South than in the north and it will increase more in the former than in the latter (rates are about 8days/K and 5days/K, respectively) . Lionello, P., Scarascia, L. The relation of climate extremes with global warming in the Mediterranean region and its north versus south contrast. Reg Environ Change 20, 31 (2020). https://doi.org/10.1007/s10113-020-01610-z [Piero Lionello, Italy]	TAKEN INTO ACCOUNT. paper has been revised text updated as appropriate
11873	74	16	74	16	“next century” meaning the 22nd century? I thought IPCC projections didn’t go that far ahead. Should this be the 21st? [Amy East, United States of America]	TAKEN INTO ACCOUNT. Text has been revised.
8027	74	16	74	18	This statement would deserve a literature reference (maybe AR5) [Bart van den Hurk, Netherlands]	noted. The correct reference has been add
98171	74	16	74	18	In addition, the Mediterranean region shows some of the strongest evidence anywhere in the world for detectable decreases in precipitation over 1901-2010, and with these trends being at least partly attributable to anthropogenic forcing according to CMIP5 models (Knutson and Zeng (2018). [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT. Text has been revised.
63937	74	20	74	21	Please introduce SPI and SPEI indices or make this information in the glossary available [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOTED. All indices used are defined in Annex VI
27483	74	20	74	26	Please also checked for a +2C scenario (multi hydro model approach) Roudier, P., Andersson, J.C.M., Donnelly, C. et al. Projections of future floods and hydrological droughts in Europe under a +2°C global warming. Climatic Change 135, 341–355 (2016). https://doi.org/10.1007/s10584-015-1570-4 The results show quite contrasted results between northern and southern Europe. Flood magnitudes are expected to increase significantly south of 60oN, except for some regions (Bulgaria, Poland, south of Spain) where the results are not significant. The sign of these changes are particularly robust in large parts of Romania, Ukraine, Germany, France and North of Spain. North of this line, floods are projected to decrease in most of Finland, NW Russia and North of Sweden, with the exception of southern Sweden and some coastal areas in Norway where floods may increase. The results concerning extreme droughts are less robust, especially for drought duration where the spread of the results among the members is quite high in some areas. Anyway, drought magnitude and duration may increase in Spain, France, Italy, Greece, the Balkans, south of the UK and Ireland. [Eric Brun, France]	TAKEN INTO ACCOUNT. paper has been revised text updated as appropriate
8029	74	20	74	26	Text grammar could have some checking [Bart van den Hurk, Netherlands]	TAKEN INTO ACCOUNT. Text has been revised.
87431	74	20	74	26	The presented model results should be relativated based on section 11.6.3.1 (Model evaluation for precipitation deficits). [Jürg Thudium, Switzerland]	NOTED. Section has been revised and references to CH11 highlighted.
11875	74	23	74	23	“year” rather than “years” [Amy East, United States of America]	TAKEN INTO ACCOUNT. Editorial
33815	74	29	74	30	Check for reference format. Change: “(Coppola et al., submitted, a)” by “(Coppola et al., submitted a)”. [Guiomar Rotllant, Spain]	noted. Mendeley fixed it.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45563	74	32	74	35	<p>In the Southern Alps, both winter and summer low flows are projected to be more severe, with a 25 % decrease in the 2050s (Vidal et al., 2016), questioning the management of high-altitude multi-purpose reservoirs (Sauquet et al., 2016).</p> <p>Vidal, J.-P., Hingray, B., Magand, C., Sauquet, E., Ducharne, A. (2016) Hierarchy of climate and hydrological uncertainties in transient low-flow projections. <i>Hydrology and Earth System Sciences</i>, 20, 3651-3672, https://doi.org/10.5194/hess-20-3651-2016</p> <p>Sauquet, E., Arama, Y., Blanc Coutagne, E., Bouscasse, H., Branger, F., Braud, I., Brun, J., Chernel, J., Cipriani, T., Datry, T., Ducharne, A., Hendrickx, F., Hingray, B., Krowicki, F., Le Goff, I., Le Lay, M., Magand, C., Malerbe, F., Mathevet, T., Monteil, C., Perrin, C., Poulhe, P., Rossi, A., Samie, R., Strosser, P., Thirel, G., Tilmant, F., Vidal, J.-P. (2016) Water allocation and uses in the Durance River basin in the 2050s: Towards new management rules for the main reservoirs? <i>Houille Blanche</i>, 2016, 25-31, https://doi.org/10.1051/lhb/2016046 [Jean-Philippe Vidal, France]</p>	TAKEN INTO ACCOUNT. first paper has been revised text updated as appropriate. Second paper is too much WGII material.
80237	74	33	74	35	Does this statement about drought frequency relates to the previous sentence about streamflow drought? If not and it is about general droughts, it contradicts our observations here in Central-Eastern Europe, where drought frequency has been increasing. [Lilian Fejes, Hungary]	TAKEN INTO ACCOUNT. Yes it does. Text has been rephrase now.
33817	74	33	74	41	Unit format, homogenize. Change: "yr." by "yr". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
99285	74	37	73	38	the sentence does not provide policy relevant information, things impact agriculture and why is wheat picked? [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT. Right this was just one example from a paper. Sentence removed now.
63859	74	37	74	37	Is wheat especially impacted? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Right this was just one example from a paper. Sentence removed now.
101649	74	37	74	38	Observed impacts and projected risks are the mandate of WGII. Drought affects not only agriculture, but also the water and energy sector. [Birgit Bednar-Friedl, Austria]	TAKEN INTO ACCOUNT. Right this was just one example from a paper. Sentence removed now.
102693	74	37	74	38	Add a sentence on other areas in Europe, for example: "Also in the rest of Europe compound events of dry and hot summers have increased. Manning et al. (2019) found that the probability of such compound events has increased across much of Europe between 1950–1979 and 1984–2013, notably in southern, eastern and western Europe, which was mainly related to increases in extreme hot temperature, but in southeastern Europe also by increased dryness." [Philippe Tulkens, Belgium]	TAKEN INTO ACCOUNT. Thanks for the suggestion. Given that the paper is about compound events, it has been added in the subsection on compound events page. 79
131477	74	37	74	38	Bind paragraph to previous paragraph. Otherwise elaborate on the statement. [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT. Right this was just one example from a paper. Sentence removed now.
4593	74	37	74	38	Odd sentence. Any other impacts besides agricultural? [Rita Yu, China]	TAKEN INTO ACCOUNT. Right this was just one example from a paper. Sentence removed now.
109903	74	38	74	38	Uzun and Ustaoglu (2019) determined that atmospheric oscillations which are caused extreme events in Turkey impact on olive yield during the 1970-2017. A. Uzun and B. Ustaoglu, "Impacts of El Nino Southern Oscillation (ENSO) and North Atlantic Oscillation (NAO) on the Olive Yield in the Mediterranean Region, Turkey," 2019 8th International Conference on Agro-Geoinformatics (Agro-Geoinformatics), Istanbul, Turkey, 2019, pp. 1-6, doi: 10.1109/Agro-Geoinformatics.2019.8820566. Publisher IEEE. [Beyza Ustaoglu, Turkey]	Noted. Sentence has been removed .

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
109905	74	38	74	38	Another product with high economic value, hazelnut, was affected by frost in 2014 and heavy precipitation in 2018. There was 25% yield loss in production. Looking at the future projections of the hazelnut adaptation process, it is predicted that it will be grown in new areas vertically depending on the increase in temperatures until 2100. B. Ustaoglu and M. Karaca, "The Effects of Climate Change on Spatiotemporal Changes of Hazelnut (<i>Corylus Avellana</i>) Cultivation Areas in the Black Sea Region Turkey", Applied Ecology and Environmental Research (AEER), vol. 12, no. 2, pp. 309-324, 2014. [Beyza Ustaoglu, Turkey]	Noted. Sentence has been removed .
8031	74	40	74	42	This statement needs a literature reference [Bart van den Hurk, Netherlands]	Noted. The reference is at the end of the sentence
126625	74	40	74	45	Is this all there is on wildfire? Very thin on detail. [Trigg Talley, United States of America]	Noted. More papers have been added.
112079	74	40	74	45	There are also additional sources of information for the Mediterranean with both RCM https://doi.org/10.1007/s10584-013-1005-z and statistical downscaling https://doi.org/10.1007/s10584-013-0787-3 methods. Also regarding observed trends https://dx.plos.org/10.1371/journal.pone.0150663 where actual wildfire values might have opposite trends to fire-weather ones and specific attribution methods are needed: https://www.nature.com/articles/s41467-018-06358-z [jose manuel gutierrez, Spain]	TAKEN INTO ACCOUNT. paper has been revised text updated as appropriate
11877	74	42	74	42	delete "in time" (redundant) [Amy East, United States of America]	TAKEN INTO ACCOUNT. Text has been rephrased.
126627	74	43	74	73	Explain what is meant by an increase in fireweather indices. [Trigg Talley, United States of America]	REJECTED. The index is defined and discussed in the referred paper and explanation it is not needed in this context.
15877	74	45	74	45	According to (Garbolino E. and Daniel W., 2019.- Potential Vulnerability of Wood Energy Supply Chain Towards 2050 in the French Mediterranean Area According to the Global Warming and the Evolution of Wildland Fire Hazard. EUBCE 2019, 27th European Biomass Conference and Exhibition, 23-31, ISBN: 978-88-89407-19-6, DOI : 10.5071/27thEUBCE2019-1AO.1.2) France will know a potential increase of areas exposed to wildland fires towards 2050 in its Mediterranean area. This study was performed by modelling the potential extent of ecological niches of 155 species mainly involved in wildfires according to RCP6.0 scenario. [Emmanuel Garbolino, France]	REJECTED. The paper is a conference proceeding and no indication on which climate models data nor scenario is given.
80239	74	47	74	53	Wondering why only the RCP8.5 results are shown here and why some are valid only until mid-century? [Lilian Fejes, Hungary]	Noted. Summary statement has been revised following the whole CH12 strategy on how to present result in term of different scenarios, global warming levels, and time horizons.
126629	74	47	74	53	This summary doesn't mention precipitation or wildfire. Also, the language of the sections on drought and wildfire are not as convincing as precipitation and streamflow, so that makes this summary a little harder to believe. [Trigg Talley, United States of America]	Noted. Only the high confidence statement are usually reported in the summary. For wildfire the summary has been updated. Precipitation is not the main focus of CH12 but it is assessed in the Atlas chapter.
96189	74	47	74	53	The change values given here are only exemplary. There is a vast literature that gives different values (though with the same signs). Suggest to delete the values here because they do obviously not relate to the confidence statements. [Nicole Wilke, Germany]	ACCEPTED. Number have been removed
99287	74	47	74	53	Eastern Europe is not mentioned [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: Eastern Europe is now mentioned in the sentence
98173	74	50	74	51	In addition to high confidence that droughts are increasing in the Mediterranean region, in my opinion there is at least medium confidence that this increase in drought (as measured by precipitation trends) is detectable and at least partly attributable to anthropogenic influence. [Thomas Knutson, United States of America]	Noted. The cross chapter region group took care of the final assessment.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
15723	74	51	74	52	"and there is a consensus among all global and regional scale projections using a range of drought indicators". It is not clear what the consensus refers to. It seems that the end of the sentence is missing. [Samuel Morin, France]	TAKEN INTO ACCOUNT. Text has been rephrased.
13925	74	53	74	53	change RCP 8.5 by RCP8.5 [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
63945	75	1	75	2	please mention the time period of decreasing mean surface wind speeds [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We added "over the past four decades"
99289	75	3	74	21	Given the low confidence in many projections regarding wind for Europe which have predominantly low confidence, assessments about confidence for wind energy, electrical grid management etc which are higher appear premature. [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We checked consistencies, and statements for wind energy now have an equal or lower confidence level
11879	75	3	75	3	clarify the time frame referred to here. Mean surface wind speeds have decreased since when? [Amy East, United States of America]	ACCEPTED: We added "over the past four decades"
8033	75	7	75	7	"has" -> "have" [Bart van den Hurk, Netherlands]	TAKEN INTO ACCOUNT. Editorial
7915	75	7	75	7	The sentence reads "Such trends has induced declining wind power potential across" and should be "Such trends have induced.." [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT. Editorial
5539	75	8	75	9	add the bibliography references, such like Turki et al., 2019, 2020 : Turki I., Massei N., Laignel B., 2019. Linking sea level dynamic and exceptional events to large scale atmospheric circulation variability : A case of the Seine Bay, France. Oceanologia, 203, 1-11, doi.org/10.1016/j.oceano.2019.01.003. [Benoit Laignel, France]	REJECTED. The reference does not fit as this paragraph is related to trends
8035	75	10	75	10	"specific atmospheric patterns": which patterns seem to have changed? [Bart van den Hurk, Netherlands]	NOT APPLICABLE: the sentences on circulation patterns have been removed as they are not dealing with wind speed
7917	75	13	75	15	The paragraph states that wind speed patterns (Li et al., 2018a), it is more likely than not that wind energy potential will decrease in the Iberian Peninsula and increase in the Aegean Sea and in Northern Europe will decrease. I think this statement need some backing argument about the driven factors that produces this consequences. Perhaps, from the scientific papers cited. [Emilia Guisado-Pintado, Spain]	ACCEPTED: the statement has been detailed and corrected with changes in levels of confidence
71217	75	15	75	17	An increase in wind variability does not induce automatically a lack of dispersion affecting air quality. I would move the link to air quality and then health to the previous sentence, which addresses the reduction of wind speed in Iberia [Matteo De Felice, Netherlands]	ACCEPTED: We only mention energy sector potential impacts. The statement on air quality is actually moved below
5541	75	15			The "wind variability may increase in many parts of Europe" sentence is not clear, and needs more explanations. [Benoit Laignel, France]	TAKEN INTO ACCOUNT: this sentence has been clarified, and grouped with the following one
7375	75	23	75	30	This paragraph provides conflicting or at least unclear information about observed changes in extreme wind events in Europe, a topic of high political and practical relevance. Specifically, one sentence notes "Extreme near-surface winds have been decreasing in the past decades" whereas a later sentence notes "Gusts exceeding 40 ms-1 and resulting catastrophic windthrow have likely increased in recent winters". Please review the underlying literature carefully and provide explanations for apparently contradicting findings. [Hans-Martin Füssel, Denmark]	ACCEPTED: the Usbeck 2009 has been removed as it is a local study, and cannot justify a statement at the scale of Europe.
99291	75	29			what kind of lossess? Economic lossess or infrastructure? [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: clarified. These are economic losses in the end.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
96191	75	32	75	33	To what time period in the past does the increase refer to? [Nicole Wilke, Germany]	ACCEPTED: We provide now time horizons and global warming levels
96193	75	35	75	37	Is there any newer reference that indicates similar results? [Nicole Wilke, Germany]	ACCEPTED. We added more references
98175	75	40	75	41	Not that they will have longer duration (stated as a fact) but rather that they are projected to have longer duration. [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT. Text has been rephrased.
8037	75	43	75	45	A reference to HighResMIP and expected future findings on this topic would be appropriate here [Bart van den Hurk, Netherlands]	NOTED. The statement has been removed as it is was based on one case and we could not find literature on short trajectory using HighResMip
4595	75	43	75	45	Odd sentence. Consider rephrase. [Rita Yu, China]	TAKEN INTO ACCOUNT: the text has been removed
86679	75	47	75	49	Quotation: "Expected changes in smaller-scale hazard phenomena such as tornadoes, wind gusts, hail storms and lightning are currently not directly available partly due to the lack of capacity to simulate such phenomena in climate models." Comment : see our comment to page 23 line 24-26. Mis-match here? [Oyvind Christophersen, Norway]	Not applicable - Unfortunately we do not understand what the comment refers to and therefore, we cannot address it. Page 23 line24-26 is about wildfire.
86681	76	2	76	3	Quotation: "Insufficient observational record length for lightning numbers does not allow an assessment of trends." Comment: It seems rather unclear wether or not the lightning frequency will increase as claimed in chapter 5 pg. 26. line 26. Please talk to authors in Chapter 5 to solve inconsistencies. [Oyvind Christophersen, Norway]	REJECTED. Sentence in CH5 pg26. line 26 is a general sentence referring to example in USA, Alaska and Africa.
51877	76	6	76	6	Please briefly explain that the term 'medicanes' means a Mediterranean hurricane. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED. Medicanes is already explained in page 75, line 38
15725	76	12	76	27	I think the paragraph on snow cover trends could benefit from better connecting to section 2.2.2 of Chapter 2 of SROCC and the extensive Supplementary Table with detailed references on past and future snow cover changes in mountain regions, including Europe. In particular, I find it surprising that this section (notably lines 21 to 27) refers to literature based on SRES and CMIP3 (Gobiet et al., 2014; Schmucki et al., 2017; Marty et al., 2017a), although literature based on EUROCORDEX (CMIP5 based / RCPs) is available, and should be referred to instead in an AR6 assessment report. See for example Verfaillie et al. (2018, https://doi.org/10.5194/tc-12-1249-2018), Hanzer et al., 2018 (https://doi.org/10.5194/hess-22-1593-2018). [Samuel Morin, France]	TAKEN INTO ACCOUNT: paper have been revised.
15727	76	12	76	27	On past snow cover trends in the Pyrenees (1958-2017), see Lopez-Moreno et al., 2020 : https://doi.org/10.1002/joc.6571 [Samuel Morin, France]	TAKEN INTO ACCOUNT: paper have been revised.
15729	76	12	76	27	On future snow cover trends in the Pyrenees, see Spandre et al., 2019 : https://doi.org/10.5194/tc-13-1325-2019 [Samuel Morin, France]	TAKEN INTO ACCOUNT: paper have been revised.
15731	76	12	76	27	While the section introducing the CIDs for snow cover mentioned application to winter tourism, it is surprising to see no mention of CIDs indicators for ski tourism, and their corresponding trends. The Steiger et al. (2019) is an excellent entry point here, more recent references relevant to this application include Spandre et al. (2019a) for the French Alps (https://doi.org/10.1038/s41598-019-44068-8) and Spandre et al. (2019b) for French Alps and Pyrenees (https://doi.org/10.5194/tc-13-1325-2019). See also Scott et al. (2019) CIDs indicators for ski tourism in Norway (doi:10.1080/13683500.2019.1608919) and Steiger and Scott for Austria (https://doi.org/10.1016/j.tourman.2019.104032). [Samuel Morin, France]	TAKEN INTO ACCOUNT: paper have been revised.
83735	76	12			Much focus in this section is on the European Alps, much less on Scandinavia, nothing on Pyrenees and Caucasus. This should be balanced more. [Andreas Käab, Norway]	Noted. Text revised

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51879	76	14	76	27	Glacial melt observations seem to be missing from this section - currently just snow depth observations and projections of glacial melt are covered. It would be helpful to add this too. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: the assessment is now based on Ch9
2867	76	14	76	37	You cannot not refer to the recent review paper by Beniston et al. (2018) regarding past, current and future changes in the European cryosphere and the related impacts. [Beniston, M., D. Farinotti, M. Stoffel, L.M. Andreassen, E. Coppola, N. Eckert, A. Fantini, F. Giacona, C. Hauck, M. Huss, H. Huwald, M. Lehning, J.I. Lopez Moreno, J. Magnusson, C. Marty, E. Moran Tejada, S. Morin, M. Naaim, A. Provenzale, A. Rabatel, D. Six, J. Stoetter, U. Strasser, S. Terzago, C. Vincent. 2018. The European mountain cryosphere: A review of past, current and future issues. The Cryosphere, 12, 759-794. doi: 10.5194/tc-12-759-2018] [Antoine RABATEL, France]	NOTED: The paper is referred already but Mendeley put the 2014 year instead of 2018
33819	76	19			Add a space between number and unit: "1500-2000m". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
33821	76	19			Change: "...slopes (Glueer et al., 2019); (Patton et al., 2019). » by « ... slopes (Glueer et al., 2019; Patton et al., 2019). ». [Guiomar Rotllant, Spain]	Noted. it is right but it is a Mendeley problem
67157	76	29	76	29	this is more than likely, and confidence higher than medium [Regine Hock, United States of America]	TAKEN INTO ACCOUNT: The Cryo CID assessment has been improved throughout CH 12 by CAs from Ch9
45649	76	29	76	37	(Thibert et al.; Marzeion and Nesje, 2012; Radić et al., 2014; Huss and Hock, 2015) are all pre-SROCC literature. Both SROCC and section 9.5.1 give a comprehensive assessment of the observed and projected changes for the European glaciers. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: The Cryo CID assessment has been improved throughout CH 12 by CAs from Ch9
63947	76	31	76	31	Why medium confidence? In line 35 you mention high confidence. In my opinion, both sentences need "high confidence" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The Cryo CID assessment has been improved throughout CH 12 by CAs from Ch9
67159	76	32	76	33	old references: the latest projections based on 11 glacier models and >250 simulations is by Marzeion et al., 2020 Earth Future. Also any projection numbers should be accompanied by which scenarios were used [Regine Hock, United States of America]	TAKEN INTO ACCOUNT. paper has been revised text updated as appropriate
88111	76	33	76	33	Please add the most recent findings from Zekollari et al 2019 doi: 10.5194/tc-13-1125-2019 and cross check with Ch9 respectively. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT. paper has been revised text updated as appropriate
16033	76	33	76	33	Thibert et al. The year of this publication is missing: It could be: Thibert, E., Dkengne Sielenou, P., Vionnet, V., Eckert, N. and Vincent, C. (2018). Causes of glacier melt extremes in the Alps since 1949. Geophysical Research Letters, 45. https://doi.org/10.1002/2017GL076333 [Christian Vincent, France]	Noted. it is right but it is a Mendeley problem, fixed now
15733	76	36	76	37	I think the statement "This will affect ecosystems, water resources (Beniston and Stoffel, 2014; Coppola et al., 2014b, 2018; Schaeffli et al., 2019) and winter tourism (Damm et al., 2017)" is out of place in a paragraph about glacier changes, and does not bring any added value to the reader of this assessment report. [Samuel Morin, France]	TAKEN INTO ACCOUNT. Text has been removed.
24151	76	37	76	37	Model calculations show that numerous new lakes are likely to form during the coming decades in deglaciating areas (Haeberli et al. 2016; Magnin et al., 2020). Such new lakes cause new flood risks but also offer possibilities for hydropower, water supply and tourism (Haeberli et al. 2016). References:(1) Haeberli, W., Buetler, M., Huggel, C., Lehmann Friedli, Th., Schaub, Y. and Schleiss, A.J., 2016. New lakes in deglaciating high-mountain regions – opportunities and risks. Climatic Change, V ol. 139, No. 2, pp. 201-214. A available at: http://doi.org/10.1007/s10584-016-1771-5 . (2) Magnin, F., Haeberli, W., Linsbauer, A., Deline, P., Raveland, L., 2020. Estimating glacier-bed overdeepenings as possible sites of future lakes in the de-glaciating Mont Blanc massif (Western European Alps). Geomorphology 350, 106913. doi.org/10.1016/j.geomorph.2019.106913 [Wilfried Haeberli, Switzerland]	NOT APPLICABLE. Text has been removed.

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99293	76	37			refer to the relevant section of WGII chapter 13 [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED. Text has been removed.
83733	76	39			Permafrost in Scandinavia and associated studies seem a bit underrepresented in this section. There is also a lot of low-land permafrost in Scandinavia with processes different from mountain/slope processes. [Andreas Käab, Norway]	TAKEN INTO ACCOUNT: Text has been revised.
11881	76	40	76	40	need a comma after Iceland [Amy East, United States of America]	TAKEN INTO ACCOUNT. Editorial
11883	76	41	76	41	the Noetzli et al. 2018 reference is incomplete in the reference list. [Amy East, United States of America]	Taken Into Account - Mendeley problem has been fixed now.
88379	76	41	76	42	You could report on the longer term permafrost warming in this region - see chapter 2. Also Noetzli et al. (2019) and Romanovsky et al (2019) could be cited - most recently published State of Climate report. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT. the two papers are already referred in line 41-42 but the wrong year was appearing. Mendeley problem.
13927	76	44	76	44	Change (Glueer et al., 2019); (Patton et al., 2019). by (Glueer et al., 2019; Patton et al., 2019). [Maria Amparo Martinez Arroyo, Mexico]	noted. Mendeley fixed it.
43579	76	44			Read" (Glueer et al., 2019; Patton et al., 2019)" rather than "(Glueer et al., 2019); (Patton et al., 2019)" [Cyriaque Rufin Nguimalet, Central African Republic]	noted. Mendeley fixed it.
45651	76	45	76	45	Please move this sentence to the snow and land ice section. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: text has been revised.
24153	76	45	76	45	This statement does not belong to permafrost but to glaciers (cf. the comment with respect to line37 [Wilfried Haerberli, Switzerland]	TAKEN INTO ACCOUNT: text has been revised.
11885	76	47	76	54	Also worth citing Lane, S. N., Bakker, M., Gabbud, C., Micheletti, N., & Saugy, J.-N. (2017). Sediment export, transient landscape response and catchment-scale connectivity following rapid climate warming and Alpine glacier recession. <i>Geomorphology</i> , 277, 210–227. http://dx.doi.org/10.1016/j.geomorph.2016.02.015 [Amy East, United States of America]	Noted. the paper is very technical and closer to WGII material
45653	76	53	76	54	This sentence is incomplete. [Lucas Ruiz, Argentina]	Not applicable - Unfortunately we do not understand what the comment refers to and therefore, we cannot address it. Sentence is completed.
99295	76	53			quantitative data for what? [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	Noted. quantitative means numbers or percentage.
73995	77	1	77	12	This is one example that shows that projections of climate change for hazard evaluation at regional scale still need much improvement. [Elena Kozlovskaya, Finland]	REJECTED. This comment is only valid for this particular hazard in this region
23773	77	6	11	11	rain-on-snow impacts are an issue for high latitude as they lead to icings with sever impacts, see IPCC cryosphere special report and e.g. http://dx.doi.org/10.1098/rsbl.2016.0466 and https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1890/09-1927.1 [Annett Bartsch, Austria]	REJECTED. The two suggested papers are not really about present trends nor about projections.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
52535	77	12	77	12	I see nothing in figure 12.7 that indicates low confidence in increasing extremes in the British Isles. There is also the Met Office study UKCP18 which indicates SL rise in the UK 4.2 For London, sea level rise by the end of the century (when compared to 1981-2000), for the low emission scenario is very likely to be in the range 0.29 m to 0.70 m. For a high emission scenario, the range is very likely to be 0.53 m to 1.15 m. 4.3 For Edinburgh, sea level rise by the end of the century (when compared to 1981-2000), for the low emission scenario is very likely to be in the range 0.08 m to 0.49 m. For a high emission scenario this range is very likely to be 0.30 m to 0.90 m https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf [Joanne Williams, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED. not clear why a sea level rise comment is here.
45655	77	13	77	15	Why not include the Permafrost in the final summary. For an assessment of our knowledge of the mountain permafrost of Europa please see section 9.5.2. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: text has been revised.
15735	77	13	77	15	As indicated in another comment, I think "In conclusion" should be replaced by "In summary", and I think the statement requires careful editing to add further information about lead times (mid-century vs. end of century) and scenarios, otherwise the information is too vague and too "obvious" to be of any added value to the readers and policy-makers, compared to what is available in previous assessment reports (in particular SROCC, regarding snow cover, glaciers and permafrost). [Samuel Morin, France]	TAKEN INTO ACCOUNT: text has been revised.
126631	77	13	77	15	Why doesn't the summary include permafrost and storms? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: text has been revised.
11887	77	15	77	15	why is this reported to be only medium confidence? The evidence just presented in this section (along with other literature not cited here) suggests substantial reduction of glacial ice could be anticipated with high confidence... [Amy East, United States of America]	TAKEN INTO ACCOUNT: text has been revised.
63949	77	15	77	15	Please change "medium confidence" to "high confidence". "High confidence" for mountain glacier losses is mentioned in the text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: text has been revised.
33823	77	20	77	24	Change unit format from "mm/yr" to "mm yr ⁻¹ ". [Guiomar Rotllant, Spain]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
8039	77	23	77	24	Baart et al (2019) did not find accelerated SLR along the Dutch coast in this period (Zeespiegelmonitor 2018; present in grey literature repository of IPCC AR6) [Bart van den Hurk, Netherlands]	NOTED: All SLR text in CH 12 is provided by CH 9 authors and is fully consistent with the Ch 9 assessment

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31627	77	26	77	33	It would be good to have a reminder that high end relative sea-level changes might take place and have impacts in Europe and probably other regions. Suggested references for high end scenarios in Europe: Thieblemont et al 2019; for high end sea level scenarios in general, Le Bars et al, Stammer et al, Jackson and Jevrejeva, Kopp et al. 2017, and references therein. Le Bars, Dewi, Sybren Drijfhout, and Hylke de Vries. "A high-end sea level rise probabilistic projection including rapid Antarctic ice sheet mass loss." Environmental Research Letters 12, no. 4 (2017): 044013. Thieblemont, R., Le Cozannet, G., Toimil, A., Meyssignac, B. and Losada, I.J., 2019. Likely and High-End Impacts of Regional Sea-Level Rise on the Shoreline Change of European Sandy Coasts Under a High Greenhouse Gas Emissions Scenario. Water, 11(12), p.2607 Stammer, D., Van de Wal, R. S. W., Nicholls, R. J., Church, J. A., Le Cozannet, G., Lowe, J. A., ... & Hinkel, J. (2019). Framework for high-end estimates of sea level rise for stakeholder applications. Earth's Future, 7(8), 923-938 Jackson, L.P. and Jevrejeva, S., 2016. A probabilistic approach to 21st century regional sea-level projections using RCP and High-end scenarios. Global and Planetary Change, 146, pp.179-189 Kopp, R.E., DeConto, R.M., Bader, D.A., Hay, C.C., Horton, R.M., Kulp, S., Oppenheimer, M., Pollard, D. and Strauss, B.H., 2017. Evolving understanding of Antarctic ice-sheet physics and ambiguity in probabilistic sea-level projections. Earth's Future, 5(12), pp.1217-1233 [Gonéri Le Cozannet, France]	Noted. High end SLR scenarios with deep uncertainty are handled in Ch 9 in dedicated Box 9.4 in a globally aggregated sense, and therefore not covered in Ch 12 which has a regional focus.
7377	77	31	77	33	Please check and clarify whether this statement refers to the whole Baltic Sea or only to its northernmost region. [Hans-Martin Füssel, Denmark]	Noted. It refers to the whole Baltic.
33827	77	32	77	33	"The model agreement is higher for the Mediterranean and in line with the previous findings by Gualdi et al., (2013)." How is higher? In previous sentences is indicated that LSR will be higher in the <northern Europe. [Guiomar Rotllant, Spain]	REJECTED. "Higher" is referred to model agreement, so nothing to do with LSR.
33829	77	32	77	33	Check for reference format. Change: "The model agreement is higher for the Mediterranean and in line with the previous findings by Gualdi et al., (2013)." By "The model agreement is higher for the Mediterranean and in line with the previous findings by Gualdi et al. (2013)." [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
33825	77	32			Add a space at the end of the sentence: "...Black Sea.The Baltic Sea...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
7379	77	35	77	37	Please check and clarify whether this statement refers to the whole Baltic Sea or only to its northernmost region. Furthermore, please check and clarify whether this statement refers to both the Atlantic and the Mediterranean coasts of the Iberian Peninsula or only parts of it. [Hans-Martin Füssel, Denmark]	TAKEN INTO ACCOUNT: it refers to the whole Baltic Sea, the Atlantic coast without any differentiation.
110955	77	35			For the Mediterranean coastline a distinction needs to be made. The storm surge maxima are projected to slightly, but significantly decrease (few percents, depending on time range and scenarios) as shown an ensemble of regionalsimulations by Conte D, Lionello P (2013) Characteristics of large positive and negative surges in the Mediterranean Sea and their attenuation in future climate scenarios. Glob Planet Change 111:159-173. doi:10.1016/j.gloplacha.2013.09.006 . However, higher probability of flooding is projected along a fraction of the Mediterranean coastline whose length increases with sea level rise (Lionello P, Conte D, Marzo L, Scarascia L (2017) The contrasting effect of increasing mean sea level and decreasing storminess on the maximum water level during storms along the coast of the Mediterranean Sea in the mid 21st century. Glob Planet Change http://dxdoiorg/10.1016/j.gloplacha.2016.06.012). In other words, sea level rise will be the dominant factor and result in a substantial increase of sea level extremes in spite of a milder storm regime [Piero Lionello, Italy]	REJECTED. Both papers are based on the old A1B scenario and the second most recent paper is already mentioned at the end of the section.
33831	77	37	77	38	Check for reference format. Change: "...Vousdoukas et al., (2018) and Paprotny, (2016),..." by "...Vousdoukas et al. (2018) and Paprotny (2016),...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
96195	77	40	77	43	Unclear whether numbers refer to increase of percentile or percentile of increase. [Nicole Wilke, Germany]	Noted. It refers to the increase of percentiles.
74643	77	47	77	47	return periods less than 1:1 years same comment before. [Moulay Driss HASNAOUI, Morocco]	Noted: This refers to the event that would occur once per year
11889	77	50	77	50	delete comma after Vitousek [Amy East, United States of America]	TAKEN INTO ACCOUNT. Editorial
33833	77	50			Check for reference format. Change: « ... Vitousek, et al., (2017)... » by « ... Vitousek, et al., (2017)... ». [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
63861	77	54	77	54	State something is "quite uncertain" without using uncertainty language [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Text has been rephrased.
13929	78	1	78	1	Change (Luijendijk et al., 2018b) by Luijendijk et al. (2018b) [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
7919	78	1	78	1	The braquets in the reference at the beginning of the sentence should be removed "Coastal erosion: (Luijendijk et al., 2018b) show a continent..." [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT. Editorial
33835	78	1	78	2	Unit format, homogenise. Change: "m/yr" by "m yr-1". [Guiomar Rotllant, Spain]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
43581	78	1			Read "Luijendijk et al. (2018b) show a continent " rather than "(Luijendijk et al., 2018b) show a continent " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT. Editorial
109457	78	4	79	6	The sentence should better describe the full range of changes and not only the maximum value. [Sophie Szopa, France]	REJECTED. page and lines are wrong. the comment cannot be understood
109453	78	5	79	5	Does the term 'likely' refer to statistical evaluation? If not the level of confidence should be expressed with quantity of evidence and their level of agreement. [Sophie Szopa, France]	REJECTED. page and lines are wrong. the comment cannot be understood
7921	78	6	78	6	I suggest replace region by continent as this section is dedicated to Europe as a whole "Projections indicate that sandy coasts throughout the region" [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT. Editorial
5543	78	6			Why only the sandy coasts ? There are also erosion and flooding in the rocky coasts with cliffs [Benoit Laignel, France]	Noted. The text is literature based.
126633	78	7	78	7	"completely" not "completed" [Trigg Talley, United States of America]	Not applicable - Unfortunately we do not understand the comment and therefore, we cannot address it.
33837	78	7	78	8	78 [Guiomar Rotllant, Spain]	Not applicable - Unfortunately we do not understand the comment and therefore, we cannot address it.
43583	78	7		8	Read "resented by Vousdoukas et al. (in press) " rather than "resented by (Vousdoukas et al., in press) " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT. Editorial

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63951	78	10	78	11	NEU is mentioned twice once with 67m recession and once with 39m recession [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Editorial
99297	78	10			remove the first NEU or rephrase [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT. Editorial
109461	78	12	79	12	Colette et al. 2016 missing from the reference list [Sophie Szopa, France]	Not applicable - Unfortunately we do not understand what the comment refers to and therefore, we cannot address it. Page and line are wrong
33839	78	15			Erase comma before reference: "...the Netherlands, (Li et al., 2014)...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
33841	78	15			Add space between numbers and units: "(about 51m, 44m and 40m with SLRs of 1.05m, 0.4m and 0)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
33843	78	16			Unit format, homogenise. Change: "m/y" by "m yr ⁻¹ ". [Guiomar Rotllant, Spain]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
13931	78	21	78	21	Delete the citation (Oliver et al., 2018a) because it is repeated in the next line. [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
109463	78	21	78	21	The reference to Horton is not suited here. Horton et al. show the increasing number of stagnation events but their work don't assess how it affects aerosols. The importance of stagnation events for AQ is just mentioned in their introduction based on Fiore et al. 2012. [Sophie Szopa, France]	NOT APPLICABLE: Text on air pollution has now been significantly shortened and moved to 12.4 introduction
109455	78	21	79	22	Shouldn't the impact of precipitations on aerosol be mentioned here? [Sophie Szopa, France]	NOT APPLICABLE: Text on air pollution has now been significantly shortened and moved to 12.4 introduction
109465	78	22	78	22	The analysis from Vautard et al. is based on the attribution of one single past event, it does not inform about how climate change will impact aerosols in the future. If the aim of this paragraph is to disentangle the ways by which climate change will affect PM concentrations in the future, the work from cholakian et al. is more suited. [Sophie Szopa, France]	NOT APPLICABLE: Text on air pollution has now been significantly shortened and moved to 12.4 introduction
109459	78	23	79	25	In Cholakian et al. 2019, the climate induced decrease of nitrates does not lead to a systematic PM decrease (in annual mean). In addition it can't be the explanation for the decrease of PM in Lacressoniere since nitrate aerosols were not taken into account in their study. [Sophie Szopa, France]	NOT APPLICABLE: Text on air pollution has now been significantly shortened and moved to 12.4 introduction
13933	78	32	78	32	Indicate see the Atlas because it is not understood [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
63953	78	32	78	32	Atlas is an insufficient reference. Please be more specific. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED. Assessment of mean is in the Atlas mandate, so it is sufficient. Moreover Oliver is also referred to.
13935	78	33	78	33	Change (Darmaraki et al., 2019) by Darmaraki et al. (2019) [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT. Editorial
33845	78	33			Check for reference format. Change: "(Darmaraki et al., 2019) project..." by "Darmaraki et al. (2019) project...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
43585	78	34			Read "Darmaraki et al. (2019) project" rather than "(Darmaraki et al., 2019) project [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT. Editorial
425	78	40	78	44	Please refer to my comment on "lake Acidification". The study by Lauvset 2015 is based on model results and no direct observations, and do not consider coastal ocean. There are no references in the SOD text to "lake acidification" so far. Here a direct quote from Lauvset et al 2015: "Here, we only evaluate trends in the open ocean." -> page 3 from the pdf article version. I'd suggest rewriting this. Please note that this comment aims at strengthening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification is omitted from the CIDs considered in CH 12, with corresponding updates for wording referring to this paper.
126635	78	40	78	49	Is there nothing on lake acidity? [Trigg Talley, United States of America]	NOTED: Lake acidification has been omitted from the CIDs considered in CH 12.
99299	78	41	78	42	why the atlantic coast of Europe and the med but not the rest? There is clear evidence that the North Sea pH is changing due to reduction in Posphate loading, and information on the Black Sea is missing despite the size of the water body [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: Lake acidification has been omitted from the CIDs considered in CH 12.
77661	79	3	79	25	Use degree C rather than K for consistency [Emer Griffin, Ireland]	TAKEN INTO ACCOUNT. Editorial
4597	79	8	79	12	Very long sentence, hard to read. [Rita Yu, China]	TAKEN INTO ACCOUNT. Sentence has been rewritten
109439	79	14	79	19	The effect of climate change on natural emissions is not specific to Europe and the papers cited do not provide the quantification of such effects on european air pollution. This paragraph would thus be more relevant in the section 12.3.7.1 describing how the climate change can affect the CID. Otherwise, these effects are already discussed in chapter 6 in the section dealing with air pollution (6.4) [Sophie Szopa, France]	Noted. text has been removed.
8659	79	25	79	29	See assessment in Ch. 11 on the possible role of CO2 on drought severity, the effects are much more complex and not soo evident as suggested by the statement. See also Vicente-Serrano et al. 2020 Wires Climate Change. and Brodrubb et al., Science 368, 261–266 (2020) [Sergio Vicente-Serrano, Spain]	Noted. Section deleted.
33847	79	25			Erase space between reference and dot: "... (see Chapter 6 for a more complete overview) ." [Guomar Rotllant, Spain]	TAKEN INTO ACCOUNT. Editorial
7381	79	27	79	28	Unclear wording or logic. How can "plant physiological response to CO2 [...] confirm the increase of drought stress in Southern Europe"? [Hans-Martin Füssel, Denmark]	Noted. Section deleted.
26451	79	27	79	30	Check the sentence here, it does not make sense [Mare Sundström, Sweden]	Noted. Section deleted.
77663	79	27	79	30	Confused interpretation of plant physiology. [Emer Griffin, Ireland]	Noted. Section deleted.
126637	79	27	79	30	This section has no value in its current form and with current content. Plant physiological responses will confirm the increase of drought stress in southern Europe? That makes no sense. This section is sorely lacking in detail. Apparently southern Europe will suffer and yields of something (who knows what) in Germany will increase by mid-century. Needs a complete rewrite. Does not make good use of enough recent, relevant research. [Trigg Talley, United States of America]	Noted. Section deleted.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
99301	79	27	79	30	the interaction between crops, temperature, and CO2 is complex and different for different crops. Please remove the paragraph as it is not fundamental here and the brevity results in loss of nuance, there is complex new literature which is not represented here [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Section deleted.
4599	79	27	79	30	Does this section make sense? [Rita Yu, China]	Noted. Section deleted.
27485	79	34	79	36	We feel that it is important to make the difference between uncertainties and errors. Most current Euro-CORDEX RCMs do not take into account the time variations of anthropogenic aerosol forcing and therefore cannot capture the strong impact of changes in anthropogenic aerosols on solar radiation (Gutierrez et al., 2020). Boé et al. (2020) show that in the few RCMs with time-varying aerosols, changes in solar radiation are very similar to changes in the GCMs. The "real" uncertainties in the evolution of surface radiation are therefore limited. Gutiérrez C., Somot S., Nabat P., Mallet M., Corre L., van Meijgaard E., Perpiñán O., Gaertner M.A. (2020) Future evolution of surface solar radiation and photovoltaic potential in Europe: investigating the role of aerosols. ERL (accepted in dec 2019) Boé, J., Somot, S., Corre, L. and Nabat, P. Large discrepancies in summer climate change over Europe as projected by global and regional climate models: causes and consequences. Clim Dyn 54, 2981–3002 (2020). [Eric Brun, France]	TAKEN INTO ACCOUNT. Sentence has been rewritten
91125	79	35	79	35	"GCMs projecting an increase in solar radiation": add "over Europe" [Martin Wild, Switzerland]	REJECTED. It is the European section, no need to specify it.
33849	79	36			To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	noted. Mendeley fixed it.
79161	79	39	79	39	I dont think the Undorf et al reference is relevant here. [Sabine Undorf, Sweden]	REJECTED. Reference checked and it is not clear why the author doesn't want her paper referenced here.
99303	79	41	79	47	the concept of compound events would need a much more extensive coverage. It would be better to move this paragraph up to the flood discussion and not introduce it here. Alternatively the section could draw on the discussion on compound events in chapter 13 WGII [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	Noted. We cannot refer to WGII given that it will be published after the release of WGI report
101651	79	41	79	53	Compound, concurrent and cascading events are an important topic for observed impacts and projected risks in WGII. It would be good to provide here more information on specific events like combined heat and drought, combined flooding and landslides, etc. [Birgit Bednar-Friedl, Austria]	TAKEN INTO ACCOUNT. Text has been revised
26453	79	41	79	53	The language needs some editing here [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT. Text has been revised
126639	79	41	79	53	This section would be improved if it opened with a list of compound events typical in Europe. Perhaps give the reader a little recap on what a compound event is so they don't have to go back to the introduction of this chapter. Then give a rundown of the type of compound events that have most frequently happened in the past and are most likely to worsen in the future. This section lacks detail and seems written in a hurry. It does not make good use of enough recent, relevant research. [Trigg Talley, United States of America]	Noted. All 12.4 section are structured in the same way, so due to space limitation we cannot redefine every time what a compound event is.
5741	79	49	79	51	Please add whether the change will be in the positive or negative direction. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT. Text has been rephrased.
87433	79	49	79	53	RCP8.5? Low confidence? [Jürg Thudium, Switzerland]	TAKEN INTO ACCOUNT. Text has been rephrased.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126641	79	50	79	51	"Spain and Bulgaria will stay longer in the hot and dry state, that could be, for example, bad for local agriculture ..." This is a very weak example. Hot and dry might have no effect if the agricultural system is well-adapted to hot and dry. Needs more explanation. [Trigg Talley, United States of America]	Noted. Text revised
99305	79	51	79	51	what does the "that could be bad for agriculture" mean. This is a significant section of the Europe chapter and the phrasing and handling here is vastly superficial. Similarly what is the basis that hot and dry is only an problem for specific parts of ~germany and the Czech Republic. This view does not agree with the assessment in WGII Chapter 13 [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Text revised
99307	80	1	80	10	please change wildfire to condition for wildfire as this is a highly managed process, [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED. We made a conscious decision to talk about wildfire weather and not wildfires
439	80	7	80	7	I would suggest to remove lake acidity/acidification from table 12.7 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: Lake acidification has been omitted from the CIDs considered in CH 12.
63939	80	7	80	11	The table shows high confidence in increasing mean precipitation in Eastern Europe. The text discusses only differences in mean precipitation between northern and southern Europe and does not provide any information about Eastern Europe. Please include this information in the text or remove the information from the table. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	noted. Text has been aligned with Table
96197	80	7	80	11	Table 12.7: Western Europe is missing (but mentioned in the main text), please add. [Nicole Wilke, Germany]	REJECTED. The table only reports the official AR6 region.
63943	80	7	80	11	The table shows medium confidence in decrease for Northern Europe River floods. The Text does not discuss northern Europe river floods. Please include this information in the text or remove the information from the table. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED. The text in section "Wet and DRY" reports about northern Europe. The text is based on literature and the table try to summarize the text by using the official Ar6 regions.
88383	80	7			Table 12.7 - Central Europe - permafrost is altitude dependent so maybe a note is required? [Sharon Smith, Canada]	Not applicable - Unfortunately we do not understand the comment and therefore, we cannot address it.
11891	80	10	80	11	Table 12.7: for the Alps and other steep alpine regions in Europe, landslide risk seems demonstrably higher the warmer it gets due to loss of ice and rock permafrost, leading to thermal rock stress and exposing rock and sediment formerly covered by ice to rain events now. It seems as though this landslide risk for at least those parts of Europe can be expected with medium to high confidence to increase. The text already in this section (and other references not cited in the IPCC report) would support a footnote in Table 12.7 specifying that for the Alps landslide risk is likely to increase. [Amy East, United States of America]	noted. It has been considered.
35087	80	16			The information assessed in the North American section focuses almost exclusively on CIDs defined using annual averages or during the extreme seasons (e.g. extreme heat in summer and cold spells in winter). But climate change during transition seasons can have profound impacts, e.g. snowmelt runoff in Spring and extended fire season in western mountains in Fall. Is it possible to devote more attention in this section to assessment of seasonally-varying confidence or magnitude of CIDs? Footnote 7 in Table 12.8 is an example of the sort of information that might be useful. Perhaps extending this seasonally-discriminating assessment to the Mean Temperature and Mean Precipitation columns, with appropriate support in the text? [David Gutzler, United States of America]	ACCEPTED: We are limited in space but have further emphasized seasonal aspects of CID changes. In particular this relates to changes in seasonality (e.g., dates of first/last frost, seasonal ice, snowmelt, fire season) and we also point to Atlas for more seasonal aspects of mean change.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
18383	80	16			I am surprised to see that in section 12.4.6 there is no mention of the many studies from NCAR Roy Rasmussen's group who produced the first downscaled climate change data for most of North America on a 4-km grid, which has been used in a large number of climate change impact studies. The following papers describe these simulations: Liu C, Ikeda K, Rasmussen RM, Barlage, M, Newman AJ, Prein AF, Chen F, Chen L, Clark M, Dai A, Dudhia J, Eidhammer T, Gochis D, Gutmann E, Kurkute S, Li Y, Thompson G, and Yates D, 2017: Continental-scale convection-permitting modeling of the current and future climate of North America. <i>Climate Dyn.</i> , 49: 71-95. doi:10.1007/s00382-016-3327-9. Rasmussen, R., K. Ikeda, C. Liu, D. Gochis, M. Clark, A. Dai, E. Gutmann, J. Dudhia, F. Chen, M. Barlage, and D. Yates, 2014: Impacts of climate change on the water balance of the Colorado headwaters: High resolution regional climate model simulations. <i>J. Hydrometeorol.</i> , 15, 1091–1116. doi: 10.1175/JHM-D-13-0118.1. [Aiguo Dai, United States of America]	TAKEN INTO ACCOUNT: These studies are both assessed as part of the Atlas assessment. We also reference Prein et al. (2017) from the same group in our discussions of heavy precipitation and severe storms.
100325	80	18	80	18	According to Figure Atlas.2, there are 5 regions in North Almerica: NEC, CNA, ENA, NWN and WNA. So, NCA should be in Central and South America. I think it would be better to use Atlas regions here. [Claudine Dereczynski, Brazil]	TAKEN INTO ACCOUNT: Chapter 12 is designed to link with WGII, which includes a North America section that includes Mexico, the United States, and Canada. CH12 therefore includes the NCA region. CH11 includes also includes NCA in its tables of extreme changes in North America. The Atlas separates Central America from South America, and its Central America section includes southern Central America, NCA, and the Caribbean (which is assessed under the CH12 small islands section). This makes sense from the Atlas' regional model domains, but from a policy or decision perspective CH12 and WGII utilize the North America continental boundaries. Differences in regional perspectives across WGI and WGII are also discussed within CH1.L2495
88385	80	18	80	26	How are Polar regions defined - north of 60N? It is also a bit unclear whether the Arctic/polar portions of this region are to be covered in this section - they seem to get mentioned later in the section. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We now refer the reader to Chapter 1 where regions are defined.
110183	80	20	80	21	The causality implied here is surely incorrect and the sentence should be rephrased accordingly. [Peter Thorne, Ireland]	ACCEPTED: We have replaced "leading to" with "transitioning to" in order to avoid confusion about dryness in southern portion of the continent driving wetness in the northern portion of the continent
126643	80	20	80	21	Inaccurate statement: "North America is characterized by drier conditions in Mexico and the Western United States leading to wetter conditions in Canada and Alaska." How do drier conditions in Mexico and the Western United States *lead* to wetter conditions in Canada and Alaska? [Trigg Talley, United States of America]	ACCEPTED: We have replaced "leading to" with "transitioning to" in order to avoid confusion about dryness in southern portion of the continent driving wetness in the northern portion of the continent
64217	80	20	80	21	The cause and effect relationship between drier conditions in Maexico ans Westers US and wetter conditions in Canada and Alaska might be lost on some readers without more info/clarification. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have replaced "leading to" with "transitioning to" in order to avoid confusion about dryness in southern portion of the continent driving wetness in the northern portion of the continent
112333	80	21			leading to wetter conditions in Canada and Alaska; what part of Canada is this relevant for??? ALL? Would help to have some nuance relative to regions within the countries [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have replaced "leading to" with "transitioning to" in order to avoid confusion about dryness in southern portion of the continent driving wetness in the northern portion of the continent
112335	80	22			Western portionss of what? [Linda Mortsch, Canada]	ACCEPTED: Text updated to indicate "western portions of the continent".
112337	80	24			while the east coast and Mexico are frequently in the paths of tropical cyclones. I think the east coast refers to the US?? Nuance. How relevant is this statement for Atlantic Canada; region gets the remnants which are important [Linda Mortsch, Canada]	ACCEPTED: This text is meant to highlight the most visible hazards, so we have updated to note US East Coast even as some hurricanes, tropical, storms, and their remnants can affect Atlantic Canada.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64219	80	29	80	29	It will be good to explain here the term 'wet-bulb globe temperature' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Wet bulb globe temperature is introduced in Section 12.1, presented in a global figure in 12.4.0, and described in the technical annex. It is therefore well established in Chapter 12 prior to its usage here.
64221	81	13	81	26	Figure 12.3 does not include a Caribbean satellite box for SWE. Please include or explain in the caption why this box was omitted. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added a note in the caption to indicate that there was an insufficient number of snow events in the Caribbean within climate models to include here.
64223	81	13	81	26	Would be useful for some readers if the term 'snow water equivalent' would be explained here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Snow water equivalent is defined in the IPCC glossary. The relevance of SWE as a climatic impact driver metric is also introduced in 12.3.4.
107889	81	20	81	21	Is this correct? Drier conditions in the west and Mexico 'lead' to wetter conditions in Canada and Alaska???. [Linda Mearns, United States of America]	ACCEPTED: We have replaced "leading to" with "transitioning to" in order to avoid confusion about dryness in southern portion of the continent driving wetness in the northern portion of the continent
110185	81	33	81	35	This makes little sense as written. If the early data were questionable then the trends may not be robust. Decadal variability is not a reason to cast doubt on the long-term record of change in the manner done here presently. Comment equally applies to p.82 ln2-3 [Peter Thorne, Ireland]	NOT APPLICABLE: Chapter 12 now relies on the Atlas for assessment of historical trends in mean temperature.
64225	81	33	81	53	The cause and effect relationship is not really clear here. The authors say that decadal-scale warming trends are more robust than century-scale ones, which is generally accepted, but what does that have to do with the Dust Bowl? Please explain in more detail or rephrase. The sentence also doesn't really fit into the context here. The sentence would fit better on page 82 after line 3. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Chapter 12 now relies on the Atlas for assessment of historical trends in mean temperature. The Atlas utilizes standard time periods for temperature trends, with an emphasis on changes in the 1960-2015 or 1980-2015 periods that both fall after the Dust Bowl period (1930s).
14973	81	33	82	41	This section is quite unbalanced when compared with the same section for previous regions. I suggest to shorten the text. [Juan Rivera, Argentina]	TAKEN INTO ACCOUNT: Text shortened and some material transferred to Atlas.
112339	81	33		35	sentence confusing; message unclear [Linda Mortsch, Canada]	NOT APPLICABLE: Chapter 12 now relies on the Atlas for assessment of historical trends in mean temperature.
107891	81	35	81	40	Some of these statements are contradictory, need to be checked against Atlas statements, and reworked. [Linda Mearns, United States of America]	ACCEPTED: Chapter 12 now relies on the Atlas for assessment of historical trends in mean temperatures
33851	81	37			Unit format, homogenise. Change: "0.5°C/decade" by "0.5°C decade ⁻¹ ". [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
35085	81	39	81	39	Figure Atlas.45 refers to Antarctica. I think this reference should be to Figure Atlas.42 [David Gutzler, United States of America]	TAKEN INTO ACCOUNT: We have updated cross-chapter figure references to ensure that we point at the correct figure.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
98177	81	40	81	40	Cite here this relevant conclusion from the US NCA4: "According to the U.S. Fourth National Assessment (Knutson et al. 2017), detectable anthropogenic warming has occurred (1901-2015) over the western and northern United States based on observations and CMIP5 models (medium confidence), while there was no detectable trends over the southeastern United States over the same period. Temperature extremes show evidence for detectable influence of external forcings (natural and anthropogenic forcings) for large subregions of North America (medium confidence)." Reference: Knutson, T., J.P. Kossin, C. Mears, J. Perlwitz, and M.F. Wehner, 2017: Detection and attribution of climate change. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 114-132, doi: 10.7930/J01834ND. [Thomas Knutson, United States of America]	NOT APPLICABLE: Chapter 12 now relies on the Atlas for assessments of observed and projected changes in mean temperatures. The Atlas does cite the NCA4 report.
13937	81	42	81	42	Indicate if Atlas.5.7 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: We now indicate that this is Section Atlas.9.4 (updated location)
105791	81	44	81	45	there is an extraneous bracket in front of Hill [Trevor Murdock, Canada]	ACCEPTED: typo corrected
13939	81	44	81	45	Change (Hill, Hawkins, & Jin, (2014) by Hill, Hawkins, and Jin, (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
64227	81	44	81	45	Cited in the wong format. Should be "Hill et al. (2014)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: typo corrected
43587	81	44		45	Read "Hill et al. (2014) " rather than "(Hill, Hawkins, & Jin, (2014) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33853	81	45			Check for reference format. Change: "(Hill, Hawkins, & Jin, (2014)...." By "Hill et al. (2014)....". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
63871	81	50	81	52	It is not explicitly clear from this sentence that there is potential for substantial damage to ecosystems and agriculture as a result of false springs as is conveyed by Allstadt et al., 2015. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This reference was dropped due to space limitations. It is important to note that It is not the role of WGI to indicate the level of damage to sectors, but rather to highlight climate information indicating changes in CID indices that are connected to sectoral impacts in Section 12.3. WGII and similar analysis will extend these climatic changes into hazards and related impacts and risk.
74645	81	54	81	54	To check if it isn't published about (... ; Coppola et al., submitted, b ; ...) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: This reference has been updated to reflect publication.
33855	81	54			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
63873	82	3	82	5	The structure of this sentence implies that the maximum occurrence acts on the minimum occurrence (the subject hot records double – or create twice as many of – the object cold records). This implies that there are twice as many minimum occurrences (cold records) as maximum occurrences (hot records) whereas it appears the intent of the sentence is to state that the opposite is true. A clearer structure would be along the lines of: "there are twice as many hot records as cold records" instead of hot records "doubling" cold records. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Assessment of hot and cold extremes is now conducted within Chapter 11. Chapter 12 instead focuses on related CID indices.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126645	82	3	82	7	Suggest revision to: "From 2000-2009, the ratio of maximum daily temperature hot records to minimum daily temperature cold records was 2 to 1, and this ratio is projected to increase in future decades (Wuebbles et al., 2014; Meehl et al., 2016), even as factors like an expansion of agricultural lands and, especially, irrigation have limited or reversed the upward trend in hot day extremes in the central and eastern United States (Mueller et al., 2017; Thiery et al., 2017)." [Trigg Talley, United States of America]	NOT APPLICABLE: Assessment of hot and cold extremes is now conducted within Chapter 11. Chapter 12 instead focuses on related CID indices.
112341	82	3		5	sentence confusing [Linda Mortsch, Canada]	NOT APPLICABLE: This sentence is no longer included in CH12, as assessment of hot and cold extremes is now conducted within Chapter 11. Chapter 12 instead focuses on related CID indices such as the NOAA Heat Index.
93791	82	5	82	7	Thiery et al. (2017) only describe the effect of irrigation, while Mueller et al. (2017) do not find a strong trend associated to cropland expansion, but rather to cropland intensification (including via irrigation). Both papers find this influence for central North America (and northern north America for Mueller et al., 2017), but not for Eastern North America. Mueller et al. (2015) would be a more appropriate reference for the North American case, while Thiery et al. (2020) have brought more evidence that irrigation have contributed to the reversion of trends in hot extremes in these regions. Please adjust these sentences accordingly in the draft. Moreover, these findings are valid for more regions than just north America, such as East Asia and southern South America (for crop intensification based on Mueller et al., 2017) as well as the Indo-Gangetic plains, the Mediterranean region and the Nile and Tigris-Euphrates basins (for irrigation, based on Thiery et al., 2017 and Thiery et al., 2020). Mueller et al. (2015). Cooling of US Midwest summer temperature extremes from cropland intensification, Nature Climate Change Thiery et al. (2020). Warming of hot extremes alleviated by expanding irrigation, Nature Communications [Quentin Lejeune, Germany]	ACCEPTED: We have revised this sentence to indicate that cropland irrigation and intensification are the primary factors rather than cropland expansion, and now refer to Thiery et al. (2020) and Mueller et al. (2017).
126647	82	8	82	9	Unclear language: "When factoring in the humidity component of heat stress, Central North America does show wider increasing trends even as maximum temperatures are limited (Grotjahn and Huynh, 2018)." Wider trends than what? How are maximum temperatures limited? Do authors mean that the rate of increase in maximum temperatures is less than the rate of increase in minimum temperatures? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This sentence has been clarified to indicate increasing trends in heat stress even as maximum temperatures are limited. The primary comparison is between trends in maximum temperature and trends in heat stress indicators that include both maximum temperature and humidity (the latter are increasing even as the former are not). "Wider" was meant to refer to a more widespread signal (geographically), which was an unnecessary descriptor that we have now removed.
112343	82	8		9	what does wider increasing trends mean? [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Wider was meant to refer to a more widespread signal (geographically), which was an unnecessary descriptor that we have now removed as part of adding clarity to this sentence.
105793	82	9	82	9	the bracket in front of Schauberger should only be in front of the year of publication since it starts a sentence [Trevor Murdock, Canada]	ACCEPTED: typo corrected
64229	82	9	82	9	Cited in the wong format. Should be "Schauberger et al. (2017)" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: typo corrected
33857	82	9	82	10	Check for reference format. Change: "(Schauberger et al., 2017)..." by "Schauberger et al. (2017)..." [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
13941	82	9	82	10	Change (Schauberger et al., 2017) by Schauburger et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43589	82	9		10	Read "Schauberger et al. (2017) tracked increases " rather than "(Schauberger et al., 2017) tracked increases " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
7665	82	12	82	13	The following paper should be cited here: Burke, M., & Emerick, K. (2016). Adaptation to Climate Change: Evidence from US Agriculture. American Economic Journal: Economic Policy, 8 (3), 106-140. [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: This Burke et al. (2016) study examines GDD with a base of 29C as a metric of extreme heat for agricultural productivity. This study is largely focused on adaptation and has very limited direct analysis of historical or projected changes in this quantity. This paper is likely highly relevant for WGII discussions of adaptation.
105795	82	16	82	16	the bracket in front of Vincent should only be in front of the year of publication since it starts a sentence [Trevor Murdock, Canada]	ACCEPTED: typo corrected
13943	82	16	82	16	Change (Vincent et al., 2018c) by Vincent et al. (2018c) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33859	82	16			Check for reference format. Change: "(Vincent et al., 2018c)... » by «Vincent et al. (2018c)... »." [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43591	82	16			Read "Vincent et al. (2018c) identified significant" rather than "(Vincent et al., 2018c) identified significant" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
105799	82	19	82	30	this seems like another (see comment #3) or perhaps better place to point out that the reliance on recent historical data for design will exacerbate extreme heat issues within buildings not designed for it... some examples of grey literature reports by stakeholders seeking to change this practice include https://planning.ubc.ca/sites/default/files/2020-05/REPORT_UBC_Climate_Resilient_Multifamily_Buildings.pdf and [Trevor Murdock, Canada]	REJECTED: Section 12.3.1.2 notes that extreme heat can raise peak cooling demand, which can apply to building design (in addition to power generation). Working Group 2 is a better location for assessment of strategies for building design, adaptation, and overall resilience planning. Section 12.4 does not assess the actual impacts or implications of the climatic impact driver changes; instead focusing on highlighting relevant changes so that impacts and risk experts can utilize this information in their planning and decision-making activities.
105797	82	21	82	21	the bracket in front of Coppola should only be in front of the year of publication since it starts a sentence... there are several more instances of this throughout this section (stopped tracking them at this point) [Trevor Murdock, Canada]	ACCEPTED: typo corrected
74647	82	21	82	21	To check if it isn't published about (Coppola et al., submitted, b) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: This reference has been updated to reflect publication.
7663	82	21	82	21	For '(Coppola et al., submitted, b)', the author's name should not be put in the parentheses. There are many occasions this is the case. [Miao Ruiqing, United States of America]	ACCEPTED: typo corrected
13945	82	21	82	22	Change (Coppola et al., submitted, b) found similar patterns in CMIP5 and CORDEX-Core). by Coppola et al. (submitted, b) found similar patterns in CMIP5 and CORDEX-Core. [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43593	82	21		22	Read "Coppola et al. (submitted, b) found similar patterns in CMIP5 and CORDEX-Core" rather than "(Coppola et al., submitted, b) found similar patterns in CMIP5 and CORDEX-Core)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33861	82	21			Check for reference format. Change: "(Coppola et al., submitted, b)" by "Coppola et al. (submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
13947	82	22	82	22	Change (Maxwell et al., 2018) by Maxwell et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43595	82	22			Read "Maxwell et al. (2018) found" rather than "(Maxwell et al., 2018) found" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13949	82	23	82	23	Change (Oleson et al., 2018) by Oleson et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33863	82	23			Check for reference format. Change: "(Maxwell et al., 2018)" by "Maxwell et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33865	82	23			Check for reference format. Change: "(Oleson et al., 2018)" by "Oleson et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43597	82	23			Read "Oleson et al. (2018)" rather than "(Oleson et al., 2018)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13951	82	25	82	25	Change (Anderson et al., 2018) by Anderson et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33867	82	25			Check for reference format. Change: « (Anderson et al., 2018)" by "Anderson et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43599	82	25			Read "Anderson et al. (2018) projected" rather than "(Anderson et al., 2018) projected" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13953	82	26	82	26	Change (Schwingshackl et al., submitted) by Schwingshackl et al. (submitted) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33869	82	26			Check for reference format. Change: « (Schwingshackl et al., submitted)" by "Schwingshackl et al. (submitted)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43601	82	26			Read "Schwingshackl et al. (submitted) found that" rather than "(Schwingshackl et al., submitted) found that" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
64231	82	29	82	30	What about heat stress on aquaculture? America had a lot of problems with mussel die-offs in the last couple of years. Also, other sectors potentially affected by extreme heat, such as recreation and tourism, are not mentioned in this section. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is the place to indicate connections between climatic impact drivers (such as extreme heat) and the various affected sectors. Assessment of past and future changes on a regional basis (within 12.4.6.1, for example) may therefore be cross-checked against these CID-sector connections to identify specific challenges for the impacts and risk communities. Although there is not sufficient space to list a large number of example studies, Section 12.3.1.2 (and the accompanying CID/Sectoral Asset table) does note that extreme heat can affect recreation and tourism, and notes a connection between extreme heat and coastal and intertidal ecosystems.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112345	82	32		41	any information for Mexico? Canada? [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: This section now notes that changes in heat-humidity indices indicates that many areas in Canada that currently do not experience high WBGT conditions will see them in the future. We have also included Mexico in our description of where WBGT>31C will be a pervasive challenge (more than 25 days/year). Studies for observed changes in heat extremes include focus areas in Mexico and Canada and the United States.
13955	82	34	82	35	A parenthesis remains to be closed in the sentence (see also (Wuebbles et al., 2014; Zhao et al., 2015a; Schwingshackl et al., Submitted). [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43603	82	34		35	Read "(see also Wuebbles et al., 2014; Zhao et al., 2015a; Schwingshackl et al., submitted)" rather than "(see also (Wuebbles et al., 2014; Zhao et al., 2015a; Schwingshackl et al., submitted)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13957	82	35	82	35	Change (Key et al., 2014) by Key et al. (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33871	82	35			Check for reference format. Change: « (Key et al., 2014)" by "Key et al. (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43605	82	35			Read "Key et al. (2014) applied the" rather than "(Key et al., 2014) applied the" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13959	82	37	82	37	Change (Dahl et al., 2019) by Dahl et al. (2019) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33873	82	37			Check for reference format. Change: « (Dahl et al., 2019)" by "Dahl et al. (2019)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43607	82	37			Read "Dahl et al. (2019) used Heat Index" rather than "(Dahl et al., 2019) used Heat Index" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
13961	82	40	82	40	Change (Steinberg et al., 2018) by Steinberg et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33875	82	40			Check for reference format. Change: « (Steinberg et al., 2018)" by "Steinberg et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43609	82	40			Read "Steinberg et al. (2018) also projected more" rather than "(Steinberg et al., 2018) also projected more" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64233	82	43	83	4	This section only mentions the effect of cold spells on agriculture. Impacts on infrastructure, tourism, human health, aquaculture etc are neglected. Some sections seem to talk about more assets than others. What is the reason for this inconsistency? The structure of the report would improve if the authors would use the order of topics given in Table 12.2 for structuring their individual sections. At the moment the reason behind talking about agriculture and tourism in some sections but not in others is not clear. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is designed to connect the climatic impact drivers to various sectoral assets so that the assessment of observed and projected changes in CID within Section 12.4 can be cast into their sectoral connections and further evaluated by Working Group II-type assessment. Section 12.3 does mention effects on human health and infrastructure in addition to agriculture. Including all combinations of CID/Sectoral assets for each regional section in 12.4 is not practical given space constraints, and examples were selected based on published literature and clear CID indices within each category. For some CIDs there is a stronger emphasis on one sector (e.g., coastal flooding for infrastructure, aridity for water resources) that generally reflects the literature.
112347	82	46		47	might be useful to explain that these results are for Canada [Linda Mortsch, Canada]	ACCEPTED: Text now explicitly notes that Mekis et al. identified extreme wind chill changes at Canadian stations
11893	82	49	82	49	fix spelling of "change" [Amy East, United States of America]	ACCEPTED: typo corrected
126649	82	49	82	49	Revise to "climate change" [Trigg Talley, United States of America]	ACCEPTED: typo corrected
126651	82	50	82	50	Add: "... high confidence). However, the Arctic Amplification effect on disrupting the midlatitude circulations seems to induce a cooling trend in eastern North America since the mid-1990s (Cohen et al. 2019)."" Citation: Cohen, J., X. Zhang, ...and coauthors, 2019: Divergent consensus on Arctic amplification influence on mid-latitude severe winter weather. Nature Climate Change, 10, 20-29. https://www.nature.com/articles/s41558-019-0662-y [Trigg Talley, United States of America]	ACCEPTED: We have added this study to our short description of changing cold air outbreaks.
33877	82	52	82	53	Check for reference format. Change: « (Wuebbles et al., 2014) " by "Wuebbles et al. (2014) ". [Guimar Rotllant, Spain]	ACCEPTED: typo corrected
13963	82	52	82	53	Change (Wuebbles et al., 2014) by Wuebbles et al. (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43611	82	52		53	Read "Wuebbles et al. (2014) projections" rather than "(Wuebbles et al., 2014) projections" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
112349	82	52		55	sentence confusing and mixing indicators/metrics [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Sentence restructured to add clarity and ensure that focus is on minimum temperature. Minimum wintertime temperatures are a factor in assessments of pavement cracking and cold hardness zones.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
104597	83	1	83	4	A novel important result based on cold outbreaks and the use of CMIP6 models would be cited after '... Barcikowska et al., 2019) (medium agreement).' as: 'For example, Zhou et al. (2020) found anthropogenic warming might increased the atmospheric variability and then increased the probability of severe cold outbreaks by using the Novermber data from 1900 to 2019 in eastern US from in-situ observations and ten CMIP6 models. This effect of human-induced dynamic process changes could help understand the increased probability of cold extremes under global warming in some regions. Reference: Zhou, C., A. Dai, J. Wang, and D. Chen, 2020: Quantifying human-induced dynamic and thermodynamic contributions to severe cold outbreaks like November 2019 in the eastern United States. Bull. Am. Meteorol. Soc., under review. [Chunlüe Zhou, United States of America]	TAKEN INTO ACCOUNT: We have added the Zhou et al. (2021) study to our discussion of cold air outbreaks related to variability.
126653	83	4	83	4	Add: ""... Barcikowska et al., 2019; Wang et al., 2015; Voelker et al., 2019)."" Citations: Wang, S.-Y., W.-R. Huang, and J.-H. Yoon, 2015: The North American winter 'dipole' and extremes activity: A CMIP5 assessment. Atmospheric Science Letters, doi: 10.1002/asl2.565. Voelker, S. L., S.-Y. Wang, T. E. Dawson, J. S. Roden, C. J. Still , F. J. Longstaffe, and A. Ayalon, 2019: Tree-ring isotopes adjacent to Lake Superior reveal cold winter anomalies for the Great Lakes region of North America. Scientific Reports, 9, 4412. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added the Cohen et al. (2019) study that assesses a divergent consensus on Arctic Amplification and its effect on winter cold air outbreaks.
64235	83	6	83	14	What is the significance of these 3 examples? Why were these three examples chosen in particular to represent the impacts on frost in the US? And why are other assets such as aquaculture, tourism, human health etc not mentioned? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is designed to connect the climatic impact drivers to various sectoral assets so that the assessment of observed and projected changes in CID within Section 12.4 can be cast into their sectoral connections and further evaluated by Working Group II-type assessment. Including all combinations of CID/Sectoral assets for each regional section in 12.4 is not practical given space constraints, and examples provided here demonstrate that frost changes are a focus of impacts study for livelihoods, agro-forestry, and infrastructure. For some CIDs there is a stronger emphasis on one sector (e.g., coastal flooding for infrastructure, aridity for water resources) that generally reflects the literature.
126655	83	14	83	14	Add "and maple syrup production (Rapp et al. 2019 Forest Ecosystem and Management, https://doi.org/10.1016/j.foreco.2019.05.045). Also consider mentioning that lack of cold spells/frost increases forest pests, ticks, and endangers burrowing mammals. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We considered the Rapp et al. (2019) study on maple syrup production connections to cold spells and looked for further connections between cold spells and pests, ticks, and burrowing mammals for section 12.3 (where Climatic impact drivers are connected to sectors). 12.3 already included information on pests and ticks, and the frost section included a mention of burrowing animals. Space was limited for additional detail such as the maple syrup connection.
98179	83	24	83	27	The text should be more specific here on where the significant wetting trends are occurring, as "northern portions of the continent" is too vague. I suggest: "There is medium evidence of observe significant (detectable) increasing precipitation trends over the central, north-central, and northeastern U.S., and south-central and southeastern Canada, as recent studies account for substantial natural variability, model uncertainty, a lack of early period data, and compare observed trends with model historical runs (Easterling et al. 2017; Knutson and Zeng 2018, etc...." [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: We have added more specificity to the regional analysis of historical precipitation trends, even as the main precipitation trend assessment occurs in Atlas.9
64237	83	26	83	26	Is the lack of early period data not associated with model uncertainties? If not, please clarify? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: The main precipitation trend assessment is conducted by Atlas.9.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
13965	83	30	83	30	Change (Knutson and Zeng, 2018) by Knutson and Zeng (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33879	83	30			Check for reference format. Change: « (Knutson and Zeng, 2018) » by «Knutson and Zeng (2018)». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43613	83	30			Read " Knutson and Zeng (2018) suggest that " rather than " (Knutson and Zeng, 2018) suggest that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
126657	83	32	83	33	"The Pacific Northwest is also projected to become wetter" seems redundant from the first sentence in the paragraph. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The AR6 region "Northwest North America" (as defined by the Atlas) does not include the Pacific Northwest, which is included in the "Western North America" AR6 region. We have clarified this sentence to indicate that it is noting a North/South divergence in precipitation trends, with the northern portions of the Western North America region getting wetter and the southern portions show low agreement in total precipitation trend.
105801	83	34	83	34	it should be specified that the low significant annual trend is in the direction of decreasing precipitation [Trevor Murdock, Canada]	ACCEPTED: We now note that changes are uncertain over much of Mexico and the Southwestern United States even as decreasing precipitation is apparent in a majority of models. In this case we felt it was important to recognize the direction of the majority of models even as the confidence in the projected direction of change was low, particularly given correspondence of drying conditions with other indices of drought, aridity, and fire weather
107893	83	34	83	36	What regional models and this is not the correct figure number in the Atlas. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We corrected the figure numbers for the final governmental draft. Discussion of the specific regional models used is beyond the scope of Chapter 12, as we refer the reader to the Atlas for analysis of the regional model signal and related model uncertainties.
105803	83	36	83	36	Figure referred to appears to be Figure 44 not 47 [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: We corrected the figure numbers for the final governmental draft.
105805	83	36	83	36	the word annual should be deleted in front of mean precipitation trend because the sentence refers to seasonal trends which by definition are not annual [Trevor Murdock, Canada]	ACCEPTED: "Annual" removed
98181	83	36	83	38	Please clarify whether this statement is intended to refer to observed historical trends or model future projections. [Thomas Knutson, United States of America]	ACCEPTED: We specify that these are projected.
112351	83	37		38	unclear: with wetter conditions extending as far south as the central Great Plains in the Spring and Winter ... but extending from where; starting point? [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Revised to read "with wetter conditions extending from the northern portions of the continent as far south as ..."

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	
64239	83	40	83	52	This sections does not mention any impact of this CID on any asset/sector given in Table 12.2. This is inconsistent with other paragraphs. Especially housing and infrastructure might be a problem if floods increase in magnitude and frequency. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is designed to connect the climatic impact drivers to various sectoral assets so that the assessment of observed and projected changes in CID within Section 12.4 can be cast into their sectoral connections and further evaluated by Working Group II-type assessment. Including all combinations of CID/Sectoral assets for each regional section in 12.4 is not practical given space constraints. We have reduced the direct sectoral connections in previous sections given overall space constraints for the Final Government Draft, relying more consistently on 12.3 to make these connections.	
112353	83	40		52	any information for Mexico? [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We did not find sufficient literature to make a confident assessment in river flood changes for Mexico. We now indicate this in the main text rather than simply in the table.	
83739	83	40			Include also something specific on river ice floods? Here, or under 'lake, river and sea ice'? Quite relevant for North America! See for instance: Rokaya, P., Budhathoki, S., and Lindenschmidt, K. E.: Trends in the timing and magnitude of ice-jam floods in Canada, <i>Sci. Rep.-UK</i> , 8, 5834, https://doi.org/10.1038/s41598-018-24057-z , 2018a. Rokaya, P., Budhathoki, S., and Lindenschmidt, K. E.: Ice-jam flood research: a scoping review, <i>Nat. Hazards</i> , 94, 1439–1457, https://doi.org/10.1007/s11069-018-3455-0 , 2018b. [Andreas Käåb, Norway]		TAKEN INTO ACCOUNT: We discuss ice jam floods and cite Rokaya et al., 2018a within the river floods sub-section and the river, lake and sea ice sub-section below.
126659	83	41	83	43	Add Hodgkins et al. (2019) for the most recent national flood trends study of the U.S. This study supports the statement about little spatial coherence in flood trends, if spatial coherence nationwide is meant by these statements. There is some regional coherence in the US for both increases and decreases. Citation: Hodgkins, G.A., Dudley, R.W., Archfield, S.A., and Renard, B., 2019, Effects of climate, regulation, and urbanization on historical flood trends in the United States: <i>Journal of Hydrology</i> , v. 573, p. 697-709, https://doi.org/10.1016/j.jhydrol.2019.03.102 . [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We now cite Hodgkins et al. (2019) as part of our assessment of North American floods.	
126663	83	43	83	45	Add Dudley et al. (2017) for the first national U.S. study analyzing trends in earlier snowmelt-related runoff. It supports the statement about high confidence in shifts in the timing of peak streamflow toward higher winter and earlier spring flows in snowmelt-driven basins in Canada (Bonsal et al., 2019) and the United States (Wehner et al., 2017). Citation: Dudley, R.W., Hodgkins, G.A., McHale, M.R., Kolian, M.J., and Renard, B., 2017, Trends in snowmelt-related streamflow timing in the conterminous United States: <i>Journal of Hydrology</i> , v. 547, p. 208-221, http://dx.doi.org/10.1016/j.jhydrol.2017.01.051 . [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We now cite Dudley et al. (2017) as part of our assessment changes in the seasonal timing of North American floods.	
126661	83	43			Adding the following references: Neri, A., G. Villarini, L.J. Slater, and F. Napolitano, On the statistical attribution of the frequency of flood events across the U.S. Midwest, <i>Advances in Water Resources</i> , 127, 225-236, 2019. Villarini, G., and L.J. Slater, Examination of changes in annual maximum gage height in the continental United States using quantile regression, <i>Journal of Hydrologic Engineering</i> , 23(3), 1-5, 2018. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We include the Neri et al. (2019) study as part of our assessment of North American floods. We had previously cited Slater and Villarini (2016), but have replaced that reference with the more updated Villarini and Slater (2019).	
107895	83	46	83	46	Statement that mean precip increases over much of the US doesn't quite align with what is said in the Atlas. Check this. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have removed this floating description of mean precipitation change and ensure coherence with updated Atlas projections.	

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126665	83	46			The following references should be relevant for the projected changes in flooding: Neri, A., G. Villarini, and F. Napolitano, Statistically-based projected changes in the frequency of flood events across the U.S. Midwest, <i>Journal of Hydrology</i> , 2020 (in press). Villarini, G., and W. Zhang, Projected changes in flooding: A U.S. perspective, submitted to <i>Annals of the New York Academy of Sciences</i> , 2020. [Trigg Talley, United States of America]	ACCEPTED: We now cite both of these studies as part of our assessment of North American floods. [Neri et al. (2020) is included in the Corrigenda when Spring and winter increases in floods are noted within 12.4.6.2]
13967	83	47	83	47	Change (Wobus et al., 2017a) by Wobus et al. (2017a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
33881	83	47			Check for reference format. Change: « (Wobus et al., 2017a) » by «Wobus et al. (2017a)». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33885	83	48	83	51	Unit format, homogenise. Change: "...frequency of current 100-yr flow events in many portions of the United States for RCP8.5 2050 with additional contributions from earlier snowmelt. (Wuebbles et al., 2014) projected that the 95th percentile (1-in-20yr) annual precipitation total will increase by 15-30% across most of the United States by RCP8.5 end-of-century, resulting in 3-4x more frequent occurrences of the current 20-yr flood over..." by: "...frequency of current 100 yr flow events in many portions of the United States for RCP8.5 2050 with additional contributions from earlier snowmelt. Wuebbles et al. (2014) projected that the 95th percentile (1-in-20 yr) annual precipitation total will increase by 15-30 % across most of the United States by RCP8.5 end-of-century, resulting in 3-4x more frequent occurrences of the current 20 yr flood over...". [Guiomar Rotllant, Spain]	ACCEPTED: Units formats updated
13969	83	49	83	49	Change (Wuebbles et al., 2014) by Wuebbles et al. (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
107897	83	49	83	52	Need to be careful mixing different sources (i.e., different CMIP sets). What was Wuebbles et al. analyzing, global models? Be more specific [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have updated the Wuebbles reference to indicate that it uses CMIP5 global models under RCP8.5 2081-2100.
33883	83	49			Check for reference format. Change: « (Wuebbles et al., 2014) » by "Wuebbles et al. (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43615	83	49			Read " Wuebbles et al. (2014) projected that " rather than " (Wuebbles et al., 2014) projected that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
77665	83	52	83	53	Correct the citation. [Emer Griffin, Ireland]	ACCEPTED: typo corrected
126667	83	54	84	3	Add a statement that increases in heavy precipitation will not necessarily increase flooding to the same degree, because of antecedent catchment conditions and other factors. There is most likely to be a 1:1 relation between increases in heavy precipitation and increases in flooding for small urban catchments. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We note the dependence on catchment size in our discussion of river floods (12.3.2.2). The importance of scale for extreme precipitation events is also discussed within Chapter 11. In 12.4.6.2 we note the dependence of flooding characteristics on localized Intensity-Duration-Frequency (IDF) information.
33887	84	2			Homogenise percentile format. Change: "...above the 80th percentile becoming more common, with largest increases in 99th percentile precipitation in..." by "...above the 80th percentile becoming more common, with largest increases in 99th percentile precipitation in...". [Guiomar Rotllant, Spain]	ACCEPTED: Percentiles now have same format (superscript "th")
33889	84	3	84	4	Check for reference format. Change: "...although (Hoerling et al., 2016) noted..." by "...although Hoerling et al. (2016) noted...". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126669	84	3	84	5	Move (Hoerling et al., 2016) to after "... Southern US"" and add Wang et al. (2014). Citation: Wang, S.-Y., K. Hakala, R. R. Gillies, and W. J. Capehart, 2014: The Pacific Quasi-Decadal Oscillation (QDO) - An important precursor towards anticipating major flood events in the Missouri River Basin? Geophysical Research Letters, 41, 991-997. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We examined this paper and found that it has a dynamical/predictability focus but is not strongly related to observed or projected trends in North American floods.
43617	84	3		4	Read "although Hoerling et al. (2016) noted that internal variability" rather than "although (Hoerling et al., 2016) noted that internal variability" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
64241	84	6	84	7	This statement contradicts the mean temperature, heat, and precipitation paragraph in which the authors state that Mexico is a dry place and will become dryer and dryer. A clarifying statement is needed. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Many regions have different directions of change for related CIDs, including mean precipitation and heavy precipitation events. Several regions (including Mexico) have increases in heavy precipitation even as mean precipitation trend is level or declining -- this is owing to different atmospheric physics (mesoscale dynamics for a heavy precipitation storm vs. large-scale moisture divergence) and is not internally inconsistent. Chapter 11 and Chapter 8 include further descriptions of aridity and heat changes in relation to overall drought and heavy precipitation changes.
33891	84	12	84	13	To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We have updated this reference following final publication and have clarified the manuscript referenced.
13971	84	13	84	13	Change (Maxwell et al., 2018) by Maxwell et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43619	84	13			Read " Maxwell et al. (2018) identified regional " rather than " (Maxwell et al., 2018) identified regional " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33893	84	13			Check for reference format. Change: "(Maxwell et al., 2018)" by "Maxwell et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
107899	84	14	84	18	There are a number of articles cited in the Atlas regarding changes in IDF in the NA-CORDEX dataset. We need to decide if they should stay in the Atlas or be moved to Chapter 12 here. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have examined the IDF text from the Atlas. Some of it is dynamical and best suited for Chapter 11, and we have added text and references on IDF changes from the previous Atlas drafts in the heavy precipitation and pluvial flooding section.
64243	84	14	84	18	This section only mentions the effect of pluvial floods on infrastructure. Impacts on agriculture, tourism, human health, aquaculture etc are neglected. What is the reason behind this? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is designed to connect the climatic impact drivers to various sectoral assets so that the assessment of observed and projected changes in CID within Section 12.4 can be cast into their sectoral connections and further evaluated by Working Group II-type assessment. Including all combinations of CID/Sectoral assets for each regional section in 12.4 is not practical given space constraints. 12.3 does connect heavy precipitation and pluvial flooding to agriculture and the table notes connections to human mortality. We have added a note relating river floods to aquaculture in 12.3 but did not find sufficient literature to establish a connection to recreation and tourism.
33895	84	16			Unit format, homogenise. Change: "...automobile hazards, as well as increases in the 10-year recurrence level of 24-hr rainfall intensities that..." by "...automobile hazards, as well as increases in the 10 year recurrence level of 24 hr rainfall intensities that...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We updated the word choices to describe recurrence intervals and periods using harmonized formats throughout Chapter 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88387	84	20	84	23	You seem to be mixing temperate and polar regions here - Lewkowicz and Way ref focusses on Banks Island of Arctic Canada. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We moved this Lewkowicz and Way reference on landslides to the polar section 12.4.9
11895	84	20	84	31	<p>paragraph on landslides: Also worth noting are recent changes in the behavior of California landslides due to extreme hydrologic fluctuations attributed in the literature to climate change (namely, the rapid transition from severe drought in 2012–2015 to extreme wet conditions in 2017; see Swain et al., 2018 on attributing this rapid hydrologic transition to a feature of anthropogenic warming). Hundreds of slow-moving, long-active landslides in northern California showed an order-of-magnitude decrease in velocity during the drought (Bennett et al., 2016), only to accelerate rapidly again during the 2017 extreme wet year (Handwerger et al., 2019a). The extreme (record, locally) wet conditions in 2017 also caused catastrophic failure of some large landslides (Handwerger et al., 2019b). The large increase in landslide activity under locally record-wet conditions in 2017 drastically increased the amount of river sediment exported (550-fold increase in annual sediment load compared to the preceding drought conditions; East et al., 2018). In addition, Geertsema et al. (2006) presented evidence that in the northern half of British Columbia the frequency of large landslides (> 0.5 million m³) increased between the 1970s and mid-2000s, which the authors considered a possible result of modern climate change.</p> <p>References: Bennett, G. L., Roering, J. J., Mackey, B. H., Handwerger, A. L., Schmidt, D. A., & Guillod, B. P. (2016). Historic drought puts the brakes on earthflows in northern California. <i>Geophysical Research Letters</i>, 43, 5725–5731. Doi: 10.1002/2016GL068378; East, A. E., Stevens, A. W., Ritchie, A. C., Barnard, P. L., Campbell-Swarzenski, P., et al. (2018). A regime shift in sediment export from a coastal watershed during a record wet winter, California: implications for landscape response to hydroclimatic extremes. <i>Earth Surface Processes and Landforms</i>, 43, 2562–2577. DOI: 10.1002/esp.4415; Handwerger, A. L., Fielding, E. J., Huang, M.-H., Bennett, G. L., Liang, C., & Schulz, W. H. (2019). Widespread initiation, reactivation, and acceleration of landslides in the Northern California Coast Ranges due to extreme rainfall. <i>Journal of Geophysical Research, Earth Surface</i>, 124, 1782–1797. Doi: 10.1029/2019JF005035; Handwerger, A. L., Huang, M.-H., Fielding, E. J., Booth, A. M., & Bürgmann, R. (2019). A shift from drought to extreme rainfall drives a stable landslide to catastrophic failure. <i>Scientific Reports</i>, 9, 1569. Swain, D. L., Langenbrunner, B., Neelin, J. D., & Hall, A. (2018). Increasing precipitation volatility in twenty-first-century California. <i>Nature Climate Change</i>, 8, 427–433. Doi:</p>	TAKEN INTO ACCOUNT: The Swain et al. reference was focused on wet-to-dry volatility that is more appropriate for Chapter 11 or Chapter 8 (Chapter 12 focuses on the resulting distribution of each type of event rather than the dynamics behind those changes). We have added a reference to the Geertsema et al. (2006) reference for landslides in British Columbia. We cite the Handwerger et al. (2019) study given that it connects changing precipitation extremes to landslide changes. The Bennet et al. (2018) paper and the Handwerger et al. (2019) studies are useful to connect landslides to drought and heavy precipitation changes that are linked to climate trends, but do not provide enough consistency to assess a confident change in direction given that both drought and heavy precipitation are expected to increase in the region with different fundamental time scales (as noted at the end of Bennet et al. (2018)).
83737	84	23			See also SROCC Chapter 2 on that topic regarding mountains, not only AR5. [Andreas Käab, Norway]	ACCEPTED: We have replaced the AR5 reference with the SROCC Chapter 2 reference (Hock et al., 2019).
13973	84	26	84	26	Change (Cloutier et al., 2017) by Cloutier et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43621	84	26			Read " Cloutier et al. (2017) projected an increase " rather than " (Cloutier et al., 2017) projected an increase " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33897	84	26			Add a space between parenthesis: "...confidence)(Gariano and Guzzetti, 2016)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33899	84	26			Check for reference format. Change: "(Cloutier et al., 2017)" by "(Cloutier et al., 2017)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33901	84	27	84	28	Check for reference format. Change: "(Robinson et al., 2017)" by "Robinson et al. (2017)" [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

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13975	84	27	84	28	Change (Robinson et al., 2017) by Robinson et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43623	84	27		28	Read " Robinson et al. (2017) used scenarios based" rather than " (Robinson et al., 2017) used scenarios based" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33903	84	28			Unit format, homogenise. Change: "...al., 2017) used scenarios based upon projection of 50-year recurrence of 7-day precipitation periods to..." by "...al., 2017) used scenarios based upon projection of 50 year recurrence of 7 day precipitation periods to...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: Updated recurrence intervals and periods for harmonized formats throughout Chapter 12.
102695	84	33	84	33	drier = lower? [Philippe Tulkens, Belgium]	ACCEPTED: "drier" replaced with "lower"
105807	84	33	84	33	increases --> increase [Trevor Murdock, Canada]	ACCEPTED: typo corrected
11897	84	33	84	33	"increase" (delete the 's') [Amy East, United States of America]	ACCEPTED: typo corrected
126671	84	33	84	44	A number of recent papers have found that declines in Colorado River Flow have been tied to increased temperatures. Some of these (Udall and Overpeck, 2017; Milly and Dunne, 2018) have suggested that future temperature increases will likely overwhelm any increases in precipitation and the overall risk of future flow reductions is high. One recent paper (Hoerling et al, 2018), using a suite of atmospheric models, also found an anthropogenic signal in the slight recent precipitation declines. Note these general concepts are covered in SOD Chapter 8 on Hydrology, so inclusion is supported by other IPCC material. Citations: McCabe, G. J., Wolock, D. M., Pederson, G. T., Woodhouse, C. A., & McAfee, S. (2017). Evidence that Recent Warming is Reducing Upper Colorado River Flows. <i>Earth Interactions</i> , 21(10), 1-14. https://doi.org/10.1175/EI-D-17-0007.1 . Woodhouse, C. A., Pederson, G. T., Morino, K., McAfee, S. A., & McCabe, G. J. (2016). Increasing influence of air temperature on upper Colorado River streamflow. <i>Geophysical Research Letters</i> , 2015GL067613. https://doi.org/10.1002/2015GL067613 . Hoerling, M., Barsugli, J., Livneh, B., Eischeid, J., Quan, X., & Badger, A. (2019). Causes for the Century-Long Decline in Colorado River Flow. <i>Journal of Climate</i> . https://doi.org/10.1175/JCLI-D-19-0207.1 . Xiao, M., Udall, B., & Lettenmaier, D. P. (2018). On the causes of declining Colorado River streamflows. <i>Water Resources Research</i> , /54(9), 6739-6756. Udall, B., & Overpeck, J. (2017). The twenty-first century Colorado River hot drought and implications for the future. <i>Water Resources Research</i> , 53(3), 2404-2418. https://doi.org/10.1002/2016WR019638 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We now specifically reference the assessment in Chapter 8, which goes into more comprehensive detail on the various aspects of water balance changes that drives shifts in North American aridity. A detailed assessment of the Colorado River flows would be more appropriate in WGII, however the findings of the suggested papers are consistent with Chapter 12 assessment.
64247	84	33	84	44	What is the impact of this CID on human health, tourism and recreation in North America? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 is designed to connect the climatic impact drivers to various sectoral assets so that the assessment of observed and projected changes in CID within Section 12.4 can be cast into their sectoral connections and further evaluated by Working Group II-type assessment. Including all combinations of CID/Sectoral assets for each regional section in 12.4 is not practical given space constraints. Aridity is connected to impacts on recreation and tourism in the table within 12.3.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64245	84	35	84	35	It would be great if the authors would mention some of the anthropogenic influences just to make it easier for readers to understand what is actually meant by that. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The intent of this sentence is to separate the internal variability from long-term climate trends driven by anthropogenic forcing -- a detailed examination of anthropogenic influences would be distracting in this portion of Working Group 1; the reviewer and similarly interested readers could learn more about anthropogenic influences on the water cycle within Chapter 8. Chapter 12 does include further information on the attribution of trend and extreme changes in the most recent revision.
107901	84	37	84	40	Verify that these statements on mean precip changes are consistent with statements in the Atlas. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Summertime precipitation declines are of low confidence in the Atlas, however soil moisture declines are prominent in Chapter 8, so we have adjusted this sentence to focus on that signal.
107903	84	40	84	40	Provide more detail in which climate model simulations are being discussed here. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have updated this to the Cook et al. (2020) reference and note that this is CMIP6.
126673	84	42	84	43	Richard Seager and co-authors would argue that the aridity gradient would also shift at least to some degree eastward, and it already has. See: Seager, R., Lis, N., Feldman, J., Ting, M., Williams, A. P., Nakamura, J., Liu, H., & Henderson, N. (2018). Whither the 100th Meridian? The Once and Future Physical and Human Geography of America's Arid-Humid Divide. Part I: The Story So Far. <i>Earth Interactions</i> , 22(5), 1-22. https://doi.org/10.1175/EI-D-17-0011.1 . Seager, R., Feldman, J., Lis, N., Ting, M., Williams, A. P., Nakamura, J., Liu, H., & Henderson, N. (2018). Whither the 100th Meridian? The Once and Future Physical and Human Geography of America's Arid-Humid Divide. Part II: The Meridian Moves East. <i>Earth Interactions</i> , 22(5), 1-24. https://doi.org/10.1175/EI-D-17-0012.1 . [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We now note eastward extension of aridity gradient in addition to northward shift, and have added a citation to the Seager et al. (2018b) study in our assessment.
13977	84	48	84	48	Change (Wehner et al., 2017) by Wehner et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
7667	84	48	84	49	The following Science paper should be cited about mega-droughts: Williams et al. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. <i>Science</i> . 314–318, 17 April 2020. [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: We consider this paper as part of our assessment of emergence in 12.5.2.
43625	84	48		49	Read "Wehner et al. (2017) assessed high confidence " rather than "(Wehner et al., 2017) assessed high confidence " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33905	84	48			Check for reference format. Change: "(Wehner et al., 2017)" by "Wehner et al. (2017)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
126675	84	50	84	52	Mo and Lettenmaier's findings about flash drought were not absolute. They indicated a rebound post-2011 and also indicated their findings were influenced by areas where soil moisture had increased, especially in mid-continental agricultural areas. In drier areas of the country where precipitation has not increased, flash droughts remain an issue and increased heat in the absence of increased precipitation is a likely recipe for more future occurrences of these events. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have removed our references to flash drought and the Mo and Lettermaier paper here given these uncertain findings and a lack of space in our section.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55231	84	52	84	53	"There is limited evidence of significant trends in the characteristics of drought in North America" AND "Long-term changes in Canadian drought are also not evident in the observational record (Bonsal et al., 2019)." These two statements are misleading. For the century-long period of 1901 to 2002, summer drying (as determined from a model estimating moisture content in deep organic layers) was statistically significant in northern Canada. Locations south of the Hudson Bay, in the eastern Maritimes, and in western Canada recorded a trend toward decreasing summer dryness. But when analyzed over 1951-2002, indeed trends could hardly be distinguished from the (multi) decadal variability. So there is a period of interest to be considered here. See Girardin et al. (2009) and Meyn et al. (2013). But more importantly, the century-long patterns of changes in drying are coherent with patterns of changes in biomass burning across Canada (see Girardin et al. 2013). So this implies that changes in drying had had already an ecological impact during the last century // Girardin, M.P. and Wotton, B.M. 2009. Summer moisture and wildfire risks across Canada. Journal of Applied Meteorology and Climatology 48: 517-533. Meyn, A., Schmidlein, S., Taylor, S.W., Girardin, M.P., Thonicke, K., and Cramer, W. 2013. Precipitation-driven decrease of wildfires in British Columbia, Regional Environmental Change 13: 165-177 Girardin, M.P., Ali, A.A., Carcaillet, C., Gauthier, S., Hély, C., Le Goff, H., Terrier, A., Bergeron, Y. . 2013. Fire in managed forests of eastern Canada: Risks and options. Forest Ecology and Management 294: 238–249 [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Our focus is on fire weather, which avoids many confounding effects associated with management and response that make signals with area burned less clear (Meyn et al., 2013). We have used the Girardin et al. (2013) reference to note low confidence in fire weather in Eastern Canada (when coupled with the Jain et al. reference).
126677	84	55	85	7	Meteorological and agricultural drought are discussed, but a major type of drought is not even mentioned: hydrological drought. This should be added. [Trigg Talley, United States of America]	ACCEPTED: We now explicitly discuss hydrological drought and agricultural and ecological drought as distinct CIDs. Discussions in Chapter 12 also connect more concretely to physical descriptions of different drought types in Chapter 8 and Chapter 11.
11899	85	1	85	3	only low or medium confidence about worsening western U.S. drought? The western U.S. should not be lumped in with the central U.S. in these statements, because many references support the inference that the western U.S. has dried significantly in recent decades, including having experienced historically unprecedented episodes of drought severity: Udall, B., & Overpeck, J. (2017). The twenty-first century Colorado River hot drought and implications for the future. Water Resources Research, 53, 2404–2418. Doi: 10.1002/2016WR019638 Xiao, M., Udall, B., & Lettenmaier, D. P. (2018). On the causes of declining Colorado River streamflows. Water Resources Research, 54, 6739–6756. Doi: 10.1029/2018WR023153 Diffenbaugh, N. S., Swain, D. L., & Touma, D. (2015). Anthropogenic warming has increased drought risk in California. Proceedings of the National Academy of Sciences, 112, 13, 3931–3936. Doi: 10.1073/pnas.1422385112 Williams, A. P., Cook, E. R., Smerdon, J. E., Cook, B. I., Abatzoglou, J. T., et al., (2020). Large contribution from anthropogenic warming to an emerging North American megadrought. Science, 368, 314–318. AghaKouchak, A., Cheng, L., Mazdiyasn, O., & Farahmand, A. (2014). Global warming and changes in risk of concurrent climate extremes: insights from the 2014 California drought. Geophysical Research Letters, 41, 8847–8852. Doi: 10.1002/2014GL062308. Robeson, S. M. (2015). Revisiting the recent California drought as an extreme value. Geophysical Research Letters, 42, 6771–6779. Doi: 10.1002/2015GL064593 [Amy East, United States of America]	TAKEN INTO ACCOUNT: High confidence in changes in drought in the Western US are more clearly discussed. The AR6 region for "Western North America" includes both the Southwestern United States and the Pacific Northwest, which can have different signals and therefore lowered the aggregate confidence assessment, although we include footnotes to indicate that the Southwestern US has high confidence. Chapter 11 now handles the assessment of historical and future drought changes, including the attribution of recent events and concurrent extremes.
74649	85	6	85	6	To check if it isn't published about (... see Coppola et al., submitted, b) [Moulay Driss HASNAOUI, Morocco]	TAKEN INTO ACCOUNT: This reference has been updated upon final acceptance decision.
13979	85	6	85	7	A parenthesis needs to be closed in the following sentence (and vice versa; see Coppola et al., Submitted, b) and Atlas for precipitation change maps) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: We have corrected this sentence to ensure that there are no open parentheses.
33907	85	6			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
13981	85	7	85	7	change (Wehner et al., 2017) by Wehner et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43627	85	7			Read " Wehner et al. (2017) found that higher evaporative " rather than " (Wehner et al., 2017) found that higher evaporative " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33909	85	7			Check for reference format. Change: "(Wehner et al., 2017)" by "Wehner et al. (2017)". [Guimar Rotllant, Spain]	ACCEPTED: typo corrected
107905	85	14	85	14	What is biivariate drought analysis? IS this the correlation between precip and temperature? Explain more clearly and why it isn't clear. [Linda Mearns, United States of America]	NOT APPLICABLE: This material has been shifted into Chapter 11, which includes discussion on compound drought events and the dangers of examining only one component of a drought at a time.
55233	85	17	85	23	Observations do not only indicates that fire weather has become more conducive to fire but also that fire regime changes have been observed. In Canada, for instance, not only did the number of fire and the area burned increase between 1959-2015, but overall there are data that show an increase in the size of the median size of fire and of large fires (95th percentile) over the period between 1959-2015 Chelene C. Hanes, Xianli Wang, Piyush Jain, Marc-André Parisien, John M. Little, Mike D. Flannigan Canadian Journal of Forest Research, 2019, 49:256-269, https://doi.org/10.1139/cjfr-2018-0293 Similarly, increasing area burned in the Western united states is explained by an anthropogenic warming signal. The cited Abatzoglou and Williams paper also goes on to directly relate the altered fuel aridity to changes already recorded in fire activity. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Discussion of burned area and fire size are within the domain of Working Group II. Chapter 12.3 now calls this climatic impact driver "Fire weather" to underscore that we are assessing changes in the climatic condition which would then need to be combined with other elements of fire triggers and management in order to understand shifts in burnt area, etc.
55235	85	17	85	32	This section is almost entirely focused on the USA. There are numerous references that specifically explored how changes in fire weather will influence the length of the fire season as well as fire occurrence and annual area burned. Also, see Gillett et al. (GEOPHYSICAL RESEARCH LETTERS, VOL. 31, L18211, doi:10.1029/2004GL020876, 2004) as well as Hanes et al. (Can. J. For. Res. 49: 256–269. 2019. dx.doi.org/10.1139/cjfr-2018-0293) for an assessment of the recent trends in wildfire activity in Canada. Boulanger et al. (Can. J. For. Res. 44: 365–376 (2014) dx.doi.org/10.1139/cjfr-2013-0372) found that an increase in fire weather severity along with an increase in fire season length will strongly increase annual area burned and the number of large fires in Canada over the current century. Although most models project an increase in wildfire activity in Canada, model-specification uncertainty (i.e., the way the models to project future fire activity is built) for future periods is particularly high, much higher than that of different GCMs and RCP scenario. These uncertainties could greatly hinder our ability to detect significant trends in burning rates for much of Canada at the end of the 21st century (Boulanger et al. 2018, https://doi.org/10.1071/WF17123). Should also enhance coverage of and relevance to Mexico, if possible, but cannot recommend literature for this. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: Our discussion of fire weather now includes numerous references to the situation in Canada. We now cite the Hanes et al. (2019) study for lightning-induced fires. Analysis of fire burned area is left for WGII, and we generally find that fire weather is easier to project than fire area given the model specifications and management considerations noted by the reviewer. The Boulanger study utilized a large number of useful fire weather indices, but was conservative in being confined to historical ranges and had only a limited discussion about dominant fire weather component changes that led to the shifting fire regime zonations.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55241	85	17	85	32	<p>Suggest adding a small section here citing evidence for increased fire activity in North America based on historical fire records: A trend analysis of historical fire activity from 1959-2015 by (Hanes et al., 2019) further suggests that the fire season starts approximately one week earlier and ends one week later in Canada. Similarly, Coops et al. 2018 found an increasing trend in area burned across Canada. For the western United States, Dennison et al. (2014) also found positive trends in the number of large fires and corresponding area burned. Balch et al (2017) identify changes in human-caused ignitions as the main driver in increasing fire season length and spatial extent in the United States.</p> <p>References: Hanes C, Wang X, Jain P, Parisien M-A, Little J, Flannigan M. 2019. Fire regime changes in Canada over the last half century. <i>Can. J. For. Res.</i> 49(3): 256-269 Coops NC, Hermosilla T, Wulder MA, White JC, Bolton DK. 2018. A thirty year, fine-scale, characterization of area burned in Canadian forests shows evidence of regionally increasing trends in the last decade. <i>PLoS One</i> 13(5): e0197218 Dennison, Philip E., Simon C. Brewer, James D. Arnold, and Max A. Moritz. "Large wildfire trends in the western United States, 1984–2011." <i>Geophysical Research Letters</i> 41, no. 8 (2014): 2928-2933. Balch, Jennifer K., Bethany A. Bradley, John T. Abatzoglou, R. Chelsea Nagy, Emily J. Fusco, and Adam L. Mahood. "Human-started wildfires expand the fire niche across the United States." <i>Proceedings of the National Academy of Sciences</i> 114, no. 11 (2017): 2946-2951 [Nancy Hamzawi, Canada]</p>	<p>TAKEN INTO ACCOUNT: We now cite Hanes et al. (2019) and Balch et al. (2017) to indicate the increase in lightning-induced fires. Note that trends in burnt area or fire size are beyond the scope of Working Group I Chapter 12 and are instead covered within Working Group II. We have renamed this climatic impact driver "fire weather" to emphasize our focus on the climatic conditions that are conducive to fire.</p>
13983	85	18	85	18	Change (Abatzoglou and Williams, 2016) by Abatzoglou and Williams (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
112355	85	18		20	way this information is communicated is confusing [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have revised this sentence to increase clarity.
43629	85	18			Read " Abatzoglou and Williams (2016) found a climate signal " rather than " (Abatzoglou and Williams, 2016) found a climate signal " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33911	85	18			Check for reference format. Change: "(Abatzoglou and Williams, 2016)" by "Abatzoglou and Williams (2016)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
13985	85	21	85	21	Change (Jain et al., 2017) by Jain et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
55239	85	21	85	23	suggest rewording to: (Jain et al., 2017) used a meteorological definition to identify a 1979-2015 expansion in fire season particularly in Eastern Canada and the southwestern United States with a smaller reduction in the northern mountain West) along with regional shifts in 99th percentile of the Canadian Fire Weather Index (FWI) and potential fire spread days. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have revised the sentence to clarify that Jain et al. (2017) identified an increase in the fire weather season.
43631	85	21			Read "Jain et al. (2017) used a fire weather index " rather than "(Jain et al., 2017) used a fire weather index " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33913	85	21			Check for reference format. Change: "(Jain et al., 2017)" by "Jain et al. (2017)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
107907	85	23	85	23	The work of Podschwit and Cullen (submitted, revised), Patterns and trends in simultaneous wildfire activity in the continental United States from 1984-2015 (<i>International Journal of Wildfire</i>) should be cited here. It establishes that there has been an increase in synchronicity of large wildfires during the historical record since 1984. This means there now a greater tendency for multiple large wildfires to burn simultaneously. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Our analysis points out the changes in fire weather, but the number of firers, area burned, and response challenges are described in Working Group II.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126679	85	23	85	23	Add: ""... spread days (Yoon et al., 2015)."" Citation: Yoon, J.-H., Wang, S.-Y., R. R. Gillies, L. Hippias, B. Kravitz, and P. Rasch, 2015: Extreme Fire Season in California: A Glimpse into the Future?. Bulletin of the American Meteorological Society, 96, DOI: 10.1175/BAMS-D-15-00114.1 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The Yoon et al. (2015) study makes a nice connection between recent fire activity and future projections, but is largely consistent with the assessment already in 12.4.6.2.
11901	85	25	85	32	but again (see earlier comment) – most wildfires are caused by human activity, not by lightning. It is seriously misleading to mention lightning here as a cause of wildfire but not to mention humans. Then, it is critically important to ensure that readers will understand that climate (and weather) determine whether those ignitions grow and spread into large fires. [Amy East, United States of America]	TAKEN INTO ACCOUNT: We now cite Hanes et al. (2019) and Balch et al. (2017) to indicate the increase in lightning-induced fires as distinct from manmade fires. Further analysis of burned area and fire control challenges are provided in WGII.
13987	85	29	85	29	Change (Prestemon et al., 2016) by Prestemon et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43633	85	29			Read "Prestemon et al. (2016) found more conducive " rather than "(Prestemon et al., 2016) found more conducive " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33915	85	29			Check for reference format. Change: "(Prestemon et al., 2016)" by "Prestemon et al. (2016)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
51881	85	34	85	37	Suggest also including observed and projected North American precipitation changes here in this summary paragraph. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The summary discussion of wet and dry climatic impact drivers is oriented around the pattern of mean precipitation change, noting deviations from that general pattern for drought and wildfire (slightly more dry than precipitation decrease zone) and for extreme precipitation (greater than mean precipitation increase zone). Summertime patterns of dry CIDs also more widespread. Mean precipitation changes themselves are often less certain than the aridity, drought, fire, and heavy precipitation changes that align with this general geographic pattern.
64249	85	43	85	43	The term 'recent' is pretty vague here. What is considered recent in a climate context? Is it possible to define a year rather than saying recent? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added time periods
55237	85	43	85	47	Climate change is likely to affect windthrow risks at northern latitudes by potentially changing high wind probabilities and soil frost duration. Saad et al. (2017) mentioned that "An increased risk of windthrow (3 to 30%) was predicted for the future mainly due to an increased duration of unfrozen soil conditions (by up to 2 to 3 months by the end of the twenty-first century under RCP8.5). In contrast, wind speed did not vary markedly with a changing climate. Strong regional variations in wind speeds translated into regional differences in windthrow risk, with the easternmost region (Atlantic provinces) having the strongest winds and the highest windthrow risk". Saad, C.; Boulanger, Y.; Beaudet, M.; Gachon, P.; Ruel, J.-C.; Gauthier, S. 2017. Potential impact of climate change on the risk of windthrow in eastern Canada's forests. Clim. Change 143: 487-501. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: This paper has larger implications for changes in frost that lead to wind throw probability increases. We have considered this for our discussion of frost-forest ecosystem impacts in 12.3, but with space limitations we feel that this is consistent with overall findings in our discussion of frost changes in 12.4.6. Sequential CIDs (frost leads to wind damage) are within the mandate of WGII considering that this is explicitly tied to vulnerability.
64251	85	47	85	47	This sentence disagrees with the sentence above where it was stated that the mean wind speed is recovering. If the wind speed is recovering even now with the anthropogenic impact what would make it decline in the coming decades? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: we added that the observed reversal is of low confidence, but observed trends may not be consistent with future changes since causes differ. We also provided explanations for the declines in future climate
33917	85	47	85	48	Check for reference format. Change: "(Karnauskas et al., 2018a)" by "Karnauskas et al. (2018a)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
13989	85	47	85	48	Change (Karnauskas et al., 2018a) by Karnauskas et al., (2018a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
107909	85	47	85	49	Again, what simulations were used in this study? Global Models, regional models? [Linda Mearns, United States of America]	ACCEPTED: we have added that CMIP5 simulations were used
43635	85	47		48	Read "Karnauskas et al. (2018a) found a reduction in wind " rather than "(Karnauskas et al., 2018a) found a reduction in wind " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
112357	85	47		49	perhaps a phrase to inform reader why this might be happening [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have added that this is due to the weakening of cyclonic activity with the eastward shift of the stationary waves (Li et al)
112359	85	53		55	any information on the duration or start of the tornado season; or changes in patterns and places of occurrence [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have not found sufficient literature to assess the length of the tornado season or changes in spatial extent of tornadic activity. Studies on the frequency of mesoscale convective systems and CAPE are the closest we can get with confidence at this point, which indicate expansions North and East and an expansion in overall season (as noted in 12.4.6.3).
64253	85	55	85	55	The sentence should say '...and an overall increase in tornade power.' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: revised to indicate "...and an overall increase in tornado power"
98183	86	1	86	3	Another recent reference to add: Knutson, T., Camargo, S. J., Chan, J. C. L., Emanuel, K., Ho, C.-H., Kossin, J., et al. (2019). Tropical Cyclones and Climate Change Assessment: Part II. Projected Response to Anthropogenic Warming. Bull. Am. Meteorol. Soc.,BAMS-D-18-0194.1. doi:10.1175/BAMS-D-18-0194.1. [Thomas Knutson, United States of America]	TAKEN INTO ACCOUNT: We have added the Knutson et al. (2020) paper as a recent and summarizing study bolstering our assessment of increased intensity for strongest storms with higher rainfall potential.
112361	86	3			what is: more rapid intensification speed for tropical cyclone winds [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: This is meant to indicate the number of days (or hours) that a storm needs to intensify, for example progressing from a tropical depression to a tropical cyclone, or from a category 1 cyclone to a category 3 or greater cyclone. This sentence revised to avoid confusing double use of "speed", now reads "more rapid intensification"
126681	86	7	86	7	Add: ""... Kossin, 2019; Wang et al. 2018)."" Citation: Wang, S.-Y., L. Zhao, J.-H. Yoon, P. Klotzbach, and R. R. Gillies, 2018: Attribution of climate effects on Hurricane Harvey's extreme rainfall in Texas. Environmental Research Letters, DOI:10.1088/1748-9326/aabb85 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Chapter 11 assesses attribution of tropical cyclones.
105809	86	9	86	9	medum --> medium [Trevor Murdock, Canada]	ACCEPTED: typo corrected
15737	86	12	86	12	An IPCC report should probably report data in an homogenous unit system, and referring to "square miles" is probably not compliant with IPCC guidelines. This requires editing. [Samuel Morin, France]	ACCEPTED: We have translated these units into square kilometres. 3300 square miles = 8547 km2. As the 3300 square miles is rounded, we use 'about 8500 km2'
126683	86	14	86	14	Add: ""... submitted; Barandiaran et al., 2013). Citation: Barandiaran, D., S.-Y. Wang, and K. Hilburn, 2013: Observed trends in the Great Plains low-level jet and associated precipitation changes in relation to recent droughts. Geophysical Research Letters, 40, 6247-6251. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The Barandiaran et al. (2013) study describes shifts in an important dynamical feature related to precipitation in the US Midwest. This analysis is more suited to the detection and attribution of mean precipitation change, which is handled in Chapter 8 and the Atlas. The paper does not specifically discuss changes in tornados or severe storms.
64255	86	15	86	18	That is a contradiction, right? If the winds decrease in North America then this would consequently be bad for the wind energy production sector, right? So why are the simulations now talking about large scale winds that are important for energy infrastructure when the sentence before states a decrease in winds. The sentence is not clear enough on this front. Also this sentence would fit better into the mean wind speed section rather then here. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: We have removed the 99th percentile wind figure as it was not appropriately descriptive of storms nor the mean wind resource.
102697	86	17	86	17	rather than storm: what do you mean here? [Philippe Tulkens, Belgium]	NOT APPLICABLE: We have removed the 99th percentile wind figure as it was not appropriately descriptive of storms nor the mean wind resource.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126685	86	20	86	31	This section misses an important link between dust and snowpack. In Western North America (and elsewhere), dust has been shown to reduce river flow and, equally important, to advance runoff timing. This may also be appropriate to put on pages 12-24, lines 13-26. Painter et al. found flow reductions of 5% on average and a 3-week advance in runoff timing. Under future even more dusty conditions, Deems et al. found 6% flow decline and a further 3-week advance in runoff. Citations: Painter, T. H., Deems, J. S., Belnap, J., Hamlet, A. F., Landry, C. C., & Udall, B. (2010). Response of Colorado River runoff to dust radiative forcing in snow. /Proceedings of the National Academy of Sciences/, /107/(40), 17125-17130. Deems, J. S., Painter, T. H., Barsugli, J. J., Belnap, J., & Udall, B. (2013). Combined impacts of current and future dust deposition and regional warming on Colorado River Basin snow dynamics and hydrology. Hydrol. Earth Syst. Sci., 17(11), 4401-4413. https://doi.org/10.5194/hess-17-4401-2013 [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Within Chapter 12 we generally avoid these secondary effects (where one CID affects another), choosing rather to evaluate the CID changes in their own right, inclusive of all factors, and in the manner that they affect sectoral assets. The Deems et al. (2010) study looks at how dust deposition can lead to higher snowmelt for the Colorado River. The Deems et al. (2013) paper notes that heavy dust deposition can lead to earlier snowmelt and therefore less evapotranspiration of meltwater including under future climate, but this is also a secondary effect.
64261	86	21	86	21	What does recent mean? At least two publications seemed pretty confident that there is an increase in dust storm activity at least for the time between 1980 -2011. So which time period does the term 'recent' refer to? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have clarified this to indicate confidence in an increase in dust storm activity since 1980.
126687	86	22	86	22	Missing parenthesis. [Trigg Talley, United States of America]	ACCEPTED: typo corrected
126689	86	22	86	22	Since the reference is used as part of the sentence, there should be an open parenthesis right before "2017". [Trigg Talley, United States of America]	ACCEPTED: typo corrected
7669	86	22	86	22	missing parenthesis before '2017'. [Miao Ruiqing, United States of America]	ACCEPTED: typo corrected
64257	86	22	86	24	A reader who is not familiar with dust and sand storms will not know what PM10 and PM2.5 stands for. A definition is needed here. Be aware that some readers (especially politicians) might only read certain sections of interest and thus can't follow abbreviations without definition. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We now define PM in its first usage (within 12.3.4) and have verified that it is also noted in the glossary (within the definition of 'aerosol'). This is also a major topic of assessment within Working Group I Chapter 6.
64259	86	22	86	24	The mention of Valley Fever (at least at this point of the paragraph) seems a bit out of context. It would be much nicer if the authors would stick to a consistent structure in all the paragraphs, i.e. talk about how the CID will change first before talking about the impacts on certain sectors and assets. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have restructured this sentence to focus on the change in dust particular matter rather than the Valley Fever implications. It is still useful to note that the study was oriented around a specific sectoral application to underscore the relevance of these metrics, but the focus here is on the climatic conditions. The basic structure of Section 12.4 should be to assess changes in the CID category (e.g., sand and dust storms) and then provide examples of specific metrics used in sectoral studies for that region. Separating the indices from the sectors leads to a more confusing presentation as we would have to refer to each study twice and this would also place undue emphasis on the impacts themselves when they are intended to be the context of the climatic information provided.
43637	86	22			Read " Tong et al. (2017) has identified a rapid intensification " rather than " Tong et al., 2017) has identified a rapid intensification " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33919	86	22			Check for reference format. Change: "Tong et al., 2017)» by «Tong et al. (2017)». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
112363	86	23			location of/country for - 29 monitoring sites [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: we have added "in the Southwestern United States" and also added "contiguous United States" to the Brahney et al. reference.
13991	86	24	86	24	Change (Brahney et al., 2013). (Hand et al., 2016) by Brahney et al. (2013). Hand et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126691	86	24	86	24	Since the reference is used as part of the sentence, the open parenthesis should be right before "2013". [Trigg Talley, United States of America]	ACCEPTED: typo corrected
43639	86	24			Read "to observations by Brahney et al. (2013). Hand et al. (2016) attributed the " rather than "to observations by (Brahney et al., 2013). (Hand et al., 2016) attributed the " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33921	86	24			Check for reference format. Change: "(Hand et al., 2016)" by "Hand et al. (2016)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
11903	86	27	86	29	the Pu and Ginoux reference is listed as 2017, not 2018b, in the reference list [Amy East, United States of America]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
33923	86	27			To which references correspond, a or b?: "(Pu and Ginoux, 2018)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
13993	86	29	86	29	Change (Pu and Ginoux, 2018b) by Pu and Ginoux, (2018b) [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
126693	86	29	86	29	Since the reference is used as part of the sentence, the open parenthesis should be right before "2018b". [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
43641	86	29			Read " Pu and Ginoux (2018b) project about 5 more " rather than " (Pu and Ginoux, 2018b) project about 5 more " [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
33925	86	29			Check for reference format. Change: "(Pu and Ginoux, 2018b)" by "Pu and Ginoux (2018b)". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We have corrected the Pu and Ginoux references to properly distinguish between the 2018 and 2017 studies, and removed the spurious 2018b designation which had been the result of a mendeley duplication.
64263	86	33	86	35	Might be worth to include decreased wind speed and dust storms in the summary. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised the summary to note changes in each CID, including mean wind speed and dust storms
107911	86	33	86	35	This summary statement does not reflect well the statements above it. For example, reduction in mean wind should be mentioned. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have revised the summary to note changes in each CID, including mean wind speed and dust storms
51883	86	34	86	34	than increased frequency of all strengths of storms, although. (add comma) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We have added the comma
88389	86	40	86	45	Refer to ch 2 and 9? [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We now specifically reference chapter 2 and 9 here.
64265	86	40	87	7	What about the impact of this CID on recreation, tourism, helath etc? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.3 establishes the connection between snow cover and recreation and tourism (in addition to many other sectors). Here we concentrate on the climatic impact driver changes which the reader and Working Group II-type assessments can take further into the sectoral impacts and risk assessments (which are beyond the mandate of Chapter 12). The figure shows snow water equivalence exceeding 10 cm, which was shown in 12.3 to be an important threshold for skiing (Wobus et al., 2017).

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
112365	86	40		45	surely there should be some publications on and insights for the change in snow cover area, snowpack depth, duration trends in Canada? How does this link to increased precipitation as rain or snow? Canadian prairies where it is important for soil moisture? [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We now refer back to Chapter 9 and the Atlas for assessments of snow, and include studies on observed snow cover changes for Canada.
45657	86	41	86	41	As regional assessment for North America, where SI units are not widely used, it is worth to use square miles, but please also include the values in square kilometers. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We now use the standard IPCC units; 3300 miles ² = 8547 km ² . As it is likely that the 3300 miles ² was rounded, we similarly round as 'about 8500 km ² '.
38207	86	41	86	42	Recommend using metric units. 3300 square miles [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: We now use the standard IPCC units; 3300 miles ² = 8547 km ² . As it is likely that the 3300 miles ² was rounded, we similarly round as 'about 8500 km ² '.
45659	86	47	87	7	Why only RCP 8.5 scenario? Others scenarios are also policy relevant. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: Chapter 12 cannot practically assess all scenarios for each Climatic impact driver in each region, so we use examples from the literature. RCP8.5 is useful as a high-emissions pathway where it is easier to distinguish the signal of the pattern of change from the noise of internal and model variability. Chapter 12 now includes additional discussions of how CID change patterns can be applied across global warming level and RCP/time horizons, with an emphasis on consistent and scalable patterns. For the Final Government Draft we have also added more examples beyond RCP8.5 and a discussion on emergence to reduce the emphasis of RCP8.5.
112367	86	50			increases in snow - what aspects - duration, snowpack depth, amount of snowfall etc. [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: This sentence has been updated to clarify that we are discussing total snowfall.
33927	86	51	86	52	Check for reference format. Change: "This is consistent with the findings of (Derksen et al., 2019) and (Easterling et al., 2017) and is reproduced in global and regional models (Fyfe et al., 2017)." By "This is consistent with the findings of Derksen et al. (2019) and Easterling et al. (2017) and is reproduced in global and regional models (Fyfe et al., 2017)." [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
13995	86	51	86	52	Change (Derksen et al., 2019) and (Easterling et al., 2017) by Derksen et al. (2019) and Easterling et al. (2017) [María Amparo Martínez Arroyo, Mexico]	ACCEPTED: typo corrected
43643	86	51		52	Read "the findings of Derksen et al. (2019) and Easterling et al. (2017)" rather than "the findings of (Derksen et al., 2019) and (Easterling et al., 2017)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
112369	86	51		55	really like how this section was written, content and level of description and explanation [Linda Mortsch, Canada]	EDITORIAL: Chapter 12 authors appreciate this comment and the recognition of our efforts to find a practical and useful level of detail.
107913	86	52	86	52	Include reference to McCrary and Mearns, 2019 (J. Hydrometeorology) along with Fyfe. They analyzed changes in snow in the NARCCAP RCM suite. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have added the McCrary and Mearns (2019) study and also connect to the discussions of regional climate model performance in the Atlas.
112371	87	1			where wintertime temperatures remain well below [Linda Mortsch, Canada]	ACCEPTED: Replaced "are well below" with "remain well below"
112373	87	3			Reduced snow totals (accumulation totals? Snow pack? More detail) and earlier onset? of snowmelt increases potential for lower dry season or summer streamflow (Kormos et al., 2016) [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have revised to indicate "total snowpack"
33929	87	5			Unit format, homogenise. Change: "100-mm" by "100 mm". [Guiomar Rotllant, Spain]	ACCEPTED: Now reads 10 cm (to be consistent with designation in 12.3)
64267	87	9	87	17	What about the impact of this CID on coastal regions? Considering the huge glacial meltwater input into coastal areas there must be an effect on coastal ecosystems and hydrographical features. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The downstream effects of glacial runoff increases are considered as part of the river flooding climatic impact driver. Meltwater input is substantial but difficult to separate from the noise of interannual flow variation.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45661	87	9	87	17	Radic et al. 2014 must be replaced with more recent studies like Hock et al. 2019 or Marzeion et al. submitted. Section 9.5.1 gives a comprehensive assessment of glacier change for North America regions. Please replace coastal range glaciers by coastal icefields. Please replace meltwater lakes by glacial or proglacial lakes. Marzeion, B. et al. Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change. Earth's Futur. (submitted). Hock, R. et al. GlacierMIP - A model intercomparison of global-scale glacier mass-balance models and projections. J. Glaciol. 65, 453–467 (2019). [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: Chapter 12 now points to Chapter 9 for its regional assessment of glacial mass balance change.
11905	87	9	87	17	also see synthesis paper by Fountain et al., 2017, who found that the total area of western U.S. glaciers and perennial snowfields—which occur in 29 mountain ranges across eight states—has declined by 39% since the mid-20th century. Fountain, A. G., Glenn, B., & Basagic, H. J. (2017). The geography of glaciers and perennial snowfields in the American West. Arctic, Antarctic, and Alpine Research, 49, 3, 391–410. https://doi.org/10.1657/AAAR0017-003 [Amy East, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 now points to Chapter 9 for its regional assessment of glacial mass balance change. The main quantification of 39% area reduction for glacier and permanent snowfields in the US West within Fountain et al. (2017) is based on a face-value comparison with Selkowitz and Forster (2016) despite acknowledged different methods and observational periods. This is not enough for us to change the assessment conducted by Chapter 9.
13997	87	10	87	10	Change (Radić et al., 2014) by Radić et al. (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43645	87	10			Read " Radić et al. (2014) projects " rather than " (Radić et al., 2014) projects " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33931	87	10			Check for reference format. Change: "(Radić et al., 2014)" by "Radić et al. (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
13999	87	11	87	11	Change (Clarke et al., 2015) by Clarke et al. (2015) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
112375	87	11		12	large glacial losses in the continental interior- would seem that the loss in glaciers would be the cordillera region not the continental interior which I interpret as the plains [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: We have avoided generic references to the 'continental interior' for glaciers to avoid such confusion. Much of this section was subsequently removed as Chapter 12 now relies on Chapter 9 for glacial mass change assessments that cite Clarke et al. (2015)
43647	87	11			Read " Clarke et al. (2015) noted large glacial losses " rather than " (Clarke et al., 2015) noted large glacial losses " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33933	87	11			Check for reference format. Change: "(Clarke et al., 2015)" by "Clarke et al. (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
88113	87	13	87	15	The issue is comprehensively discussed in SROCC, please refer to it. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: We now refer to Chapter 9 for the glacial mass assessment, where SROCC is discussed extensively. Our focus here is only on conveying the regional changes and extending them toward CID indices like meltwater influences and glacial lakes.
45663	87	19	87	27	Why only RCP 8.5 scenario? Others scenarios are also policy relevant. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: For the Final Government Draft we have added projections for RCP2.6, RCP4.5 and RCP8.5.
11907	87	19	87	27	also see excellent work by: Farquharson, L. M., Romanovsky, V. E., Cable, W. O., Walker, D. A., Kokelj, S. V., & Nicolsky, D. (2019). Climate change drives widespread and rapid thermokarst development in very cold permafrost in the Canadian high Arctic. Geophysical Research Letters, 46, 6681–6689. https://doi.org/10.1029/2019GL082187 [Amy East, United States of America]	TAKEN INTO ACCOUNT: The Farquharson et al. (2019) study on thermokarst development in Canada is consistent with the current assessment. The updated permafrost observational dataset by Romanovsky et al. (2020) is also now cited.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126695	87	19	87	27	This section says nothing about impacts or likelihoods of exceeding thresholds (e.g., as in the example in Figure 12.1). The final sentence is worthless, because it refers to changes, but not direction of change. Why say it? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This sentence now specifies high confidence in reductions of mountain near-surface permafrost area. We did not identify clear and consistent thresholds used for permafrost in the literature, so our focus has been on active layer thickness, area with permafrost, and permafrost temperature. Changes in all three are related, as areas with increasing permafrost temperature will eventually see increased active layer thickness and then the loss of permafrost.
14001	87	22	87	22	Change (Slater and Lawrence, 2013) by Slater and Lawrence (2013) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
64269	87	22	87	23	This sentence is not clear. What is sustainable permafrost? And what is the most probable condition? Please rephrase this sentence to make it easier to follow. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised this sentence as we agree that "sustainable" has alternative meanings in the IPCC context that were not intended here. This reference indicates that near-surface permafrost was the probable condition in the Canadian Archipelago in that scenario time horizon. Other areas may have remaining deep permafrost that will eventually disappear given the changing surface condition.
63875	87	22	87	23	"(Slater and Lawrence, 2013) note that, for end-of-century North America, RCP8.5 has sustainable permafrost only as the most probable condition in the Canadian Archipelago" would more clearly convey the intended statement [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: typo corrected
55245	87	22	87	23	"22 (Slater and Lawrence, 2013) note that end-of-century RCP8.5 in North America only has sustainable 23 permafrost as the most probable condition in the Canadian Archipelago" page 105 has the following: 25 "CMIP5 analyses by (Slater and Lawrence, 2013) 26 projected that sustainable permafrost would be most probable only in portions of the Canadian Arctic 27 Archipelago and the Russian Arctic coastal and eastern upland regions by RCP8.5 2100." This is not a report I have read, and noticed that the language appears different in these two sections. If this is not the case, please disregard. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: These assessments are equivalent, although the focus in the North America section is on the sub-polar losses while the focus in the Polar section is on the pattern of remaining permafrost in the arctic region.
55243	87	22	87	25	Both studies (Slater and Lawrence, and Melvin) use CMIP5 which only simulates permafrost thaw in the upper 3.5 m of the soil column. So to say that permafrost is only "sustainable" (ambiguous, do you mean still present, or not actively degrading?) in the Canadian Arctic Archipelago is misleading, because the model is only of the upper 3.5 m. Rework to accurately present the findings (ie, clarify that it's only near-surface permafrost). Also, on line 25 "increases in active layer thickness where permafrost remains" insert "near-surface" before permafrost. [Nancy Hamzawi, Canada]	ACCEPTED: We have added "near-surface" to the references of permafrost from these studies, and have removed the term "sustainable" as it is confusing to readers who are used to seeing that term in other contexts within the IPCC.
43649	87	22			Read " Slater and Lawrence (2013) note that " rather than " (Slater and Lawrence, 2013) note that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33935	87	22			Check for reference format. Change: « (Slater and Lawrence, 2013)» by "Slater and Lawrence (2013)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14003	87	23	87	23	Change (Melvin et al., 2017) by Melvin et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
43651	87	23			Read " Melvin et al. (2017) noted the loss " rather than " (Melvin et al., 2017) noted the loss " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33937	87	23			Check for reference format. Change: "(Melvin et al., 2017)" by "(Melvin et al. (2017))". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
88393	87	25	87	27	Note there are very few observations in North American mountains and these are in areas north of 60N where permafrost occurrence has less to do with elevation. Also most of these very few sites are in valley bottoms. It also isn't clear what is meant by change in permafrost - its temperature as discussed in Biskaborn et al (2019) [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We have revised this sentence to be more clearly indicate a reduction in near-surface permafrost area and spatial variability in mountain regions, and further note permafrost temperature changes in the sentence that cites Biskaborn et al. (2019). This section is also greatly reduced as Chapter 12 now refers to Chapter 9 for its assessment on regional permafrost changes. The clear relationship between temperature changes and permafrost change lend confidence in these assessments even as permafrost temperature observations are not as common in steep terrain.
64271	87	29	87	46	What about the impact of this CID on indigeneous traditions (which was stated as an highly impacted sector in Table 12.2)? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: An actual assessment of those impacts and risks is beyond the scope of Working Group I, although Chapter 12's mandate is to identify and provide climate information to enable those impacts and risk studies. The structure of Chapter 12 notes CID connections to sectors such as Indigenous traditions and then notes regional changes in these CIDs. Together this leads to a message that CIDs are changing in important ways for indigenous traditions, and that is an indication that this topic merits further assessment of actual impacts and risk in Working Group II-like studies and assessments.
112377	87	29			could introduce effects on Laurentian Great Lakes [Linda Mortsch, Canada]	ACCEPTED: We note changes in lakes for Central and Eastern North America from EPA, 2016, and Benson et al., 2012. We also include Mason et al. (2016) which is focused on the Laurentian Great Lakes, and Hewer and Gough (2018) which focuses on Lake Ontario projections and Matsumoto et al. (2019) which focuses on Lake Superior.
126697	87	33	87	34	Add Benson et al. (2012) for reduced lake ice in eastern North America in the last 150 years. This is the most spatially extensive study on lake-ice trends in North America. Citation: Benson, B.J., Magnuson, J.J., Jensen, O.P., Card, V., Hodgkins, G.A., Korhonen, J., Livingston, D.M., Stewart, K.M., Weyhenmeyer, G.A., and Granin, N.G., 2012, Extreme events, trends and variability in Northern Hemisphere lake ice phenology (1855 - 2005): Climatic Change, v. 112, p. 299-323, DOI 10.1007/s10584-011-0212-8. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added Benson et al. (2012) study for lake ice in Central and Eastern North America.
14005	87	46	87	46	Indicate if 12.4.9 is a section for example Section 12.4.9 [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: We now indicate that this is Section 12.4.9.
14007	87	49	87	49	Change (Kluver and Leathers, 2015) by Kluver and Leathers (2015) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43653	87	49			Read " Kluver and Leathers (2015) noted a 1930-2008 " rather than " (Kluver and Leathers, 2015) noted a 1930-2008 " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33939	87	49			Check for reference format. Change: "(Kluver and Leathers, 2015)" by "Kluver and Leathers (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33941	87	50			Check for reference format. Change: "(Changnon, 2018)" by "Changnon (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14009	87	51	87	51	Change (Changnon, 2018) by Changnon (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43655	87	51			Read " Changnon (2018) found that most " rather than " (Changnon, 2018) found that most " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
14011	88	2	88	2	Change (Janoski et al., 2018) by Janoski et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43657	88	2			Read "Janoski et al. (2018) used a high-resolution " rather than "(Janoski et al., 2018) used a high-resolution " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33943	88	3			Check for reference format. Change: "(Janoski et al., 2018)" by "(Janoski et al., 2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
23775	88	6	88	11	rain-on-snow impacts are an issue for high latitude as they lead to icings with sever impacts, see IPCC cryosphere special report and e.g. http://dx.doi.org/10.1098/rsbl.2016.0466 and https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1890/09-1927.1 [Annett Bartsch, Austria]	TAKEN INTO ACCOUNT: The importance of rain-on-snow events is indicated in Section 12.3. We considered the IPCC SROCC and the Forbes et al. (2016) and Bartsch et al. (2010) studies as part of our Section 12.3 assessment and look to those studies for possible indicators over North America in Section 12.4.6. Note that snow freeze/re-freeze would fall under frost events.
14013	88	7	88	7	Change (Groisman et al., 2016) by Groisman et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43659	88	7			Read "Groisman et al. (2016) examined 40 years of " rather than "(Groisman et al., 2016) examined 40 years of " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33945	88	7			Check for reference format. Change: "(Groisman et al., 2016)" by «Groisman et al. (2016) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14015	88	8	88	8	Change (Ning and Bradley, 2015) by Ning and Bradley (2015) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
107915	88	8	88	11	What climate models and what scenarios? [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We now note results from Ning and Bradley (2015) for RCP4.5 and RCP8.5. Naming each set of climate models is beyond the scope for this section of Chapter 12 (information can be traced through citations, and the point of this section is not to perform model intercomparisons).
43661	88	8			Read " Ning and Bradley (2015) project that the average " rather than " (Ning and Bradley, 2015) project that the average " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33947	88	8			Check for reference format. Change: "(Ning and Bradley, 2015)" by "Ning and Bradley (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14017	88	14	88	14	Change (Allen et al., 2015b; Allen, 2018) by Allen et al. (2015b) and Allen (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43663	88	14			Read " Allen et al. (2015b) and Allen (2018) found that temporal inconsistencies " rather than " (Allen et al., 2015b; Allen, 2018) found that temporal inconsistencies " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33949	88	14			Check for reference format. Change: "(Allen et al., 2015b; Allen, 2018)" by "Allen et al. (2015b) and Allen (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43665	88	15			Read " Tang et al. (2019a) identified " rather than " (Tang et al., 2019a) identified " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33951	88	15			Check for reference format. Change: "(Tang et al., 2019a)" by "Tang et al. (2019a)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14019	88	18	88	18	Change (Tippett et al., 2015) by Tippett et al. (2015) [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Reference no longer cited
43667	88	18			Read "Tippett et al. (2015) project increases in convective " rather than " (Tippett et al., 2015) project increases in convective " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Reference no longer cited
33953	88	18			Check for reference format. Change: "(Tippett et al., 2015)" by "Tippett et al. (2015)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Reference no longer cited
107917	88	19	88	20	What are the projections? [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have removed the reference to Tippett et al. (2015) as it was largely a review of other studies across multiple projection horizons, and many of these studies were already cited in the severe wind storm section above. Instead we rely more on the Brimelow et al. and Trapp et al. studies using regional and convection-permitting model simulations. Those studies use the A2 mid-century (NARCCAP) and RCP8.5 end-of-century simulations, but the overall assessment here is low confidence so we do not detail these differences.
14021	88	23	88	23	Change (Mock and Birkeland, 2000) by Mock and Birkeland (2000) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43669	88	23			Read "Mock and Birkeland (2000) identified a 1969-1995 decrease " rather than "(Mock and Birkeland, 2000) identified a 1969-1995 decrease " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33955	88	23			Check for reference format. Change: "(Mock and Birkeland, 2000)" by "Mock and Birkeland (2000)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14023	88	26	88	29	Change We concur with the (Hock et al., 2019b) assessment of medium confidence and high agreement that snow avalanche hazards generally decrease at low elevations given lower snowpack even as high elevations are increasingly susceptible to wet snow avalanches (see also (Lazar and Williams, 2008)). by We concur with the assessment of medium confidence and high agreement that snow avalanche hazards generally decrease at low elevations given lower snowpack even as high elevations are increasingly susceptible to wet snow avalanches (Hock et al., 2019b; see also Lazar and Williams, 2008). [Maria Amparo Martinez Arroyo, Mexico]	REJECTED: The original sentence phrasing more clearly indicates that we are agreeing with the assessment by Hock et al., with support from Lazar and Williams.
43671	88	26			Read "with the Hock et al. (2019b) " rather than "with the (Hock et al., 2019b) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
15739	88	28	88	28	I'm not sure I understand the use of the "even as" wording in this sentence. Could be replaced by "even if" ? Or "and" ? [Samuel Morin, France]	TAKEN INTO ACCOUNT: This phrasing underscores that the snowfall rate distribution can become more extreme despite the total amount of snow declining. It is likely to be a bit counter-intuitive for some readers, so we are emphasizing that this shift in distribution on top of a mean change in the opposite direction is plausible.
51885	88	31	88	31	Suggested addition to clarify that these are observed changes: '...characterised by an observed reduction in glaciers..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We now indicate at the beginning of the summary statement that observations and projections agree that these snow and ice CIDs are changing.
45665	88	31	88	34	Permafrost is also relevant CID for North America and must be highlighted here. [Lucas Ruiz, Argentina]	ACCEPTED: We have added permafrost to the summary statement for snow and ice CIDs in North America.
51887	88	33	88	33	Suggested addition: 'and ice hazards. This trend is projected to continue in the coming decades..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We now indicate at the beginning of the summary statement that observations and projections agree that these snow and ice CIDs are changing.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33957	88	41	88	46	Unit format, homogenise. Change: "A hybrid reconstruction of tide-gauge and satellite data over 1900-2015 finds regional-mean relative SLR of 1.4 ± 0.6 mm/yr in the subpolar North Atlantic region compared to a GMSL change of 1.6 ± 0.4 mm/yr. For the period 1993-2015, the SLR rates increased to 2.2 ± 0.3 mm/yr, compared to a GMSL change of 2.8 ± 0.3 mm/yr (Dangendorf et al., 2019). Relative sea level (RSL) is falling in much of northern Northeastern Canada and around Hudson Bay (where land is rising by >10 mm/year; (Greenan et al., 2019))." By "A hybrid reconstruction of tide-gauge and satellite data over 1900-2015 finds regional-mean relative SLR of 1.4 ± 0.6 mm yr ⁻¹ in the subpolar North Atlantic region compared to a GMSL change of 1.6 ± 0.4 mm yr ⁻¹ . For the period 1993-2015, the SLR rates increased to 2.2 ± 0.3 mm yr ⁻¹ , compared to a GMSL change of 2.8 ± 0.3 mm yr ⁻¹ (Dangendorf et al., 2019). Relative sea level (RSL) is falling in much of northern Northeastern Canada and around Hudson Bay (where land is rising by >10 mm year ⁻¹ ; (Greenan et al., 2019))." [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
64273	88	51	88	51	w.r.t' should be written as ' with reference to' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: w.r.t changed to "compared to"
33959	88	53	88	54	Check for reference format. Change: "(Sweet and Park, 2014)" by "Sweet and Park (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14025	88	53	88	54	Change (Sweet and Park, 2014) by Sweet and Park (2014) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
31629	88	53	88	55	The statement on tidal flood could be moved to the subsection on coastal flooding. Furthermore, this is typically one place where the reminder on high-end sea level scenarios (e.g., Kopp et al 2014 have regional projections and a discussion on New York) Kopp, Robert E., Radley M. Horton, Christopher M. Little, Jerry X. Mitrovica, Michael Oppenheimer, D. J. Rasmussen, Benjamin H. Strauss, and Claudia Tebaldi. "Probabilistic 21st and 22nd century sea-level projections at a global network of tide-gauge sites." Earth's future 2, no. 8 (2014): 383-406 [Gonéri Le Cozannet, France]	ACCEPTED: We have moved the section on tidal flooding to the coastal flooding paragraph. The study by Kopp et al. (2014) employs a combination of expert judgment and model analysis for probabilistic projections for New York City, but that approach has been updated with the newer CH9 assessment and we will not duplicate that here.
126699	88	53	88	55	The Sweet and Park (2014) reference does not describe 30 flood days/ year as a tipping point for "permanent inundation". It was a somewhat arbitrary value designed to give context to change over time. Suggest rewording this sentence to clarify. Also, the work described in that article has since been updated via a NOAA technical report (using the updated 2017 NOAA SLR Scenarios), which should definitely be cited: Sweet, W.V., G. Dusek, J. Obeysekera and J.J. Marra (2018). Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold. NOAA Technical Report NOS CO-OPS 086. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We already reference the Sweet et al. (2018) study and use its results for the historical conditions as well. We also avoid the term "permanent inundation".
43673	88	53		54	Read " Sweet and Park (2014) found that portions of nearly" rather than " (Sweet and Park, 2014) found that portions of nearly" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
5545	89	3	89	24	it laks impacts on the Mississippi delta [Benoit Laignel, France]	TAKEN INTO ACCOUNT: We discuss the Gulf Coast (Central North America region) in the coastal flooding section.
110187	89	5	89	6	1m sea level rise is toward the very top end of SRCLL and chapter 9 assessed ranges by century end. This characterisation thus needs to be revised commensurately. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: This phrasing was from the underlying study, but we have revised this text to avoid labelling scenarios and to be consistent with Chapter 9.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63877	89	5	89	9	The paper cited described this scenario (Intermediate) and its corollary (Low Intermediate) as “associated with the low-end and high-end ‘likely’ (about a 66% chance of occurrence) ranges for the representative concentration pathway (RCP) 4.5 and RCP 8.5 emissions scenarios for future global temperatures, respectively.” (Sweet et al, 2018, p. 24). Would it be worth providing the conversion from 1m rise in GMSL by 2100 to RCP 8.5 here (as is done with regards to Africa in Section 12.4.1.5) in order to maintain a common frame of reference throughout the paragraph and chapter? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This phrasing was from the underlying study, but we have revised this text to avoid labelling scenarios and to be consistent with Chapter 9. We now contextualize this scenario against the GMSL projections from CH9 SSP-RCPs.
33961	89	10			Unit format, homogenise. Change: “100-year” by “100 year”. [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
33963	89	14	89	15	Check for reference format. Change: “(Vousdoukas et al., 2018)” by “Vousdoukas et al. (2018)”. [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14027	89	14	89	15	Change (Vousdoukas et al., 2018) by Vousdoukas et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43675	89	14		15	Reda " Vousdoukas et al. (2018) project increases of" rather than " (Vousdoukas et al., 2018) project increases of" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
43677	89	19			Read " with Vousdoukas et al. (2018) indicating " rather than " with (Vousdoukas et al., 2018) indicating " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
43679	89	21			Read " by Sweet et al. (2017), Ghanbari et al. (2019) " rather than " by (Sweet et al., 2017), (Ghanbari et al., 2019) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33965	89	21			Check for reference format. Change: « (Sweet et al., 2017), (Ghanbari et al., 2019) » by « (Sweet et al., 2017 ; Ghanbari et al., 2019) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
126701	89	22	89	22	What is the “highest average tide”? MHHW? MHW? Please clarify. [Trigg Talley, United States of America]	NOT APPLICABLE: We have shortened the reference to Ghanbari et al. (2019) given space constraints, and now just note the shift toward higher frequency of major flooding events without detailing the methods in CH12 main text.
14029	89	29	89	29	Change (Luijendijk et al., 2018b) by Luijendijk et al. (2018b) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
1813	89	29	89	30	As before, please avoid the term accretion rate within this context, unless you are referring to vertical accretion. I suspect the authors mean progradation. [Torbjorn Tornqvist, United States of America]	TAKEN INTO ACCOUNT: We use progradation for horizontal land expansion, although this sentence has been restructured in the North America coastal erosion section.
43681	89	29			Read "Luijendijk et al. (2018b) shows a continent averaged " rather than "(Luijendijk et al., 2018b) shows a continent averaged " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33967	89	29			Check for reference format. Change: “(Luijendijk et al., 2018b)» by “Luijendijk et al. (2018b) » [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
11909	89	30	89	30	fix spelling of “accretion” [Amy East, United States of America]	ACCEPTED: typo corrected
1815	89	30	89	32	It seems odd to mention coastal wetland loss for the Pacific and Atlantic coasts, but not for the US Gulf Coast that has suffered the largest rates of coastal wetland loss in the world over the past century. [Torbjorn Tornqvist, United States of America]	TAKEN INTO ACCOUNT: We have removed explicit mention of wetland loss in this section due to space constraints. This section does mention Gulf Coast coastal flooding and erosion rates.
33969	89	30			Unit format, homogenise. Change: “0.12 m/yr” by “0.12 m yr ⁻¹ ”. [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
33971	89	35	89	36	Check for reference format. Change: « (Vousdoukas et al., in press)» by «Vousdoukas et al. (in press)». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43683	89	35		36	Read " presented by Vousdoukas et al. (in press) show" rather than " presented by (Vousdoukas et al., 35 in press) show" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
14031	89	37	89	37	Change (Erikson et al., 2015) by Erikson et al. (2015) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43685	89	37			Read " Erikson et al. (2015) also project a rotation " rather than " (Erikson et al., 2015) also project a rotation " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33973	89	37			Check for reference format. Change: "(Erikson et al., 2015)" by "Erikson et al. (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33975	89	40			Unit format, homogenise. Change: "100m" by "100 m". [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
45069	89	43	89	43	of ==> that? [Christophe Deissenberg, Luxembourg]	ACCEPTED: "that"
33977	89	44			Format, homogenise. Change: "20th" by "20th". [Guiomar Rotllant, Spain]	ACCEPTED: 20th century uses superscript for "th"
14033	89	45	89	45	Standardize the writing format N America or North America [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: We no longer use the "N America" abbreviation, instead writing "North America" in full.
14035	89	53	89	53	Change (Frölicher et al., 2018) by Frölicher et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43687	89	53			Read "Frölicher et al. (2018) " rather than "(Frölicher et al., 2018) " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33979	89	53			Check for reference format. Change: "(Frölicher et al., 2018)" by "(Frölicher et al., 2018) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
427	90	3	90	14	Please refer to my comment on "lake Acidification". The study by Lauvset 2015 is based on model results and no direct observations, and do not consider coastal ocean. There are no references in the SOD text to "lake acidification" so far. Here a direct quote from Lauvset et al 2015: "Here, we only evaluate trends in the open ocean. " -> page 3 from the pdf article version. I'd suggest rewriting this, or even removing lake acidification from the text. Please note that this comment aims at strenghtening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	TAKEN INTO ACCOUNT: We have removed the discussion of lake acidification as a climatic impact driver.
126703	90	3	90	14	A few papers have come out about acidification in the Great Lakes (e.g., Phillips et al., 2015, Oceanography). It would be good to mention them. [Trigg Talley, United States of America]	NOT APPLICABLE: We have removed the discussion of lake acidification as a climatic impact driver. The Phillips et al. (2015) study on Great Lakes acidification is interesting but not strongly conclusive in terms of long-term signal given spatial heterogeneity and additional factors affecting acidification (runoff, etc.).
126705	90	3	90	14	Add mention of "coastal acidification" as a lot of work has been done in North America to characterize this phenomena and its drivers which are in addition to atmospheric CO2. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Coastal ocean acidification resulting from eutrophication is beyond the scope of our climate assessment, falling more into a broader category of environmental pollutants that will likely be treated separately in policy.
33981	90	8	90	11	Can you please re-write the following sentence to make it clearer? Maybe you can broke it in two sentences since it is quite long, second part is confusing: "The Atlantic coast of North America is projected to become more acidic over the 21st century, as is the Pacific coast (high confidence) with the rate of ocean acidification being proportional to that of CO2 emissions (pH decreases of 0.2 (RCP4.5) and 0.4 (RCP8.5) are projected for RCP4.5 and RCP8.5 by end of century (Atlas)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: We have moved this section to 12.4.0, and have removed this specific level of detail.
14037	90	10	90	10	One parenthesis missing from the sentence (pH decreases of 0.2 (RCP4.5) and 0.4 (RCP8.5) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43689	90	11		12	Read " Ekstrom et al. (2015) mapped out " rather than "(Ekstrom et al., 2015) mapped out " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
33983	90	11			Check for reference format. Change: "(Ekstrom et al., 2015)" by "Ekstrom et al. (2015)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
64039	90	16		17	"over the 21st Century" is yet 100 years. On reviewing the rate of climate change and their impact drivers along the past 20 years of the 21st century, data will reveal abrupt changes and unexpected events. In the presence of such untrusted trends, a 100 year bracket cannot be measurable or detectable. Moreover; on reviewing all reports and recommendations of the climate change summits and conferences of the large industrial countries, one would conclude that within this 100 year bracket, life on earth would have probably ended in a way of another due to complete and crucial destruction of an ecosystem that can creatures can bear and struggle through. Thereby; these 100 years and their projections cannot be reliable. Again I suggest, slicing up the long periods or not exceeding a 50 year projection period all over the report. It is even more advisable to have both short term and long term projections. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The summary discussion of 12.4.6.5 is now more specific in its use of time horizons and does not leave an impression that we are focused solely on the end of the century. A detailed description of specific outcomes on short and long time horizons is beyond the scope of this summary paragraph, which is meant to convey the strong directionality in coastal changes. The text indicates that these trends are observed and will increase, which shows the reader that these are not distant concerns.
51889	90	17	90	19	Suggested addition: An observed increase in relative sea level is very likely to continue in North America (other than around the Hudson Bay), contributing...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Suggested addition of the observed increase utilized in text.
64275	90	23	90	49	There is no summary (in bold) for this section. Please include to be consistent with other sections. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This "other CID" section does not lend itself to a clear summary that contextualizes and links the sub-elements, so no summary discussion is provided.
126707	90	25	90	39	The paragraph on impacts to air pollution in North America should distinguish between ozone and PM in the opening sentence. The link between climate change and ozone in North America is considerably stronger and with more agreement than is the case for PM. In addition, the statement that the effects of climate are low relative to emission changes is less valid in scenarios that are not based on significant emission reductions. The discussion on air quality should also note the impacts of increasing aeroallergens. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Discussion on air pollution weather CIDs has been moved to Section 12.4.0, which further distinguishes between ozone and PM discussions.
112379	90	35			air quality, PM and black carbon etc issues not only in US but west coast and prairies of Canada [Linda Mortsch, Canada]	TAKEN INTO ACCOUNT: Discussion on air pollution weather CIDs has been moved to Section 12.4.0. This also reduces the amount of regional detail that we can provide, leaving us with space only for some example studies (there is not enough space to include a comprehensive set of literature). We have also connected this discussion to Chapter 6, which takes a more dynamical approach connecting also with atmospheric chemistry with both global and regional findings.
14039	90	36	90	36	Change (Shen et al., 2017) by Shen et al. (2017) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43691	90	36			Read "Shen et al. (2017) used" rather than "(Shen et al., 2017) used" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
33985	90	36			Check for reference format. Change:« (Shen et al., 2017) » by «Shen et al. (2017) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
33987	90	37	90	38	Check format, -3 should be a superindex: "...project a PM2.5 mean increase of 0.4–1.4 µg m ⁻³ in the Eastern United States (with higher summertime increases) and a mean decrease of 0.3–1.2 µg m ⁻³ in the inter-mountain West, but noted substantial...". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We have homogenized units.
20795	90	41	90	45	Same remark as for page 40 lines 2-4 [philippe waldteufel, France]	TAKEN INTO ACCOUNT: We now have a global discussion of the surface CO2 concentration CID in Section 12.4.0 considering it is not very regional in nature. Atmospheric CO2 concentration at surface is an important CID considering its effects on agriculture and ecosystems.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126709	90	41			[CONFIDENCE] Respectfully question the inclusion of nutritional impacts as being a "virtually certain" outcome. There are extremely few studies on this; in fact, the Ziska paper might be the only one. There is not nearly sufficient available data to include this. [Trigg Talley, United States of America]	NOT APPLICABLE: Working Group I does not have the mandate to discuss impacts of CO2 concentration changes on nutritional aspects of agricultural production; this is the mandate of Working Group II (Chapter 5). Section 12.3 does mention the nutritional aspects noted by the reviewer with several studies that indicate this is an important area of consideration where climate information is needed to assess impacts and risk
64277	90	50	90	51	The table would be much more helpful at the beginning of the section re CID in North America to give the reader an overview right at the beginning. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: We considered placing this table at the beginning of Section 12.4.6, but found that this leads to confusion on specific CID changes prior to their discussion. The current setup also allows us to lead each regional section with maps and end with the summary CID change table.
55247	91	1	91	6	Why is confidence for an increase in fire activity in Mexico high, when there are no supporting references for Mexico in the discussion, whereas generally there is agreement about increases in western north america, but this is only categorized as medium confidence? [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have added literature on fire weather, noting specific connections to Mexico and also indicating North America wide findings that include Mexico. We have also re-assessed fire weather confidence in the Western United States (now high confidence).
441	91	3	91	3	I would suggest to remove lake acidity/acidification from table 12.8 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: We have removed lake acidity from table 12.8, but still include ocean acidification as this is an important driver of ecological changes along North American coasts.
64279	91	3	91	6	The Table gives a nice overview but unfortunately the numbers given in the Table are quite confusing and a bit too much to take in. Numbers are also not given for most CIDs, why is that the case? I think it is enough to colorcode the directional changes of the DICs without going to much into detail on how they change (i.e. numbers). If the readers wants to have more info regarding a specific CID they can go to the section in the text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Numbers presented in this table are footnotes that provide important distinctions between spatial patterns and subsets of climatic impact-driver changes. Removing these would lead to less accurate assessments given the AR6 regions. Chapter 12 climatic impact-driver change tables have been reconfigured to better address multiple scenarios and key concepts such as emergence, but are not meant to provide specific quantitative projections because each CID category has a large number of characteristics and metrics that cannot be represented by a single quantity.
40585	91	13	91	14	Note that the glossary has a definition for SIDS: "Small Island Developing States (SIDS), as recognised by the United Nations OHRLLS (Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States), are a distinct group of developing countries facing specific social, economic and environmental vulnerabilities (UN-OHRLLS, 2011). They were recognized as a special case both for their environment and development at the Rio Earth Summit in Brazil in 1992. Fifty-eight countries and territories are presently classified as SIDS by the UN OHRLLS, with 38 being UN member states and 20 being Non-UN Members or Associate Members of the Regional Commissions (UN-OHRLLS, 2018)." [TSU WGI, France]	Taken into account. Sentence was revised to refer to the Glossary for the definition of SIDS, and to the Cross-Chapter Box Atlas.2.
33989	91	13	91	14	Re-write: "The small island developing states are small island states and territories in the Caribbean, Pacific, Atlantic and Indian Oceans and the Mediterranean (Nurse et al., 2014; Shultz et al., 2019)". Avoid writing twice small island states. [Guiomar Rotllant, Spain]	Not applicable. Sentence has been deleted in this chapter. A revised version of this sentence is in Cross-Chapter Box Atlas.2.
126711	91	13	91	14	The Caribbean is a "sea" not an ocean. Rephrase as: "... states and territories in the Pacific, Atlantic, and Indian Oceans, and the Caribbean and Mediterranean Seas ..." [Trigg Talley, United States of America]	Accepted. The "Caribbean" was initially used here to define the region. However, sentence was revised to refer to the "Caribbean Sea" as suggested, for clarity.
33991	91	13	91	28	Confusing whether Mediterranean small islands will be taken in account in this section. [Guiomar Rotllant, Spain]	Taken into account. Paragraph has been revised to explicitly state that small islands in the Caribbean and the Pacific are considered in the assessment of this chapter.
2761	91	13	92	27	There is no mention of the drought risk in SIDS. Changes in precipitation patterns, so extended dry seasons and shorter but more intense wet seasons should be noted. [Carianne Johnson, Belize]	Not applicable. Text referred to in the comment has been shortened due to space constraints. However, the discussion on drought in the small islands can be found in Section 12.4.7.2, which also refers to Cross-Chapter Box Atlas.2.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64041	91	13		14	How can we gather a group of islands of different climatic zones especially in terms of marine life and Coastal within one sub-topic. It is advisable to separate them back into further subtopics or to group each under its climatic and geographical regions previously stated or to their open and closed ocean section following. This is to avoid repetition in marine and coastal data and help create new conclusions when they are related to their original zones. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Grouping for the small islands are based on geographic region. We consider the Caribbean and Pacific Islands as distinct groupings and note when there is strong heterogeneity within these groups. We also note additional small islands in the Indian Ocean, Mediterranean, Atlantic, and Arctic regions. Cross-Chapter Box Atlas.1 provides additional information about how we assess climatic impact-driver changes in Small Islands.
126713	91	15	91	15	"climate-related impact drivers affecting small islands" This phrase is awkward. Perhaps rephrase as "drivers of different climate impacts affecting small islands"? [Trigg Talley, United States of America]	Taken into account. Sentence was revised by replacing the phrase with "climatic impact-drivers affecting small islands".
325	91	18	91	19	(1) have MOSTLY tropical climates is accurate; (2) influences not influence; (3) delete "Given their geographical location", start with Seasonal [Patrick Nunn, Australia]	Editorial. Sentence was revised.
31663	91	19	91	23	Long sentence, not clear. I suggest to split the sentence in two. [Alessandro Pezzoli, Italy]	Taken into account. Sentence was shortened and revised to refer to the discussion in Cross-Chapter Box Atlas.2.
100879	91	23	91	24	AMV instead of AMO should be used, and PDV should replace PDO. These modes should be referred to AnnexVI.8 and AnnexVI.7 respectively. While IOD definition should refer to Annex VI.5 [Corti Susanna, Italy]	Not applicable. Sentence has been revised but moved to Cross-Chapter Box Atlas.2.
3157	91	24	91	24	"El Niño Southern Oscillation"should be changed to "El Niño and Southern Oscillation" [Hui Wang, China]	Not applicable. Text was moved to Cross-Chapter Box Atlas.2, which defined ENSO as "El Niño-Southern Oscillation", following Technical Annex IV.
126715	91	24	91	24	El Niño - Southern Oscillation should have a hyphen between "Niño" and "Southern". Be consistent throughout the document -- for example, see page 32, line 31 (Africa section), page 62, line 16, etc. [Trigg Talley, United States of America]	Not applicable. Text was moved to Cross-Chapter Box Atlas.2, which defined ENSO as "El Niño-Southern Oscillation", following Technical Annex IV, and as suggested.
327	91	25	91	25	I am not sure the IOD affects climate variability in the Caribbean and Pacific, save from a great distance [Patrick Nunn, Australia]	Not applicable. Text has been moved to Cross-Chapter Box Atlas.2, which also considered small islands in the Western Indian Ocean.
126717	91	25	91	25	Add "North Atlantic Oscillation (NAO)" to the list (as in Jury et al. 2007, doi:10.1029/2006JD007541). [Trigg Talley, United States of America]	Not applicable. Text has been moved to Cross-Chapter Box Atlas.2. Discussion of the NAO is beyond the purview of Chapter 12, and the suggested reference is not recent compared to others on the NAO within WGI.
126719	91	25	91	26	"... which have been associated with occurrences of flooding and drought in the islands (Kruk et al., 2015)." This Kruk et al. paper is about trends in extreme rainfall in the western Pacific Islands (does not address Caribbean or Atlantic modes), and does not specifically analyze "flooding" and "drought" driven by these modes. It does have a nice discussion of how each region is affected by these modes. Suggest adding Caribbean citation(s), a Hawaii citation that addresses the impact of ENSO, PDO and PNA on rainfall, and rephrasing as: "... which have been associated with extreme events in the islands (Frazier et al., 2018; Kruk et al., 2015; Jury et al., 2007; Stephenson et al., 2014)." Here is the Hawaii paper: Frazier (https://doi.org/10.1007/s00382-017-4003-4). And maybe these two for the Caribbean: Stephenson (Caribbean trends in extremes, linked to AMO), https://doi.org/10.1002/joc.3889 ; Jury (ENSO and NAO in Caribbean), doi:10.1029/2006JD007541 [Trigg Talley, United States of America]	Not applicable. Text has been moved to Cross-Chapter Box Atlas.2 but was revised with the suggested recent references added.
126721	91	28	91	28	"given their situation" What is their situation? This is not the right word. Do authors mean their geographic location? [Trigg Talley, United States of America]	Accepted. Text was revised to replace "given their situation" with "given their geographical location".
126723	92	2	92	2	"as well as their vulnerability and the impacts of climate change" should be "as well as their vulnerability to the impacts of climate change". [Trigg Talley, United States of America]	Accepted. Text was revised as suggested.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126725	92	5	92	7	<p>More current references for impacts on US-Pacific and US-Caribbean to cite: Keener, V., D. Helweg, S. Asam, S. Balwani, M. Burkett, C. Fletcher, T. Giambelluca, Z. Grecni, M. Nobrega-Olivera, J. Polovina, and G. Tribble, 2018: Hawai'i and U.S.-Affiliated Pacific Islands. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 1242-1308. doi: 10.7930/NCA4.2018.CH27.</p> <p>Gould, W.A., E.L. Diaz, (co-leads), N.L. Alvarez-Berros, F. Aponte-Gonzalez, W. Archibald, J.H. Bowden, L. Carrubba, W. Crespo, S.J. Fain, G. Gonzalez, A. Goulbourne, E. Harmsen, E. Holupchinski, A.H. Khalyani, J. Kossin, A.J. Leinberger, V.I. Marrero-Santiago, O. Martinez-Sanchez, K. McGinley, P. Mendez-Lazaro, J. Morell, M.M. Oyola, I.K. Pares-Ramos, R. Pulwarty, W.V. Sweet, A. Terando, and S. Torres-Gonzalez, 2018: U.S. Caribbean. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 809–871. doi: 10.7930/NCA4.2018.CH20. [Trigg Talley, United States of America]</p>	Accepted. Suggested references have been added.
126727	92	7	92	11	<p>Recommend reviewing the Caribbean chapter of the Fourth U.S. National Climate Assessment (https://nca2018.globalchange.gov/chapter/20/). There is discussion of more recent literature based on CMIP5 that suggests a lower projected precipitation decline compared to the CMIP3 models, as well as example dynamically downscaled projections of precipitation change for the US Caribbean based on CMIP5 models. [Trigg Talley, United States of America]</p>	<p>Taken into account. Suggested reference has been reviewed to cite some of the report's relevant references (Khalyani et al. 2016; Bhardwaj et al. 2018), as well as Bowden et al. (2021). Other references were not included since these are either project reports, datasets or not recent literature.</p>
126729	92	9	92	11	<p>Need more references here to represent higher resolution regional downscaling (CMIP3 and CMIP5) for more islands, that didn't make it into the AR5 because of the publication date. Here are a few from the Pacific Region:</p> <p>Elison Timm, O., 2017: Future warming rates over the Hawaiian Islands based on elevation-dependent scaling factors. International Journal of Climatology, 37, 1093-1104. doi:10.1002/joc.5065.</p> <p>Elison Timm, O., T. W. Giambelluca, and H. F. Diaz, 2015: Statistical downscaling of rainfall changes in Hawai'i based on the CMIP5 global model projections. Journal of Geophysical Research Atmospheres, 120 (1), 92-112. doi:10.1002/2014JD022059.</p> <p>Zhang, C., Y. Wang, K. Hamilton, and A. Lauer, 2016: Dynamical downscaling of the climate for the Hawaiian Islands. Part II: Projection for the late twenty-first century. Journal of Climate, 29 (23), 8333-8354. doi:10.1175/JCLI-D-16-0038.1.</p> <p>Australian Bureau of Meteorology, and CSIRO, 2014: Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports 2014. Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO), Melbourne, Australia. [Trigg Talley, United States of America]</p>	<p>Taken into account. Two of the references suggested on high resolution regional downscaling have been added to the text (i.e. Elison Timm et al. 2015; Zhang et al. 2016).</p>
63671	92	20	92	21	<p>Not clear if there is no drought risk, or there is an excess of precipitation as an opposing effect; further in text it says it is the wetter conditions, so it is worthy mentioning it here [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]</p>	<p>Taken into account. Text was revised and moved to the Aridity subsection (12.4.7.2).</p>
126731	92	20	92	22	<p>Declines in groundwater recharge are projected on the leeward sides of Maui island, Hawaii. Would be good to note that ""topography and elevation have a significant impact on freshwater availability in different island microclimates"". Citation: Mair, A.; Johnson, A.G.; Rotzoll, K.; Oki, D.S. Estimated Groundwater Recharge from a Water-Budget Model Incorporating Selected Climate Projections, Island of Maui, Hawai'i; US Geological Survey: Reston, VA, USA, 2019; p. 46; Brewington, L.; Keener, V.; Mair, A. (2019) Simulating Land Cover Change Impacts on Groundwater Recharge under Selected Climate Projections, Maui, Hawai'i. Remote Sens. 11, 3048. https://doi.org/10.3390/rs11243048. [Trigg Talley, United States of America]</p>	<p>Taken into account. Text was moved to the Aridity subsection (within 12.4.7.2) and was revised as suggested.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126733	92	20	92	22	"Declines in freshwater availability are also projected with increasing drought risk in the Caribbean, unlike in some islands in the western Pacific and northern Indian Ocean (Karnauskas et al., 2016; Hoegh-Guldberg et al., 2018)." From these references, how can Pacific Islands not also see declines in freshwater availability with increased drought risk? Almost all small islands (except for those with very large projected increases in rainfall) will experience declines in freshwater availability, especially atolls. Remove the second half of the sentence and generalize it so it reads as: "Declines in freshwater availability are also projected for many islands, with increasing drought risk (Karnauskas et al., 2016; Hoegh-Guldberg et al., 2018)." [Trigg Talley, United States of America]	Taken into account. Text was revised and moved to the Aridity subsection (12.4.7.2).
14041	92	34	92	34	Indicate if Atlas 5.8.1 is a section [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Format and reference to the relevant Atlas section (Section Atlas.10.2) was updated in the text.
14043	92	35	92	35	Indicate if Atlas 5.8.3 is a section [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Format and reference to the relevant Atlas section (Section Atlas.10.4) was updated in the text.
126735	92	35	92	38	Australian Bureau of Meteorology, and CSIRO, 2014: Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports 2014. Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO), Melbourne, Australia (https://www.pacificclimatechangescience.org/publications/reports/climate-variability-extremes-and-change-in-the-western-tropical-pacific-2014/) has regional temperature projections for the Pacific that can be added to this sentence. [Trigg Talley, United States of America]	Accepted. Suggested reference is cited in the text.
57457	92	35	92	38	Figure Atlas.40 is cited as referring to the Caribbean, but it contains information about Europe [Daniel Martinez Castro, Cuba]	Taken into account. Correction was made in the corrigenda to update text to refer to Figure Atlas.12, which shows the global map of projected temperature changes.
14045	92	37	92	37	Change 1°-2°C [2°-4°C] by 1°C-2°C [2°C-4°C] [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Text was revised as suggested.
14047	92	41	92	41	Indicate if Atlas 5.8.1 is a section [Maria Amparo Martinez Arroyo, Mexico]	Not applicable. Citation of Atlas section was removed. Temperature extremes are assessed in Chapter 11 so relevant sections in Chapter 11 were cited in the text.
126737	92	43	92	43	Define "WBGT" here, as you redefine ENSO in each section. "wet bulb globe temperature (WBGT)" [Trigg Talley, United States of America]	ACCEPTED: We define WBGT at its first use in Section 12.3 and again within 12.4 (also 12.4.1, 12.4.5, 12.4.7).
110189	92	44	92	46	Please check this number as it seems unfeasibly large. That is 1.2C over period trend - is this specifically e.g. hottest day or is this as presently implied that every day is on average that much warmer? I guess if wet bulb temperatures are increasingly rapidly this is feasible but these are small islands so temperature changes will be constrained by the oceans surrounding which are changing much more slowly. Without careful explaining this result communicated this way could be easy target for those wishing to discredit the report. [Peter Thorne, Ireland]	Taken into account. Ramirez-Beltran et al. (2017) did estimate a trend of 0.05C/year for the maximum daytime heat index over the 1980-2014 period. Nonetheless, we have removed the estimated value to highlight the direction of the trend.
14049	92	48	92	49	Change (Hoegh-Guldberg et al., 2018) by Hoegh-Guldberg et al. (2018). [Maria Amparo Martinez Arroyo, Mexico]	Not applicable. Text has been revised to cite the assessment in Chapter 11, instead of Hoegh-Guldberg et al. (2018).
14051	92	50	92	51	Standardize the size of the letters in the sentence (calculated using the methodology developed by NOAA's National Weather Service [Maria Amparo Martinez Arroyo, Mexico]	Not applicable. Text has been revised.
110191	92	50	92	54	But this is no different to the recent trend reported previously (another reason to question that value carefully) [Peter Thorne, Ireland]	Taken into account. Text was revised by removing the estimated values, highlighting the direction of the trend and citing assessment in Chapter 11.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126739	92	52	92	52	"Intra-Americas Region" is not a very common term. Also, no need to capitalize "Intra" or "Region" ("region" was not capitalized on line 45 same page). The paper this is referring to uses this phrase, but for better readability and to avoid confusion (you already use "Mesoamerica and Caribbean region" on line 45), it should say "the Caribbean region". [Trigg Talley, United States of America]	Accepted. "Intra-Americas Region" was replaced with "CAR", which refers to the Caribbean region.
126741	93	1	93	3	Increases in numbers of extreme hot days at island-scale in the US-Affiliated Pacific are available at: Marra, J. J., and M. C. Kruk, 2017: State of Environmental Conditions in Hawaii and the U.S. Affiliated Pacific Islands under a Changing Climate: 2017. NOAA National Centers for Environmental Information, https://statesummaries.ncics.org/sites/default/files/pdfs/PI_State_of_the_Environment_2017.pdf . [Trigg Talley, United States of America]	Taken into account. Suggested reference has more information on observed increase in extreme hot days in the western and central Pacific; values of projections are for average temperature. In any case, this information is relevant for the assessment in Chapter 11, which is cross-referenced in the text.
98185	93	11	93	13	Could add here that: Analysis of GPCP precipitation trends for the period 1901-2010 find some evidence for detectable decreasing trends for some gridpoints within the Caribbean and Bahamas region, though this was not found for the more recent 1951-2010 trends (Knutson and Zeng 2018). [Thomas Knutson, United States of America]	Taken into account. Suggested text has been summarized with citation of Knutson and Zeng (2018) and Section Atlas.10.2 (which also discussed this finding and cited Knutson and Zeng (2018)).
2763	93	11	93	13	I have no confidence in this statement, please consider deleting and finding evidence elsewhere [Carianne Johnson, Belize]	Taken into account. The statement has been revised to consider another reviewer's comment to indicate that detectable decreasing trends are noted in some areas in the Caribbean over the 1901-2010 period, but not in the 1951-2010 (Knutson and Zeng, 2018). The text also refers to the assessment done in Section Atlas.10.2 and Cross-Chapter Box Atlas.2 Table 1.
33993	93	12			Format, homogenise. Change: "20th" by "20th". [Guiomar Rotllant, Spain]	Editorial. Formatting of "20th" was checked to ensure consistency in the text.
14053	93	13	93	13	Indicate if Atlas.14 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Not applicable. Text was revised to cite Section Atlas.10.2 and Cross-Chapter Box Atlas.2 Table 1.
126743	93	15	93	15	Since Hawaii is referenced in other sections, add Hawaii literature reference here. Lots of studies document drying trends in precipitation. Add: "...Table 11.5). In some areas of Hawaii, significant drying trends have been documented during the 1920-2012 period (Frazier and Giambelluca, 2017)." Citation: Spatial trend analysis of Hawaiian rainfall from 1920 to 2012, https://doi.org/10.1002/joc.4862 . [Trigg Talley, United States of America]	Taken into account. Text has been summarized with citation of assessment in Atlas.10.2 and Cross-Chapter Box Atlas.1, Table 1 (which also discussed this finding and cited Frazier and Giambelluca (2017)).
126745	93	16	93	16	"... in parts of the western and equatorial Pacific, and southern ocean by 2041-2060, ..." Why is "and southern ocean" included here? Do authors mean the Southern Pacific Ocean? Or the Southern Ocean around Antarctica? In which case, it should be capitalized, but why would it be included in this small islands section? Perhaps just remove ", and southern ocean". [Trigg Talley, United States of America]	Accepted. Text was revised to remove "and southern ocean".
33995	93	31	93	45	Format, homogenise. Change: "21st" by "21st". [Guiomar Rotllant, Spain]	Editorial. Formatting of "21st" was checked to ensure consistency in the text.
126747	93	34	93	34	Pacific basin changes in extreme precipitation can be found in: Kruk, M. C., A. M. Lorrey, G. M. Griffiths, M. Lander, E. J. Gibney, H. J. Diamond, and J. J. Marra, 2015: On the state of the knowledge of rainfall extremes in the western and northern Pacific basin. International Journal of Climatology, 35 (3), 321--336. doi:10.1002/joc.3990. [Trigg Talley, United States of America]	Taken into account. Suggested reference has been cited in Cross-Chapter Box Atlas.2, Table 1, which has been cited in the text.
126749	93	37	93	40	Start sentence with "In Tobago, trends in extreme precipitation were more pronounced ..." [Trigg Talley, United States of America]	Not applicable. A revised version of the text was moved to Section 11.4.2.
74651	93	38	93	38	... significant increasing trends of 0.59 mm/day in daily intensity compared to the uncertainty in measuring rainfall which is 0.1 is not significant for a period of one day because of rainfall in these areas are very high (hundreds mm) [Moulay Driss HASNAOUI, Morocco]	Not applicable. A revised version of the text was moved to Section 11.4.2. Nonetheless, based on Stephenson et al. 2014, the statistical significance of the trend in daily rainfall intensity (SDII) (among other indices) was assessed at the 5% level using t-test.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126751	93	41	93	42	Add reference: "... southwestern French Polynesia and the southern subtropics (McGree et al., 2019)." Citation: Recent Changes in Mean and Extreme Temperature and Precipitation in the Western Pacific Islands, https://doi.org/10.1175/JCLI-D-18-0748.1 [Trigg Talley, United States of America]	Not applicable. A revised version of the text was moved to Section 11.4.2, which cites Section Atlas.10. Section Atlas.10 cites McGree et al. (2019).
33997	93	44			Homogenise percentile format. Change: "99th" by 99th". [Guiomar Rotllant, Spain]	Not applicable. Text has been revised such that "99th" was removed in the text.
110195	93	49	93	51	As written this erroneously implies that these are only a recent phenomenon whereas presumably there is abundant evidence for such events prior to their direct recording and analysis in recent years? [Peter Thorne, Ireland]	Taken into account. Sentence was revised for clarity.
11911	93	49	93	55	it's important to note that some small, steep islands, including those in the Caribbean, are vulnerable to landslides during tropical cyclone rainfall. Major landsliding occurred, for example, during 2017's Hurricane Maria in Puerto Rico: Bessette-Kirton, E. K., Cerovski-Darriau, C., Schulz, W. H., Coe, J. A., Kean, J. W., Godt, J. W., Thomas, M. A., & Hughes, S. K. (2019). Landslides triggered by Hurricane Maria: assessment of an extreme event in Puerto Rico. <i>GSA Today</i> 29 (6). [Amy East, United States of America]	Taken into account. Text was added with the suggested reference: "Heavy rainfall, such as from tropical cyclones, can trigger landslides over steep terrain in the small islands (Bessette-Kirton et al. 2019)."
126753	94	1	94	1	Declines in groundwater recharge are projected on the leeward sides of Maui island, Hawaii, although islandwide recharge is expected to increase. Citation: Mair, A.; Johnson, A.G.; Rotzoll, K.; Oki, D.S. Estimated Groundwater Recharge from a Water-Budget Model Incorporating Selected Climate Projections, Island of Maui, Hawai'i; US Geological Survey: Reston, VA, USA, 2019; p. 46; Brewington, L.; Keener, V.; Mair, A. (2019) Simulating Land Cover Change Impacts on Groundwater Recharge under Selected Climate Projections, Maui, Hawai'i. <i>Remote Sens.</i> 11, 3048. https://doi.org/10.3390/rs11243048 . [Trigg Talley, United States of America]	Taken into account. Text and suggested references have been added in the discussion on Aridity in Section 12.4.7.2.
98187	94	2	94	4	You should add a low-confidence qualifier for the statement about slowdown in TC translation speeds in most basins, or just delete the sentence, since the original study making this claim (Kossin 2018) was challenged by two commentaries (Moon et al. 2019; Lanzante 2019). Kossin's (2019) response then emphasized more a century scale declining trend in TC translation speed that has occurred over the continental U.S. only. [Thomas Knutson, United States of America]	Taken into account. A low confidence qualifier was added with the citation of Section 11.7.1.2, which discussed TC translation speed. (Note that this comment addresses text in page 95, not page 94.)
102699	94	3	94	4	availability for drinking water? (because groundwater quality has deteriorated due to saltwater intrusion?) [Philippe Tulkens, Belgium]	Noted. Text was referring to availability of freshwater in general.
126755	94	9	94	9	"more frequent extreme IOD events" Add citation? Also, add "ENSO events" too, as these drive most drought events in the western Pacific Islands. [Trigg Talley, United States of America]	Not applicable. The text referred in this comment has been removed since Box 11.5 was also removed in Chapter 11.
14055	94	9	94	9	Change {Box 11.5} by {Box 11.5} [Maria Amparo Martinez Arroyo, Mexico]	Not applicable. Box 11.5 was removed in Chapter 11.
41855	94	13	94	13	The reference "Peterson et al., 2002", is little bit old! [JACQUES ANDRE NDIONE, Senegal]	Not applicable. Text has been revised such that reference is no longer cited.
126757	94	15	94	15	Should be "western Pacific" not "West Pacific" to be consistent throughout. [Trigg Talley, United States of America]	Not applicable. The text referred in this comment has been removed since Box 11.5 was also removed in Chapter 11.
126759	94	16	94	16	Add "McGree et al., 2016", Trends and Variability in Droughts in the Pacific Islands and Northeast Australia, https://doi.org/10.1175/JCLI-D-16-0332.1 [Trigg Talley, United States of America]	Not applicable. The text referred in this comment has been removed since Box 11.5 was also removed in Chapter 11.
126761	94	18	94	18	"droughts will increase" Specify which aspects of drought will "increase" (e.g., frequency, severity, intensity, duration, extent). [Trigg Talley, United States of America]	Taken into account. Sentence was revised for clarity to specify increases in drought frequency, duration, magnitude and extent.
33999	94	19	94	21	Format, homogenise. Change: "21st" by "21st". [Guiomar Rotllant, Spain]	Not applicable. Text referred in the comment has been removed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
43693	94	29			Read "but Trauernicht et al. (2015) notes the difficulty" rather than "but (Trauernicht et al., 2015) notes the difficulty" [Cyriaque Rufin Nguimalet, Central African Republic]	Editorial. Text was revised, as suggested.
34001	94	29			Check for reference format. Change: "(Trauernicht et al., 2015)" by "Trauernicht et al. (2015) ». [Guiomar Rotllant, Spain]	Editorial. Text was revised, as suggested.
15875	94	32	94	32	Another example about wildfire projection in the Mediterranean area (Emmanuel Garbolino, Valérie Sanseverino-Godfrin, Guillermo Hinojos-Mendoza. Describing and predicting of the vegetation development of Corsica due to expected climate change and its impact on forest fire risk evolution. Safety Science, Elsevier, 2016, 88, pp.180-186. (10.1016/j.ssci.2016.02.006). (hal-01295682)) The results of this study show a potential increase of the extent of wildfires in Corsica towards 2100. This example can be transposed to other small islands in the Mediterranean area. [Emmanuel Garbolino, France]	Not applicable. Assessment for the Mediterranean can be found in the Europe section.
51891	94	34	94	34	Suggested edit: 'The observed drying trend in the small islands has increased the frequency and severity of droughts in recent years.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Not applicable. Text referred in the comment has been removed.
126763	94	42	94	42	For observations and projected changes in wind speed for USAPI, see: Marra, J. J., and M. C. Kruk, 2017: State of Environmental Conditions in Hawaii and the U.S. Affiliated Pacific Islands under a Changing Climate: 2017. NOAA National Centers for Environmental Information, https://statesummaries.ncics.org/sites/default/files/pdfs/PI_State_of_the_Environment_2017.pdf . [Trigg Talley, United States of America]	Taken into account. Text has been added on observed trends in wind speed based on Marra and Kruk (2017). However, information on projected changes in winds have not been included since the reference used was based on CMIP3 output.
34003	94	46			Unit format, homogenise. Change: « 0.4 m/s » by « 0.4 m s ⁻¹ ». [Guiomar Rotllant, Spain]	Editorial. Changed format of units as suggested.
34005	95	2			Format, homogenise. Change: "20th" by "20th". [Guiomar Rotllant, Spain]	Editorial. Formatting of "20th" was checked to ensure consistency in the text.
14057	95	4	95	4	Indicate if 11.7.1.2 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Format and reference to Section 11.7.1.2 was updated in the text.
51893	95	7	95	9	It would be useful to give a bit more detail here around some of the differences per region referred to - right now the reference only speaks to one aspect in the sub-tropical central Pacific, but a comparison to other regions would be helpful - "Future changes in TCs, including more frequent Category 4-5 TCs (medium confidence) and increased average TC rain rates (very high confidence), are expected to exacerbate wind and coastal hazards on the small islands but will differ per region (11.7.1.5; Box 11.5) (medium confidence)" [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Text has been revised to discuss tropical cyclone changes in other regions, where possible.
14059	95	8	95	8	Indicate if 11.7.1.5 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Format and reference to Section 11.7.1.5 was updated in the text.
89917	95	8	95	11	The information contain in chapter 12 is not as consistent as it should be. For instance, the information assessed on TC in small islands here is at variance with box 11.5, which appears to contain robust and precise information. Chapter 12 needs to be more precise to convey a clearer message. There is no figure 11.23. There is a figure 2 and a figure 3. [Joanne Deoraj, Trinidad and Tobago]	Taken into account. The assessment has been revised to be consistent with Section 11.7.1.5. References to Box 11.5 and Figure 11.23 were removed in the text.
100019	95	8	95	11	It appears that there are some inconsistencies introduced here with regard to the tropical cyclone assessment in Chapter 11 (e.g. Box 11.5). Please make sure that the assessment here is in-line with the corresponding process chapter. In addition, please make sure to reference existing figures (Figure 11.23 does not exist). [Caroline Eugene, Saint Lucia]	Taken into account. The assessment has been revised to be consistent with Section 11.7.1.5. References to Box 11.5 and Figure 11.23 were removed in the text.
84159	95	8	95	11	There are some inconsistencies introduced here with regard to the tropical cyclone assessment in Chapter 11 (e.g. Box 11.5). Please make sure that the assessment here is in-line with the corresponding process chapter. In addition, please make sure to reference existing figures (Figure 11.23 does not exist). [Jeffers Cheryl, Saint Kitts and Nevis]	Taken into account. The assessment has been revised to be consistent with Section 11.7.1.5. References to Box 11.5 and Figure 11.23 were removed in the text.
34007	95	8	95	39	Format, homogenise. Change: "21st" by "21st". [Guiomar Rotllant, Spain]	Editorial. Formatting of "21st" was checked to ensure consistency in the text.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14061	95	13	95	13	Indicate if 11.7.1.5 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Format and reference to Section 11.7.1.5 was updated in the text.
131479	95	15	95	16	What aspect of hurricanes is increasing? [Hans Poertner and WGII TSU, Germany]	Taken into account. Sentence was revised to clarify that it is the number of hurricanes that is increasing.
51895	95	20	95	21	Suggestion addition: 'Projected changes in tropical cyclone track, frequency, intensity and associated rainfall can increase wind and coastal hazards faced by small islands, especially when compounded by (very likely) rising sea levels.' - Reference to line 39 on the same page. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Not applicable. Text has been revised to focus on tropical cyclones.
126765	95	27	95	27	Recommend adding regional influence of ENSO events on impacts. For example, in the west and south Pacific, during El Niño/La Niña, sea levels are below/above average, which can worsen local impacts. See https://nca2018.globalchange.gov/chapter/27#fig-27-3 , and Sutton, J., N. Luchetti, E. Wright, M. C. Kruk, and J. J. Marra, 2015: An El Niño Southern Oscillation (ENSO) based precipitation climatology for the United States Affiliated Pacific Islands (USAPI) using the PERSIANN Climate Data Record (CDR). NOAA National Centers for Environmental Information, Asheville, NC, 478 pp. [Trigg Talley, United States of America]	Rejected. The section focused on estimates of relative SLR rather than the dynamics behind storm events considering space constraints.
34011	95	31	95	33	Unit format, homogenise. Change: "mm/yr" by "mm yr-1". [Guiomar Rotllant, Spain]	Editorial. Changed format of units as suggested.
34009	95	32	95	37	Unit format, homogenise. Change: "mm/yr" by "mm yr-1". [Guiomar Rotllant, Spain]	Editorial. Changed format of units as suggested.
329	95	39	95	39	"very likely" - I cannot think of anyone who says this is not "almost certain" - suggest change here (and elsewhere, like p 97, line 9) [Patrick Nunn, Australia]	Rejected. Text on RSLR is consistent with the assessment in Chapter 9.
126767	95	45	95	45	Authors use "swells and waves", but it is not clear why as both terms are of course waves. Do they mean "swells and wind sea"? Clarify. [Trigg Talley, United States of America]	Taken into account. Text was revised to remove "waves".
11913	95	47	95	47	spell out "extra-tropical cyclones", since these are not the same as the tropical cyclones that you are using the abbreviation TC for. [Amy East, United States of America]	Accepted. Text was revised as suggested.
41857	95	48	95	49	Is it relevant to cite these references "Hoeke et al., 2013; Merrifield et al., 2014"; we're doing the AR6! Recent peer review papers are priority... [JACQUES ANDRE NDIONE, Senegal]	Rejected. References on coastal flooding are limited and the cited references are fairly recent.
11915	95	50	95	50	Northwestern should be one word here [Amy East, United States of America]	Not applicable. Text has been revised.
87989	96	3	96	15	Two studies have modelled stormtides from tropical cyclones around Fiji and Samoa including projected changes to sea level and tropical cyclone frequency and intensity. They both find that the effect of SL change is produces the dominant change to recurrent intervals with TC changes mainly affecting storm tide likelihoods on longer (e.g. 100 year) recurrence intervals. McInnes, K.L., Hoeke, R.K., Walsh, K.J.E., O'Grady, J.G. and Hubbert, G.D. 2016: Tropical Cyclone Storm Tide Assessment for Samoa. Natural Hazards. 80: 425–444. DOI 10.1007/s11069-015-1975-4. McInnes, K.L., Walsh, K.J.E., O'Grady, J.G., Hoeke, R.K., Colberg, F. and Hubbert, G.D. 2014: Quantifying Storm Tide Risk in Fiji due to Climate Variability and Change. Global and Planetary Change. 116: 115–129. [Kathleen McInnes, Australia]	REJECTED: Here we specifically assess ETWLs that combine RSLR, tides, surge and wave setup and not storm tide (surge+tide)
24475	96	7	96	10	Dynamic simulation of future changes in extreme wave height (up to 1/10-years frequency) has been studied following reference. Shimura, T., N. Mori and M. A. Hemer (2016) Projection of tropical cyclone-generated extreme wave climate based on CMIP5 multi-model ensemble in the Western North Pacific, Climate Dynamics, Vol.49(4), pp.1449-1462. [Nobuhito Mori, Japan]	REJECTED: Relevant text on extreme waves alone has been deleted. Now we specifically assess ETWLs that combine RSLR, tides, surge and wave setup.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
331	96	17	96	35	90% of this section refers to "reef islands", often not explicitly which is potentially misleading. I think this section overemphasizes the apparent stability of reef/atoll island shorelines and implies that this situation is applicable to all small islands, which is far from being the case. [Patrick Nunn, Australia]	Taken into account. Section on coastal erosion has been substantially revised and now clearly indicates the threat of erosion
335	96	17	96	43	I understand why global references like Luijendijk, Mentaschi, Vousdoukas are used so often in this chapter but inevitably this gives only very crude regional data. For small islands there have been several books published since AR5 with lots of relevant data - it would be good to see some of this and more regionally focused references used here, but perhaps that is unrealistic. [Patrick Nunn, Australia]	Noted. Global references have been used for a more "regional" assessment, in contrast to estimates on coastal erosion that may be too localized. More detail of specific island changes may be provided in the WGII Small Islands chapter where space will be less constrained.
333	96	24	96	27	a parallel study was in Micronesia - Nunn, P.D., A. Kohler, and R. Kumar. 2017. "Identifying and assessing evidence for recent shoreline change attributable to uncommonly rapid sea-level rise in Pohnpei, Federated States of Micronesia, northwest Pacific Ocean." Journal of Coastal Conservation 21 (6):719-30. doi: 10.1007/s11852-017-0531-7. The important point is that Solomon Islands (never THE Solomon Islands) and Micronesia are the two parts of the western Pacific where sea level has been rising fastest in the past 50 years so this is where you would expect to see the greatest effects - like the erasure of entire islands. [Patrick Nunn, Australia]	Noted. There is not space in this section for sub-regional detail such as that suggested here, although it is possible that this information would be added within the WGII chapter on small islands. The only use of "the Solomon Islands" comes in a paper reference (Albert et al., 2016) that we cannot adjust.
11917	96	42	96	42	does "accretion" here mean vertical accretion (vertical elevation increase) or progradation (lateral growth of the shoreline)? From the numbers given (10 to 150 m), it sounds more likely to mean progradation; if so, it would be better to switch the terms. [Amy East, United States of America]	Not applicable. Text has been revised to provide estimates of shoreline retreat.
57459	97	4	97	4	Atlas Wrong figure number cited (Fig. Atlas 23 refer to maximum temperature, not to acidity) [Daniel Martinez Castro, Cuba]	NOT APPLICABLE: Due to space limitations, only a brief assessment of Ocean acidification is now given in 12.4 introduction. Small Islands are not specifically mentioned in relation to Ocean acidity in this new text in 12.4 introduction.
443	97	4	97	7	I would suggest to remove lake acidity/acidification from the text. [Leticia Cotrim da Cunha, Brazil]	Accepted. Text on lake acidity has been removed.
109441	97	24	92	25	Here, It is mentionned that "Projections indicate that the increased aridity in North Africa, is suspected to increase dust emission and transport in the future whereas p38 l 3 to 5, "Dust loadings and related air pollution hazards are projected to generally decrease in many regions of the Sahara and Sahel due to the changing winds", it does not seem totally consistent. [Sophie Szopa, France]	NOT APPLICABLE: Due to space limitations, only a brief and general assessment of Air Pollution is now given in 12.4 introduction. Small Islands are not specifically mentioned in relation to Air pollution in this new text in 12.4 introduction.
34013	97	29			Format, homogenise. Change: "21st" by "21st". [Guiomar Rotllant, Spain]	Not applicable. Text has been removed due to space constraints.
20797	97	32	97	34	Same remark as for page 40 lines 2-4 [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The CO2 assessment has now been changed to a brief and general assessment and moved to 12.4 introduction.
51897	97	43	97	45	There is a reference in chapter 9 on the climatological effect of Saharan Dust on tropical cyclones - suggest it would be useful amend this statement to reflect: "The assessed direction of change in climate impact drivers for the Caribbean and Pacific small islands.... Cold, Snow, Ice related climatic impact drivers and sand and dust storms are not broadly relevant in small islands." (reference in chapter 9 - 'Strong, J. D. O., Vecchi, G. A., and Ginoux, P. (2018). The Climatological Effect of Saharan Dust on Global Tropical Cyclones in a Fully Coupled GCM. J. Geophys. Res. Atmos. 123, 5538–5559. doi:10.1029/2017JD027808.')	Rejected. Although dust has an indirect effect on tropical cyclones, the assessment in this section was focused on climatic impact-drivers with direct impacts on the sectors and assets in the small islands rather than the atmospheric radiation, chemistry and dynamics that lead to such events.
445	97	50	97	50	I would suggest to remove lake acidity/acidification from table 12.9 [Leticia Cotrim da Cunha, Brazil]	Accepted. Lake acidity has been removed in Table 12.9.
110199	97	53	98	1	Should hail not at least be marked as relevant in this table? [Peter Thorne, Ireland]	Taken into account. A review of (recent) literature indicates hail as not broadly relevant to the small islands, in terms of being a hazard.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
110207	98	6			This section feels hugely redundant with and like it risks undermining the substantive assessments in 2-3-4 and 9. I would suggest removing this section which really has no regional focus at all. I cannot really see a case as to what it adds to the chapter which would be better focussing explicitly on impacts over inhabited regions. Otherwise it needs substantial redrafting to call out the regional and impacts aspect far more clearly. [Peter Thorne, Ireland]	Taken into account - text revised by removing redundancy but including necessary linkage to the assessment of previous chapters (e.g. Chapter 2,3,4,5,9). The major focus of this section is to provide regional climate information that can be used for vulnerability and impact assessment in WG II. This section is unique as to present information on climate impact driver for different oceanic regions associated with confidence intervals and time of emergence as presented in Table 12.10.
51899	98	8	98	11	Suggested revision: "The ocean makes up around two thirds of the planet's surface and is a vital part of the Earth's system. The ocean and its ecosystems support food production, freshwater supply, health and wellbeing, livelihoods, and other benefits, on which all people on Earth depend, whilst facilitating clean energy and global transportation." [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: sentence has been deleted
89347	98	13	98	24	It's not clear to me why these overall statements and assessments are relevant in this particular part of the AR6 assessment. Instead, these same statements are assessed in Chps 2, 9. I would have thought only aspects of regional change would be emphasized here, and otherwise links to the other chapters' discussions of SROCC and AR5 would suffice. The following paragraph seems to be much more on point, so I'd suggest radically shortening this paragraph or eliminating it. [Baylor Fox-Kemper, United States of America]	NOT APPLICABLE: paragraph has been deleted
110201	98	16	98	24	All this suggests that SROCC is the most recent word on the issue. In reality the 11 prior chapters have performed substantively new and updated assessments and these should be given here instead. Otherwise you are implying to users they should trust SROCC over the AR6 WG1 report. [Peter Thorne, Ireland]	NOT APPLICABLE: paragraph has been deleted
14063	98	30	98	30	Indicate if 12.3 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Editorial - text revised - "Section 12.3"
63649	99	3	99	7	"Marine heatwaves have become more frequent (high confidence) and longer in duration (medium confidence)" sentence has almost repeated in the following sentence once again. It becomes clear with the upcoming sentences, thus "Marine heatwaves are projected to become more frequent (high confidence) with longer duration (medium confidence)" part can be removed. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Taken into account. Text revised for observations and projections of MHW
89345	99	16	100	52	This section duplicates assessment and is potentially inconsistent with assessments in chapter 9. Duplication of assessments elsewhere should be eliminated, so that a focus on regional impacts assessment can be emphasized wherever italicized statements appear here. [Baylor Fox-Kemper, United States of America]	Taken into account - Consistency and redundancy of this section with Chapter 9 and other Chapters have been eliminated in the italicized statement.
6823	99	18	99	18	Comment 209 on Chapter 9 applies here also. The value quoted here needs to be reconciled with what is shown in Table 2.4. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Text revised by making appropriate linkage with Chapter 2
110203	99	25	99	27	Quoting such numbers without a range is a huge issue. It implies that IPCC somehow knows these values exactly - we don't and can't and so this absolutely needs rectifying via provision of a range, I may have missed earlier occurrences so the chapter as a whole should be checked carefully. No projected changes should be presented as a deterministic estimate and to do so risks undermining the report as a whole. [Peter Thorne, Ireland]	Taken into Account - Multi-model range of projection has been provided.
63645	99	27	99	32	Regarding to global warming of 2°C, based on result for species including in the sentence, may go to high confidence instead of medium confidence in terms of evaluating evidence. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Rejected. Keeping the "medium confidence" considering the evidence and agreement within the literature

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63647	99	29	99	42	It is mentioned in the sentence as " There is high confidence that upper ocean thermal stratification will continue to increase in the tropical and North Atlantic Ocean, Southern Ocean and North Pacific" based on which information? It would be clear to shortly touch upon. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: sentence has been deleted
100133	99	51	99	53	change to read '... and impact marine ecosystems in the Eastern Boundary Upwelling Systems (Wang et al., 2015a; Rykaczewski et al., 2015), including the Canary Upwelling Ecosystem (CUE) (Sousa et al., 2017a), as well as the Somali upwelling system (Sousa et al., 2016), and Western Iberian Peninsula (WIP) (Sousa et al., 2017b) (low confidence).' [Steven Bograd, United States of America]	NOT APPLICABLE: sentence has been deleted
100135	100	3	100	12	See my comments about MHW projections from Chapter 9 [Steven Bograd, United States of America]	Noted. These comments are relevant to Chapter 9
126769	100	3	100	12	The conclusions about marine heatwaves are misleading. The trends described (based on Frolicher et al., 2018; Frolicher and Laufkotter, 2018; Oliver et al., 2018) are actually due to the warming trend -- i.e., due to mean warming, historical temperature thresholds are exceeded more often. But that is different from an actual change in the the waves, which are variability around the mean. This issue is discussed in Jacox (2019, Marine Heatwaves in a Changing Climate, Nature). Ultimately the statements about high confidence in the increasing intensity, duration, and frequency of marine heatwaves will be wrong. A more appropriate handling of the issue would be to discuss the trend and heatwaves separately (which is actually how the sections are organized), and then the combination of the two could be called "Extreme Heat". This would match the handling of sea level, in which sea level rise is distinct from waves and tides, but authors can add together to produce Extreme Sea Level. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This is similar to our treatment of atmospheric extreme heat and the key distinction is that we are interested in impact-drivers where climate changes are likely to cause a response in the underlying natural and/or human systems. Heatwaves can change due to a shift in the frequency of extreme events, but also due to an increasing mean temperature condition that means that a smaller deviation from the mean can cause high temperatures. From a purely statistical vantage point the frequency of 'extreme heat' does not depend on the mean temperature, but impacts assessments related to marine heatwaves must also factor in thresholds of system tolerance that are more concerned with the intensity, frequency, duration, seasonal timing and geographical extent of exceedances than statistical values that shift with the mean. Therefore, from the impacted sector's perspective both the mean and variability shifts are important to factor in to understand the risk of extreme marine heat.
51901	100	3	100	12	Where this section is considering the regional differences in CIDs, it would be useful to also discuss the potential for MHWs in the deeper ocean, while there is uncertainty in these due to the lack of in situ measurements, the impacts could be significant across a broad range of marine ecosystems. The discussion should recognise that regional differences in MHWs may be driven by ocean dynamics as well as SST. References such as Schaeffer, A., and M. Roughan (2017),, Subsurface intensification of marine heatwaves off southeastern Australia: The role of stratification and local winds, Geophys. Res. Lett., 44, 5025–5033, doi:10.1002/2017GL073714, could be considered. It would be useful to explain whether future MHW are likely to expand both across the ocean surface and at depth. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Consistency has been checked and linkage made with the Box 9.2. Table 12.2 also notes the importance of marine heatwaves for deep sea ecosystems.
89343	100	3	100	12	This section duplicates assessment and is potentially inconsistent with assessments in cross-chapter box 9.1. Either that box should be relocated to here or this section should be radically shortened to include just a basic description and linkage to that box. [Baylor Fox-Kemper, United States of America]	Taken into account. Consistency has been checked and linkage made with the Box 9.2. This portion of CH12 therefore focuses on extending the more general discussion on marine heatwaves from Box 9.2 into a regional CID perspective.
20289	100	4	100	7	Is it necessary to repeat almost identically that marine heatwaves are expected to increase in frequency and duration? [philippe waldteufel, France]	Taken in to account - Text revised to separate the assessment on historical and future projections
63651	100	7	100	7	Regarding future modelling, the uncertainty language which is "low confidence" here, can be changed as "unlikely". [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Rejected. Low confidence can be used for representing uncertainties in the future. A likelihood statement requires a different assessment, and is generally only provided when there is at least medium confidence.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55249	100	17	100	38	<p>First paragraph of Section 12.4.8.3 mentions the increased significant wave height in historical period due to sea ice loss. However, there is nothing mentioned in the future projections in that regard. Recent studies (Casas-Prat and Wang, 2020a, 2020b) show notable increase in wave height by the end of the century, for which sea-ice retreat plays a major role.</p> <p>Casas-Prat, M and Wang, X.L. (2020a), "Projections of extreme ocean waves in the Arctic and potential implications for coastal inundation and erosion", Journal of Geophysical Research: Oceans, accepted.</p> <p>Casas-Prat, M. and Wang, X.L. (2020b), "Sea-ice retreat contributes to projected increases in extreme Arctic ocean surface waves", Geophysical Research Letters, https://doi.org/10.1029/2020GL088100. [Nancy Hamzawi, Canada]</p>	NOT APPLICABLE: section has been deleted
45071	100	19	100	21	Please check for a possible contradiction: "have been increasing in the ... North Atlantic (Bertin et al., 2013; Wang et al., 2014; Bromirski and Cayan, 2015), ... and decreased in the North Atlantic" [Christophe Deissenberg, Luxembourg]	NOT APPLICABLE: section has been deleted
3159	100	19	100	21	The research content and results are not found in the related reference paper: "Recent studies have shown that storm wave heights have been increasing in the North Pacific (Bromirski et al., 2013), North Atlantic (Bertin et al., 2013; Wang et al., 2014; Bromirski and Cayan, 2015), the Southern Ocean (Hemer, 2010) and decreased in the North Atlantic and Mediterranean Sea (Shimura et al., 2015)." [Hui Wang, China]	NOT APPLICABLE: section on marine storms has been deleted
39427	100	19	100	22	No uncertainty language? [Lourdes Tibig, Philippines]	NOT APPLICABLE: section has been deleted
55255	100	19	100	22	<p>"19 Recent studies have shown that storm wave heights have been increasing 20 in the North Pacific (Bromirski et al., 2013), North Atlantic (Bertin et al., 2013; Wang et al., 2014; 21 Bromirski and Cayan, 2015), the Southern Ocean (Hemer, 2010) and decreased in the North Atlantic and 22 Mediterranean Sea (Shimura et al., 2015)."</p> <p>The above statement appears to be contradictory in the references to the North Atlantic (the first part of the sentence indicates wave heights have been increasing in the North Atlantic and in the second half of the sentence it says it is decreasing). I have not read these reports, nor am I an expert in storm wave heights. I wanted to flag in case it needed a second review. [Nancy Hamzawi, Canada]</p>	NOT APPLICABLE: section on marine storms has been deleted
11919	100	22	100	22	fix spelling of Arctic! [Amy East, United States of America]	NOT APPLICABLE: section has been deleted
45073	100	22	100	27	Arctic sea ice loss increased significant wave height WHERE???? during 1985 2018 (Stopa et al., 2016; Thomson et al., 2016), and increased extreme wave height (90th percentile) in the Southern Ocean WHEN??? ARE BOTH SENTENCE FRAGMENTS REFERRING TO THE SAME PERIOD/PLACE? THIS IS UN-CLEAR UNDER THE CURRENT FORMULATION (IPCC, 2019b; Young and Ribal, 2019) (medium confi-dence). Global wave power (the transport of the energy transferred from the wind into sea-surface motion) has increased globally about 0.4% per year since 1948, with stronger changes observed in the Southern hemisphere and larger in the Pacific ocean (Reguero et al., 2019). ARE STRONGER AND LARGER CHANGES FUNDAMENTALLY DIFFERENT? WHETHER OR NOT THIS IS THE CASE, THE CURRENT FORMULATION IS AMBIGUOUS [Christophe Deissenberg, Luxembourg]	NOT APPLICABLE: section on marine storms has been deleted
20799	100	29	100	38	Although rogue/monster waves (e.g. Alex, Cattrell, 2018, Journal of Geophysical Research: Oceans. 123 (8): 5624–5636. doi:10.1029/2018JC013958) certainly belong to the domain of climate and are thus bound to be influenced by CID, this subsection does not mention them. Is there no literature about present climatology of rogue waves, neither projections? [philippe waldteufel, France]	NOT APPLICABLE: section on marine storms has been deleted

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
87991	100	29	100	38	would also consider Morim, J. et al., 2018: On the concordance of 21st century wind-wave climate projections. Global and Planetary Change and Morim, J., Hemer, M., Wang, X.L., Cartwright, N., Trenham, C., Semedo, A., Young, I., Bricheno, L., Camus, P., Casas-Prat, M., Erikson, L., Mentaschi, L., Mori, N., Shimura, T., Timmermans, B., Aarnes, O., Breivik, Ø., Behrens, A., Dobrynin, M., Menendez, M., Staneva, J., Wehner, M., Wolf, J., Kamranzad, B., Webb, A., Stopa, J. and Andutta, F., 2019. Robustness and uncertainties in global multivariate wind-wave climate projections. Nature Climate Change, 9(9): 711-718. [Kathleen McInnes, Australia]	NOT APPLICABLE: section on marine storms and waves has been deleted
55253	100	29	100	38	Future wave projections need a reference to Morim et al (2019, 2020), which includes the most comprehensive analysis of future changes in wave climate (using the largest ensemble available to date), which also include wave extremes Morim et al (2019). Robustness and uncertainties in global multivariate wind-wave climate projections. Nature Climate Change, 7, 711-718, https://doi.org/10.1038/s41558-019-0542-5 Morim et al (2020) A global ensemble of ocean wave climate projections from CMIP5-driven models. Nature Scientific Data, 7, 105, https://doi.org/10.6084/m9.figshare.11940576 [Nancy Hamzawi, Canada]	NOT APPLICABLE: section on marine storms and waves has been deleted
102701	100	36	100	36	small typo (space) on line 36 'increase e" [Philippe Tulkens, Belgium]	NOT APPLICABLE: section has been deleted
38209	100	36	100	36	A typo white space. increas" "e --> increase [Junhee Lee, Republic of Korea]	NOT APPLICABLE: section has been deleted
11921	100	36	100	36	fix spelling of "increase" [Amy East, United States of America]	NOT APPLICABLE: section has been deleted
43695	100	36			Read "energy flux (WEF) is projected to increase by up to " rather than "energy flux (WEF) is projected to increas e by up to " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: section has been deleted
34015	100	36			Erase space: "increas e". [Guiomar Rotllant, Spain]	NOT APPLICABLE: section has been deleted
83351	100	41	101	1	Why does Section 12.4.6.4 Sea Ice only deal w3ith Arctic sea ice? Please add Antarctic sea ice. [Robert Massom, Australia]	Taken into account - Assessment on Antarctic sea-ice has been made
88395	100	43	100	43	Reference could be made to Ch 2 for large scale trends in Arctic sea ice [Sharon Smith, Canada]	Taken into account - References has been made to Chapter 2.
51903	100	43	100	43	It would be helpful to specify here the average % decrease per decade over the past x decades. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Accepted . Text has been revised
110205	100	45	100	49	This sentence makes no logical sense. The range in duration lower bound should be at least double that quoted if the three sets of numbers given are even plausibly to pass an internal consistency test. The season extension lower bound cannot logically be smaller than the sum of the lower bounds of earlier onset and later cessation. [Peter Thorne, Ireland]	Accepted . Text has been revised with the rates of decrease
63673	100	51	100	51	"Projections indicate that the Arctic will be ice-free during summer for most years under..." For most years, starting from when? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Taken into account - text has been revised with appropriate uncertainty language
55251	100	51	100	51	'ice-free during summer for most years': 'most' is probably not accurate. For example, Jahn 2018 predicts the percentage of ice-free years under 2.0C global warming to be 34%, while Sigmond et al 2018 predicts this to be 20%. [Nancy Hamzawi, Canada]	Taken into account- text revised as "more often"

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66901	100	51	101	1	<p>Additional pollution from increased shipping can be especially harmful for the Arctic. More traffic within the Arctic and global climate because increased tourism or shipping will lead to increased pollution, including that of GHGs and SLCPs including black carbon that can further enhance warming in the region that is already warming twice the global average. Declining sea ice is already increasing shipping and tourism within the delicate Arctic region, where increased pollutants—including emissions of black carbon that can decrease the reflectivity of the surface in the region when it lands on snow and ice, which allows greater warming—could further endanger the Arctic, and as such, policies should be developed that will limit and minimize climate impacts in the Arctic. Stephenson S. R., et al. (2018) Climatic responses to future trans-Arctic shipping, GEOPHYSICAL RESEARCH LETTERS 45:9898–9908; Arctic Council Secretariat (2017) EXPERT GROUP ON BLACK CARBON AND METHANE: SUMMARY OF PROGRESS AND RECOMMENDATIONS 2017, 17 (“Arctic shipping currently accounts for about 5 percent of black carbon emissions within the Arctic; absent emission controls, shipping emissions within the Arctic could double by 2030 under some projections of Arctic vessel traffic.”); Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA, 1 (“Changes in climate will have direct impacts on snow and ice, as well as on terrestrial, freshwater and marine ecosystems. In addition to climate change, the region’s ecosystems are also influenced by several other impacts of human activities, such as chemical pollution, invasive species, and increased shipping and industrial developments. The end result is cumulative and cascading impacts on ecosystems and societies in the area.”); Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES, 2 (“Climate benefits for cryosphere regions from black carbon reductions carry less uncertainty than they would in other parts of the globe and are sometimes very large. This is because emissions from sources that emit black carbon—even with other pollutants—almost always lead to warming over reflective ice and snow.”). [Kristin Campbell, United States of America]</p>	<p>Noted. Impact of ocean pollution from increased shipping is under the scope of WG II. In Section 12.3 we also note that CID changes can lead to system changes or adaptations that could in turn affect other CIDs, but this depends on vulnerability, adaptation, and mitigation efforts and is thus under the domain of WGII.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68475	100	51	101	1	<p>An ice-free Arctic is possible in the next decade or two, according to Overland and Wang (2013) When will the summer Arctic be nearly sea ice free?, GEOPHYSICAL RESEARCH LETTERS 40:2097–2101, 2097 (“Time horizons for a nearly sea ice-free summer for these three approaches [for estimating future ice loss covered in the study] are roughly 2020 or earlier, 2030 ± 10 years, and 2040 or later.”). Also include the implications of increased climate forcing from reduced Arctic sea ice, which will be more extreme as less and less ice exists in the Arctic; see Pistone K., et al. (2014) Observational Determination of Albedo Decrease Caused by Vanishing Arctic Sea Ice, PROC. NAT’L. ACAD. SCI. 111(9):3322–3326, 3322 (“The Arctic has warmed by nearly 2 °C since the 1970s, a temperature change three times larger than the global mean (1). During this period, the Arctic sea ice cover has retreated significantly, with the summer minimum sea ice extent decreasing by 40% (2). This retreat, if not compensated by other changes such as an increase in cloudiness (3–6), should lead to a decrease in the Arctic planetary albedo (percent of incident solar radiation reflected to space), because sea ice is much more reflective than open ocean. Such an amplified response of the Arctic to global warming was hypothesized and modeled in the 1960s by Budyko (7) and Sellers (8). As per the Budyko–Sellers hypothesis, an initial warming of the Arctic due to factors such as CO2 forcing will lead to decreased ice cover which exposes more of the underlying darker ocean and amplifies the warming.”); Pistone K., et al. (2019) Radiative Heating of an Ice-Free Arctic Ocean, GEOPHYSICAL RESEARCH LETTERS 46(13):7474–7480 (“During recent decades, there has been dramatic Arctic sea ice retreat. This has reduced the top-of-atmosphere albedo, adding more solar energy to the climate system. There is substantial uncertainty regarding how much ice retreat and associated solar heating will occur in the future. This is relevant to future climate projections, including the timescale for reaching global warming stabilization targets. Here we use satellite observations to estimate the amount of solar energy that would be added in the worst-case scenario of a complete disappearance of Arctic sea ice throughout the sunlit part of the year. Assuming constant cloudiness, we calculate a global radiative heating of 0.71 W/m2 relative to the 1979 baseline state. This is equivalent to the effect of one trillion tons of CO2 emissions. These results suggest that the additional heating due to complete Arctic sea ice loss would hasten global</p>	<p>Noted. Appropriate linkage with Chapter 9 on the assessment of ice-free Arctic has been established. A deeper discussion of ice-free conditions in the Arctic is provided in Section 9.3.1.1; Section 12.4.9 and Section 4.4.2.1</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68477	100	51	101	1	Additional pollution from increased shipping can be especially harmful for the Arctic. More traffic within the Arctic and global climate because increased tourism or shipping will lead to increased pollution, including that of GHGs and SLCPs including black carbon that can further enhance warming in the region that is already warming twice the global average. Declining sea ice is already increasing shipping and tourism within the delicate Arctic region, where increased pollutants—including emissions of black carbon that can decrease the reflectivity of the surface in the region when it lands on snow and ice, which allows greater warming—could further endanger the Arctic, and as such, policies should be developed that will limit and minimize climate impacts in the Arctic. Given the current climate emergency, continued warming in the Arctic will continue to deplete sea ice—to which, if all of the sea ice is lost, it would be like adding an additional trillion tons of CO2 to the atmosphere—and thaw permafrost, which will also amplify warming through its release of stored carbon dioxide and methane; all together, these and other feedbacks will lead to a hothouse Earth. Stephenson S. R., et al. (2018) Climatic responses to future trans-Arctic shipping, GEOPHYSICAL RESEARCH LETTERS 45:9898–9908; Arctic Council Secretariat (2017) EXPERT GROUP ON BLACK CARBON AND METHANE: SUMMARY OF PROGRESS AND RECOMMENDATIONS 2017, 17 (“Arctic shipping currently accounts for about 5 percent of black carbon emissions within the Arctic; absent emission controls, shipping emissions within the Arctic could double by 2030 under some projections of Arctic vessel traffic.”); Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA, 1 (“Changes in climate will have direct impacts on snow and ice, as well as on terrestrial, freshwater and marine ecosystems. In addition to climate change, the region’s ecosystems are also influenced by several other impacts of human activities, such as chemical pollution, invasive species, and increased shipping and industrial developments. The end result is cumulative and cascading impacts on ecosystems and societies in the area.”); Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES, 2	Noted. Impact of ocean pollution from increased shipping is under the scope of WG II. In Section 12.3 we also note that CID changes can lead to system changes or adaptations that could in turn affect other CIDs, but this depends on vulnerability, adaptation, and mitigation efforts and is thus under the domain of WGII.
63653	100	54	100	55	"more likely" is mentioned in the sentence but not in italic. I am not sure whether it belongs to uncertainty language or not? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Taken into account - sentence has been revised
83349	100	54	101	1	Discussion on icebergs seems out of place in a Section entitled "Sea Ice" [Robert Massom, Australia]	Taken into account: Ice berg hazards are noted in 12.2 as being a slightly distinct CID to sea ice, but they are grouped within the sea ice CID category in both Section 12.3 and 12.4.8.
88397	101	4			Section 12.4.8.5 - Note that the shelf was exposed during period of lower sea level associated with glaciation and permafrost could form under the cold conditions. Degradation of permafrost occurred as these areas became submerged as sea level rose during deglaciation. Permafrost is therefore in disequilibrium and change in its thermal condition is lagging behind the cause of the change. [Sharon Smith, Canada]	NOT APPLICABLE: section has been deleted
11923	101	6	101	6	"permafrost... is highly vulnerable" [Amy East, United States of America]	NOT APPLICABLE: section has been deleted
11925	101	8	101	8	spell out "methane" in addition to CH4 [Amy East, United States of America]	NOT APPLICABLE: section has been deleted

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51905	101	19	101	24	This section could also cross reference results of regional differences at depth in ocean acidification, i.e. the discussion in section 5.3.3.1 on the variability of acidification at depth in different regions, this will have varying ecological consequences which will need to be understood, and also that some of these deep water pH changes will be irreversible (as discussed in chapter 4). Similarly there are regional differences in irreversibility that should be reflected here (as discussed in section 5.3.3.3) [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Linkage with the relevant sections of Ch 5.3.3.3 has been established
51907	101	19	101	24	Suggest this section could also cross reference regional variability discussed in section 5.3.3.3 such as the expected faster rates of change predicted for the Arctic Ocean [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	Taken into account. Linkage with the relevant sections of Ch 5.3.3.3 has been established
18051	101	37	101	39	These references are all pre AR5. Please cite more recent literature on oxygen loss if possible. Some is Reviewed in Levin, 2018 Ann. Rev. Mar. Science. [Lisa Levin, United States of America]	Noted. Recent literature relevant to this section are assessed.
84067	101	49	101	49	please insert another paragraph. On top of it pollutants are also a driver of lower oxygen. [Marco Tulio Cabral, Brazil]	Rejected. Explaining the processes of lowering the oxygen by pollution is not relevant to the Chapter 12. Broader discussions of sustainability related to runoff pollution and low oxygen zones are beyond the scope of WGI, which focuses on CID changes from anthropogenic climate change (as described in 12.2 and 12.3).
14065	102	12	102	12	Indicate if Atlas.3.b is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	Taken into account - text revised - "Figure Atlas.2:b"
63655	102	15	102	23	The Table 12.10 explains very well the regions and CID under the colour/confidence levels. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOTED. Thanks to the reviewer for the positive words of encouragement!
7923	102	17	102	21	In Table 12.10 the color used for representing "medium-confidence of increase" is not the same in the key that in the table itself. [Emilia Guisado-Pintado, Spain]	TAKEN INTO ACCOUNT: We have revised this table to ensure that the colour of the Table 12.10 is consistent with the confidence of increase
32789	102	23	102	23	need to mention SST increase in Persian Gulf SST as high confidence based on Rasuli et. al. (2013); paper's link (in persian with English abstract: http://geographical-space.iau-ahar.ac.ir/article-1-337-fa.html) [sadegh zeyaeyan, Iran]	TAKEN INTO ACCOUNT: There is high confidence of SST increase for all global oceans
33119	102	23	102	23	need to mention SST increase in Persian Gulf SST as high confidence based on Rasuli et. al. (2013); paper's link (in persian with English abstract: http://geographical-space.iau-ahar.ac.ir/article-1-337-fa.html) [Sahar Tajbakhsh Mosalman, Iran]	TAKEN INTO ACCOUNT: There is high confidence of SST increase for all global oceans
21117	102	23	102	23	need to mention SST increase in Persian Gulf SST as high confidence based on Rasuli et. al. (2013); paper's link (in persian with English abstract: http://geographical-space.iau-ahar.ac.ir/article-1-337-fa.html) [Iman BABAEIAN, Iran]	TAKEN INTO ACCOUNT: There is high confidence of SST increase for all global oceans
51909	102	32	102	32	reduce during summer' - ice free by mid century under most emissions scenarios? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: sentence has been deleted
20291	103	2	103	2	and with? [philippe waldteufel, France]	Accepted - "with" is removed to make the sentence grammatically correct
63771	103	6	107	24	Please compare information with SROCC, as I see some differences (see Chapter 3: Polar Regions and Chapter 4: Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This section now relies more heavily on assessments from Chapter 9 and the SROCC, and has been further coordinated with Polar region experts from CH9 and the Atlas

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63773	103	6	107	24	Changes in Antarctica are becoming more evident during the last year. So an update of the bibliography is highly recommendable [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We added a reference to record heat and frost observations in Antarctica for 2019/2020 summer (Robinson et al., 2020). We also added information from the "State of the Climate 2019" AMS bulletin when we could contextualize recent changes in long-term trends (more of this for Arctic than Antarctic, unfortunately).
63775	103	10	103	10	Please define "sectoral assets" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Sectoral assets is defined in Section 12.3 above.
63777	103	10	103	15	This paragraph is focused on Climatic Impact Drivers, and this sentence does not add relevant information. Remove the sentence ". Antarctica is significantly colder and more prone to climate variability than the Arctic, although both regions are strongly responsive to large-scale variability including the northern and southern annular modes (Screen et al., 2018a)." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We have removed this sentence.
14067	103	12	103	12	Indicate if 12.4.2, 12.4.5, 12.4.6 are sections or figures [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: We note that these are Sections.
14069	103	13	103	13	Indicate if 12.4.8 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: We note that these are Sections.
106105	103	13	103	15	I am not sure if such a summarythe Antarctic climate in relevant in this Chapter. Antarctic climate is described in details in other chapter and I think this introduction is too simplistic. [Cécile Agosta, France]	ACCEPTED: We have removed this climatological overview.
100881	103	15	103	15	Here NAM and SAM should refer to Annex VI.2 and VI.3 [Corti Susanna, Italy]	TAKEN INTO ACCOUNT: We have removed the reference to the modes of variability, as they are not critical to describing the climatology of CIDs in the region.
106107	103	15	103	17	I find this sentence too reductive/simplistic compared to standards of IPCC reports. [Cécile Agosta, France]	ACCEPTED: We have removed this climatological overview.
106109	103	17	103	19	here again, I don't understand why the focus is set on this specific topic and why these two article are cited among the very large littérature on this topic [Cécile Agosta, France]	ACCEPTED: We have removed this climatological overview.
64043	103	21			What are the several climatic assessments referred to and when were they carried, since the provided reference does not elaborate mech on that statement. Further elaboration including the period of study and tools as well as conclusion is required. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: the assessments are listed at the end of this sentence.
77667	103	32	103	32	Correct the citation. [Emer Griffin, Ireland]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
104449	103	33	103	37	The statement "although warming on the Antarctic Peninsula has moderated since the late 1990s likely influenced by internal variability (Turner et al., 2016)" is giving too much weight on the moderation of warming. We have stated it differently in the Atlas: (Atlas-98, lines 29-31): "This warming trend in the Antarctic Peninsula is strong and significant, despite its short recent slowdown (since the 2000s), attributed to a greater frequency of cyclonic conditions in the Weddell sea which result in cold, south-easterly winds (Turner et al., 2016)." [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have removed our elaboration of the Atlas' assessment for warming in West Antarctica, and refer the reader to the Atlas in case more information is desired.
104447	103	33	103	37	12.4.9.2 Heat and cold, L33-37: "Arctic lands and portions of Western Antarctica are among the fastest-warming places on Earth (AMAP, 2017), although warming on the Antarctic Peninsula has moderated since the late 1990s likely influenced by internal variability (Turner et al., 2016). There is medium confidence in observations since 1950 of warming in West Antarctica, but limited evidence of mean temperature change across East Antarctica even as there is high confidence in future warming across the continent (Meredith et al., 2019) (Figures Atlas.50 and Atlas.51).".....=> 1) AMAP (2017). Snow, Water, Ice and Permafrost in the Arctic (SWIPA) 2017. - reference is only for the Arctic (not relevant for Antarctica). 2) Wrong reference to Figures Atlas.50 and Atlas.51 - replace by Figure Atlas.45 for recent warming and Figure Atlas.47 for future projections. 3) Suggest rephrasing the first sentence as: "Arctic lands and portions of Western Antarctica has warmed much faster than the global average since 1950 (AMAP, 2017; Nicolas and Bromwich, 2014; Atlas 5.9.1.2) "; 4) not consistent with statement in Ch4 (p. 53, L18), "while there is high confidence that the SH high latitudes will warm by more than the tropics on centennial timescales, there is low confidence that such a feature will emerge this century (Section 7.6)." [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: 1) We have revised AMAP references to avoid application to Antarctica. 2) We have updated Figure numbers for FGD 3) We have followed Atlas assessment of mean temperature trends. 4) The text on emergence from Chapter 4 assesses a particular comparative rate of warming feature between the Southern Hemisphere polar regions and the Tropics, but this is not a focus of CH12, which assesses emergence in each region on its own basis.
104451	103	35	103	37	"There is medium confidence in observations since 1950 of warming in West Antarctica, but limited evidence of mean temperature change across East Antarctica even as there is high confidence in future warming across the continent (Meredith et al., 2019) (Figures Atlas.50 and Atlas.51)." => statements are consistent with Atlas but reference to (Figures Atlas.50 and Atlas.51) is not relevant. Correct references: Figures Atlas.45 (observations), Atlas.47 (projections), {Atlas.5.9.1.2} [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have removed our elaboration of the Atlas' assessment for warming in West Antarctica, and refer the reader to the Atlas in case more information is desired. We also updated all section and figure references to the latest FGD numbers.
63779	103	39	103	39	warm spells should be included. I miss information about Antarctica, specially about the Extreme Heat Waves. Please include: Robinson, S. A., Klekociuk, A. R., King, D. H., Rojas, M. P., Zúñiga, G. E., & Bergstrom, D. M. (2020). The 2019/2020 summer of Antarctic heatwaves. Global Change Biology. https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.15083 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We added a reference to Robinson et al. (2020) as part of an enhanced discussion on Antarctic extreme heat.
104453	103	39	103	49	Extreme heat, cold spell and frost: no discussion for Antarctica - while included as in Table 12.11(12-107) with high and medium confidence (need justification for this and other estimates in table 12.11 for West/East Antarctica) [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We added a reference to the record temperatures from 2019/2020 in Antarctica (Robinson et al., 2020).
64045	103	39			The term "Extreme Heat" is an elastic one, since it could be valued differently as per the region of impact. So, in case of the poles it should be precisely identified how do we scale temperature ranges, since what used to be extreme in the past is no longer one in the present due to the greenhouse effect and general elevation in terrestrial temperature. Also, what used to be unabtable for polar animals and polar life in the past, is no longer the same. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We added a caveat in the opening paragraph of the extreme heat section on the relative nature of CID thresholds for polar regions given ecosystem and societal tolerance.
110209	103	44	103	44	Are you sure you mean at the single point of the north pole or do you really mean in the high arctic here? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: The original sentence was meant to distinguish the Arctic from the Antarctic but the language was imprecise. We have updated text to refer to the Arctic rather than the singular North Pole point.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14071	103	45	103	45	Indicate if the T refers to maximum, minimum or average temperature [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: We have updated this text to reflect that Graham et al. (2017) refer to winter warm events (not days), which is based upon the 2-meter temperatures exceeding -10C. As this is no longer a daily quantity it is not daily mean, max, or minimum, but rather the instantaneous temperature exceeding this value.
104455	103	54	103	55	12.4.9.3 Wet and dry (p103, L54-55): "Mean precipitation: Spatial heterogeneity and disagreement in precipitation datasets lends low confidence to changes in Arctic and Antarctic precipitation (Atlas)."..... => This statement refers to the Atlas but in the Atlas we have a different assessment based on literature. Also we justify assessment for surface mass balance as there are more observations compared to precipitation. ES from Atlas Antarctica 5.9: "West Antarctica likely experienced an increase in surface mass balance mostly seen over the Antarctic Peninsula and the east part of West Antarctica, while the surface mass balance in East Antarctica showed strong interannual variability over recent decades, masking any possible existing trends (medium confidence due to limited observations). Changes in surface mass balance are likely driven by changes in precipitation." Also a reference shall be added to Chapter 9, which states (9.4.2.1, p9-61): "Contrary to older studies (Monaghan et al., 2006), there is some recent evidence (low confidence) from modelling, observations and reanalyses that increased Antarctic precipitation might have mitigated dynamical ice mass losses by about 50 Gt yr ⁻¹ since about 1990 (Lenaerts et al., 2018; Medley and Thomas, 2019) and at lower rates over the entire 20th century (Medley and Thomas, 2019)." Also a reference to SROCC will be relevant, which states: "Mass gains due to increased snowfall have somewhat offset dynamic-thinning losses (high confidence)....AIS snowfall increased by +4 ± 1 then +14 ± 1 Gt per decade over the 19th and 20th centuries, of which EAIS contributed 10% (Thomas et al., 2017b)." [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have revised to be coherent with updated mean precipitation and snow and ice mass balance assessment in Atlas.
63781	103	54	104	4	For me it is difficult to understand that "on the one hand there is low confidence to changes in Arctic and Antarctic precipitation", and on the other hand "increases in Arctic and Antarctic precipitation are very likely". [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have clarified the time periods in question: assessments of recent observations have lower confidence than future projections, which include stronger climate forcing strongly coupled with precipitation changes in this region.
104457	103	55	104	4	12.4.9.3 Wet and dry: "Increases in Arctic and Antarctic precipitation are very likely with projected percentage increases that are much higher than most sub-polar regions of the world; reaching 50% in many regions although there remains a region of uncertain precipitation changes in the North Atlantic near southern Greenland associated with ocean heat transport uncertainties (Figures Atlas.50 and Atlas.51).".....=> 1) This statement needs to be revised... Interactive Atlas shows that the % increase over Antarctica is much less than 50% and the highest % (up to 40%) concerns only small regions in central Antarctica with very small annual total precipitation/SMB and large errors.. 2) Reference to Figures Atlas.50 and Atlas.51) is not relevant - the correct is Figure Atlas.47; [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We simplified this section to more directly relay the readers to the Atlas assessments. We also updated to reflect the latest Atlas section and figure numbers.
63787	104	15	104	16	This summer season in Antarctica was specially rainy (snow was rare and rain was very common). As far as I know, there are no papers reporting it, but will be in the near future. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The most recent year was quite anomalous -- we looked for updated studies that may be able to fit this into a climatological perspective, although it is likely that these will come after the IPCC Working Group 1 acceptance deadline. We did add a reference to the heatwaves observed by Robinson et al., 2020.
63783	104	15	104	18	Ice discharge in both the Arctic and Antarctic has increased in response to recent climate change, see: 1) Paolo FS, Fricker HA, Padman L. Volume loss from Antarctic ice shelves is accelerating. Science. 2015;348:327 LP–327331. doi: 10.1126/science.aaa0940. 2) Bamber J, van den Broeke M, Ettema J, Lenaerts J, Rignot E. Recent large increases in freshwater fluxes from Greenland into the North Atlantic. Geophys. Res. Lett. 2012;39:L19501–L19501. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Thank you to the reviewers for pointing us to these papers. Both studies are mostly focused on mass balance and freshwater dynamics which is the domain of CH9 (both studies cited there). We do note iceberg production as a CID in 12.3 (Marson et al., 2018)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
88399	104	15	104	18	There are several recent studies regarding occurrence of retrogressive thaw slumps (observational evidence) in addition to Lewkowicz and Way. See Ch 2 for references and also Derksen et al. 2019 (already in your ref list). Processes are somewhat different than in mountain areas as often these mass movements are occurring in thick glacial sediments that are ice-rich including massive ice. Other refs include: Cassidy, A. E., et al. 2017 Impacts of retrogressive thaw slumps on vegetation, soil and net ecosystem exchange of carbon dioxide in the Canadian High Arctic. <i>Arct. Sci.</i> 3, 179–202. https://doi.org/10.1139/as-2016-0034 Ward Jones, MK et al. 2019. Rapid initialization of retrogressive thaw slumps in the Canadian high Arctic and their response to climate and terrain factors. <i>Environ. Res. Lett.</i> 14 055006 https://doi.org/10.1088/1748-9326/ab12fd [Sharon Smith, Canada]	ACCEPTED: We have added the Ward Jones et al. reference and Derksen et al. 2019 from CH2, while also adding a link to 2.3.2.5. The Cassidy et al. paper focuses on ecosystem responses at a test site on Ellesmere Island and we felt this was more relevant for section 12.3 or WGII.
11927	104	15	104	18	but there are quite a few recent studies showing that mass movements occur in polar regions (or, at least, high Arctic regions) due to permafrost thaw. These landslides/slumps can be enormous, causing major ground deformation, and put a lot of new sediment into river networks. This is certainly worth mentioning here. Some examples are these; if you can only cite one or two of these, cite Patton et al. (2019) and Kokelj et al. (2013) at least. Patton, A. I., Rathburn, S. L., & Capps, D. M. (2019). Landslide response to climate change in permafrost regions. <i>Geomorphology</i> , 340, 116–128. DOI: 10.1016/j.geomorph.2019.04.029 Kokelj, S. V., Lacelle, D., Lantz, T. C., Tunnicliffe, J., Malone, L., Clark, I. D., & Chin, K. S. (2013). Thawing of massive ground ice in mega slumps drives increases in stream sediment and solute flux across a range of watershed scales. <i>Journal of Geophysical Research, Earth Surface</i> , 118, 681–692. doi:10.1002/jgrf.20063 Kokelj, S. V., Lantz, T. C., Tunnicliffe, J., Segal, R., & Lacelle, D. (2017). Climate-driven thaw of permafrost preserved glacial landscapes, northwestern Canada. <i>Geology</i> , 45(4), 371–374. Doi: 10.1130/G38626.1 Lamoureux, S. F., Lafreniere, M. J., & Favaro, E. A. (2014). Erosion dynamics following localized permafrost disturbances. <i>Geophysical Research Letters</i> , 41, 5499–5505. DOI:10.1002/2014GL060677 Rudy, A. C. A., Lamoureux, S. F., Kokelj, S. V., Smith, I. R., & England, J. H. (2017). Accelerating thermokarst transforms ice-cored terrain triggering a downstream cascade to the ocean. <i>Geophysical Research Letters</i> , 44, 11,080–11,087. DOI:10.1002/2017GL074912 [Amy East, United States of America]	ACCEPTED: We have modified this sentence to indicate the growing number of studies on mass movements in the Arctic. We added a Kokelj et al. (2015) reference which connects retrogressive thaw slumps to water systems. We added the Patton et al. (2019) reference.
88401	104	17	104	17	Change "melting" to "thawing" [Sharon Smith, Canada]	ACCEPTED: typo corrected
77669	104	18	104	18	Correct the citation. [Emer Griffin, Ireland]	ACCEPTED: typo corrected
55257	104	18	104	18	change "melting" to "thawing". Permafrost doesn't melt. [Nancy Hamzawi, Canada]	ACCEPTED: typo corrected
63785	104	20	104	27	If ice melts completely early in the season, ecosystems will suffer drought for the rest of the season. Please see: Robinson, S. A., King, D. H., Bramley-Alves, J., Waterman, M. J., Ashcroft, M. B., Wasley, J., ... Hua, Q. (2018). Rapid change in East Antarctic terrestrial vegetation in response to regional drying. <i>Nature Climate Change</i> , 8(10), 879–884. Also include: Barrett, J. E., Virginia, R. A., Wall, D. H., Doran, P. T., Fountain, A. G., Welch, K. A., & Lyons, W. B. (2008). Persistent effects of a discrete warming event on a polar desert ecosystem. <i>Global Change Biology</i> , 14(10), 2249–2261. https://doi.org/10.1111/j.1365-2486.2008.01641.x [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: A comprehensive assessment of specific connections between CID changes relating to sequentially-connected extreme events is beyond the scope of Chapter 12 (would be good suggestions for WGII Cross-Chapter Paper)

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55259	104	29	104	31	"Fire weather index increases have already exceeded historical variability envelopes in boreal 30 forests of Arctic Europe, and will emerge in portions of Arctic Russia and Northeast North America by the 31 2040s (medium confidence)" This statement is misleading because the reference to "historical" is vague. There is work showing that projected changes in drought severity could remain within the paleo-historical range of variability in specific regions such as in eastern boreal North America (e.g. Girardin et al. 2013). So please define 'historical'. // Girardin, M.P., Ali, A.A., Carcaillet, C., Gauthier, S., Hély, C., Le Goff, H., Terrier, A., Bergeron, Y. . 2013. Fire in managed forests of eastern Canada: Risks and options. Forest Ecology and Management 294: 238–249. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We clarified that this is a simulation-based study with a pre-industrial reference period of 1861-1910. Our analysis is related to this pre-industrial period rather than the broader paleo record described in Girard et al. (2013).
34017	104	39	104	40	Check for reference format. Change: "(Karnauskas et al., 2018a)" by "Karnauskas et al. (2018a)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
86683	104	39	104	44	Quotation: "Wildfire: Fire weather index increases have already exceeded historical variability envelopes in boreal forests of Arctic Europe, and will emerge in portions of Arctic Russia and Northeast North America by the 2040s (medium confidence) (Abatzoglou et al., 2019). Wildfire season also lengthened from 1979-2015 over Arctic portions of North America (Jain et al., 2017). Trends toward more frequent wildfires in tundra regions are expected to continue driven in particular by increasing potential evapotranspiration and changes in vegetation (high confidence) (Hu et al., 2015a; AMAP, 2017; Young et al., 2017)." Comment: the interaction between fire weather index and frequency of lightning is an important issue that should be further discussed in this chapter. [Oyvind Christophersen, Norway]	TAKEN INTO ACCOUNT: We have added a reference to Veraverbeke et al. (2017) documenting increases in lightning-ignited fires in Alaska and the NW Territories from 1975-2015.
43697	104	39		40	Read "Karnauskas et al. (2018a) found decreasing mean" rather than "(Karnauskas et al., 2018a) found decreasing mean" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34019	104	40	104	41	Check for reference format. Change: « (Bintanja et al., 2014)" by "Bintanja et al. (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43699	104	40		41	Read "Bintanja et al. (2014) projected that" rather than "(Bintanja et al., 2014) projected that" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
43701	104	43		44	Read "In contrast (Gorter et al., 2014), regional climate model projections indicated a reduction in mean winds over the interior of Greenland by RCP4.5 2100 while coastal winds increase." or "In contrast, regional climate model projections indicated a reduction in mean winds over the interior of Greenland by RCP4.5 2100 while coastal winds increase (Gorter et al., 2014)." rather than "In contrast, (Gorter et al., 2014) regional climate model projections indicated a reduction in mean winds over the interior of Greenland by RCP4.5 2100 while coastal winds increase." [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34021	104	43			Check for reference format. Change: « (Gorter et al., 2014)" by "Gorter et al. (2014)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
38211	104	46	104	50	Severe storms at the arctic region can interact with sea ice to reinforce local warming process (e.g., Kim et al., 2017). Kim, B.-M., Hong, J., Jun, S. et al., 2017: Major cause of unprecedented Arctic warming in January 2016: Critical role of an Atlantic windstorm. Scientific Reports, 7, 40051, https://doi.org/10.1038/srep40051 . [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: Chapter 12 does not assess the local dynamics that can exacerbate or counteract broader patterns of extreme changes, rather it assesses the resulting climatic impact-driver changes with all factors included.
35377	104	53	105	16	this section on snow and land ice is jumping from precipitation/snow to ice sheets, glaciers, Antarctic snow and glacier lake outburst floods, suggest to restructure paragraph to have snow first, then glaciers followed by ice sheets. Find missing mentioning of Svalbard and Russian Arctic glaciers. Note the new paper GlacierMIP paper https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019EF001470 that will inform projections and uncertainties of these for all 19 RGI regions, including the ones mentioned in this section [Guðfinna Aðalgeirsdóttir, Iceland]	ACCEPTED: We revised this section to separate snow and glacier discussions. We also added note on glacial area losses with a reference to Marzeion et al. (2020) GlacierMIP study.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
45667	105	2	105	3	Why only RCP 8.5 scenario? Others scenarios are also policy relevant. [Lucas Ruiz, Argentina]	TAKEN INTO ACCOUNT: We have revised all sections of Chapter 12 to better reflect climatic impact-driver changes under multiple scenarios. We have also revised our CID assessment tables to include more information about time, scenario, and global warming dependence. Here we have added information about glacial changes for RCP2.6, RCP4.5 and RCP8.5
88403	105	8	105	11	Reference could be made to Ch 2 for large scale trends in ice sheets and glaciers [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: This section now refers back to Section 2.3.2.3 to note dramatic decreases in glacier area.
110211	105	8	105	16	I don't really see the value of this repetition here. What does this add to the chapter or report as a whole given that it almost entirely repeats the chapter 9 findings? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Chapter 12 consolidates information on climate phenomena from earlier chapters and translates them further into climatic impact driver metrics. The Final Government Draft increasingly relies on the earlier chapters for the main assessment of physical changes, but adds further details that are critically relevant to stakeholders. This section also becomes a "one-stop shop" for climate information for regional impact and for risk assessments so that readers do not have to navigate the entire report looking for a specific physical quantity's change in their region.
43703	105	8			Read "Chapter 9 and Meredith et al. (2019) assess that" rather than "Chapter 9 and (Meredith et al., 2019) assess that" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34023	105	8			Check for reference format. Change: "(Meredith et al., 2019)" by "Meredith et al. (2019)". [Guimar Rotllant, Spain]	ACCEPTED: typo corrected
87441	105	16	105	16	reference duplicated in error: should read (Coulter et al., 2019) Full reference - Coulter, L., Serrao-Neumann, S., & Coiacetto, E. (2019). Climate change adaptation narratives: Linking climate knowledge and future thinking. Futures, 111, 57-70. doi:10.1016/j.futures.2019.05.004 [Liese Coulter, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: The reference and topic of the recommended reference in this comment do not seem to correspond to the text location noted.
88405	105	18	105	19	Reference could be made to Ch 2 for observed change. Updated Romanovsky et al. (2019) - most recent state fo climate report, could also be referenced for up to date observations. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: Chapter 12 more directly connects to assessments from Chapter 2, Chapter 9, and the Atlas for some polar region CIDs. We have added the Romanovsky et al. (2020) State of the Climate in 2019 report for updated information on polar region permafrost.
110213	105	18	105	21	Why are you redundantly performing an assessment undertaken already across chapters 2 and 9 here rather than citing their substantive findings? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Chapter 12 consolidates information on climate phenomena from earlier chapters and translates them further into climatic impact driver metrics. The Final Government Draft increasingly relies on the earlier chapters for the main assessment of physical changes, but adds further details that are critically relevant to stakeholders. This section also becomes a "one-stop shop" for climate information for regional impact and for risk assessments so that readers do not have to navigate the entire report looking for a specific physical quantity's change in their region.
104475	105	20	105	23	[12.4.9.5] 12-105, L20-23: "...Future projections indicate decreases in permafrost extent and increases in permafrost temperature and active layer thickness across the Arctic and the increasingly ice-free portions of Antarctica (Chapter 9)."....=> This statement "Future projections indicate... the increasingly ice-free portions of Antarctica (Chapter 9)" does not refer to changes in permafrost in Antarctica. At the same time, in Table 12.11 (12-107) (also in SPM-37, L3-4, Box 3 and Table TS.20, p134): Permafrost in West Antarctica shows 'High confidence of increase': this is not supported by any statement/reference. [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have updated our assessment of permafrost change in Antarctica with inputs from Chapter 9 and Chapter 2

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63789	105	22	105	22	please, indicate the decreases in permafrost extend, as the decrease will be very high and significant [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have added some more specific text on permafrost losses which highlight the substantial losses in polar regions.
14073	105	23	105	23	Change (Streletskiy et al., 2019) by Streletskiy et al. (2019) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
88407	105	23	105	25	See Ch 2 and also Fig 9.23 in Ch 9 which also shows how increase in permafrost temeprature is greater in cold continuous permafrost throughout Arctic. Reference could be made to both chapter 2 and 9 and also Romanovsky et al. 2019 - recent state of climate report. See also (I can provide copy): Smith SL, et al 2019 Tracking changes in permafrost thermal state in Northern Canada. In: Bilodeau J-P, Nadeau DF, Fortier D, Conciatori D (eds) Cold Regions Engineering 2019, Proceedings of the 18th International Conference on Cold Regions Engineering and the 8th Canadian Permafrost Conference, Quebec, Quebec, Canada, August 18-22 2019. American Society of Civil Engineers, pp 670-677. doi:10.1061/9780784482599 [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We have added a reference to Romanovsky et al., 2020.
43705	105	23			Read "Streletskiy et al. (2019) noted that" rather than "(Streletskiy et al., 2019) noted that" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34025	105	23			Check for reference format. Change: "(Streletskiy et al., 2019)" by "Streletskiy et al. (2019)". [Guimar Rotllant, Spain]	ACCEPTED: typo corrected
14075	105	25	105	25	Change (Slater and Lawrence, 2013) by Slater and Lawrence (2013) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
88409	105	25	105	27	Misleading statement (see earlier comment) - These models only consider upper 3 m or near-surface permafrost extent - Since permafrost can be 10s to 100s metres thick it may still exist at depth where these projections indicate it has disappeared from upper 3 m. [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: WE now specify that this is in reference to near-surface permafrost
43707	105	25			Read "by Slater and Lawrence (2013)" rather than "by (Slater and Lawrence, 2013)" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34027	105	25			Check for reference format. Change: "(Slater and Lawrence, 2013)" by "Slater and Lawrence (2013)". [Guimar Rotllant, Spain]	ACCEPTED: typo corrected
63791	105	26	105	26	what is the meaning of sustainable permafrost? durable over time? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised this sentence as we agree that "sustainable" has alternative meanings in the IPCC context that were not intended here. This reference indicates that near-surface permafrost was the probable condition in the Canadian Archipelago in that scenario time horizon. Other areas may have remaining deep permafrost that will eventually disappear given the changing surface condition.
88411	105	29	105	31	Refer to Ch 2 for observed trends [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: Chapter 12 now directly builds on assessments from Chapter 2 and Chapter 9 for sea ice CIDs
110215	105	29	105	31	This was assessed in some depth in chapter 2. Not cited. Assessment finding not 100% consistent. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We have updated to be consistent with latest assessments from Chapter 2 and Chapter 9.
83353	105	29	105	44	Why is the sea ice discussion here dominated by the Arctic, with only 1 sentence on Antarctic sea ice? Please add more Antarctic information here. [Robert Massom, Australia]	TAKEN INTO ACCOUNT: Chapter 2 and Chapter 9 assess low confidence in observed and projected changes for Antarctic sea ice, which largely precludes more in depth discussion of additional climatic impact-driver indices related to these uncertain changes given space limitations in the chapter.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66903	105	29	105	53	<p>Additional pollution from increased shipping can be especially harmful for the Arctic. More traffic within the Arctic and global climate because increased tourism or shipping will lead to increased pollution, including that of GHGs and SLCPs including black carbon that can further enhance warming in the region that is already warming twice the global average. Declining sea ice is already increasing shipping and tourism within the delicate Arctic region, where increased pollutants—including emissions of black carbon that can decrease the reflectivity of the surface in the region when it lands on snow and ice, which allows greater warming—could further endanger the Arctic, and as such, policies should be developed that will limit and minimize climate impacts in the Arctic. Stephenson S. R., et al. (2018) Climatic responses to future trans-Arctic shipping, <i>GEOPHYSICAL RESEARCH LETTERS</i> 45:9898–9908; Arctic Council Secretariat (2017) EXPERT GROUP ON BLACK CARBON AND METHANE: SUMMARY OF PROGRESS AND RECOMMENDATIONS 2017, 17 (“Arctic shipping currently accounts for about 5 percent of black carbon emissions within the Arctic; absent emission controls, shipping emissions within the Arctic could double by 2030 under some projections of Arctic vessel traffic.”); Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA, 1 (“Changes in climate will have direct impacts on snow and ice, as well as on terrestrial, freshwater and marine ecosystems. In addition to climate change, the region’s ecosystems are also influenced by several other impacts of human activities, such as chemical pollution, invasive species, and increased shipping and industrial developments. The end result is cumulative and cascading impacts on ecosystems and societies in the area.”); Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, <i>ADVANCES IN ATMOSPHERIC SCIENCES</i> 32:64–91; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES, 2 (“Climate benefits for cryosphere regions from black carbon reductions carry less uncertainty than they would in other parts of the globe and are sometimes very large. This is because emissions from sources that emit black carbon—even with other pollutants—almost always lead to warming over reflective ice and snow.”). [Kristin Campbell, United States of America]</p>	<p>TAKEN INTO ACCOUNT: Within chapter 12 we generally avoid these secondary effects (where one CID affects another), choosing rather to evaluate the CID changes in their own right, inclusive of all factors, and in the manner that they affect sectoral assets. We have also revised the "air pollution" CID to more specifically relate to "air pollution weather", as many aspects of future air pollution depend directly on emissions policy and other factors that are assessed in Working Groups 2 and 3.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68479	105	29	105	53	<p>An ice-free Arctic is possible in the next decade or two, according to Overland and Wang (2013) When will the summer Arctic be nearly sea ice free?, GEOPHYSICAL RESEARCH LETTERS 40:2097–2101, 2097 (“Time horizons for a nearly sea ice-free summer for these three approaches [for estimating future ice loss covered in the study] are roughly 2020 or earlier, 2030 ± 10 years, and 2040 or later.”). Also include the implications of increased climate forcing from reduced Arctic sea ice, which will be more extreme as less and less ice exists in the Arctic; see Pistone K., et al. (2014) Observational Determination of Albedo Decrease Caused by Vanishing Arctic Sea Ice, PROC. NAT’L. ACAD. SCI. 111(9):3322–3326, 3322 (“The Arctic has warmed by nearly 2 °C since the 1970s, a temperature change three times larger than the global mean (1). During this period, the Arctic sea ice cover has retreated significantly, with the summer minimum sea ice extent decreasing by 40% (2). This retreat, if not compensated by other changes such as an increase in cloudiness (3–6), should lead to a decrease in the Arctic planetary albedo (percent of incident solar radiation reflected to space), because sea ice is much more reflective than open ocean. Such an amplified response of the Arctic to global warming was hypothesized and modeled in the 1960s by Budyko (7) and Sellers (8). As per the Budyko–Sellers hypothesis, an initial warming of the Arctic due to factors such as CO2 forcing will lead to decreased ice cover which exposes more of the underlying darker ocean and amplifies the warming.”); Pistone K., et al. (2019) Radiative Heating of an Ice-Free Arctic Ocean, GEOPHYSICAL RESEARCH LETTERS 46(13):7474–7480 (“During recent decades, there has been dramatic Arctic sea ice retreat. This has reduced the top-of-atmosphere albedo, adding more solar energy to the climate system. There is substantial uncertainty regarding how much ice retreat and associated solar heating will occur in the future. This is relevant to future climate projections, including the timescale for reaching global warming stabilization targets. Here we use satellite observations to estimate the amount of solar energy that would be added in the worst-case scenario of a complete disappearance of Arctic sea ice throughout the sunlit part of the year. Assuming constant cloudiness, we calculate a global radiative heating of 0.71 W/m2 relative to the 1979 baseline state. This is equivalent to the effect of one trillion tons of CO2 emissions. These results suggest that the additional heating due to complete Arctic sea ice loss would hasten global</p>	<p>TAKEN INTO ACCOUNT: We are generally following the Chapter 9 assessment of the ice-free Arctic given observations and model improvements Overland and Wang (2013). Results from that study seem consistent with ice-free conditions prior to 2050. Changes in planetary albedo are beyond Chapter 12’s focus on changes that are directly relevant to ecosystems and society.</p>

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68481	105	29	105	53	Additional pollution from increased shipping can be especially harmful for the Arctic. More traffic within the Arctic and global climate because increased tourism or shipping will lead to increased pollution, including that of GHGs and SLCs including black carbon that can further enhance warming in the region that is already warming twice the global average. Declining sea ice is already increasing shipping and tourism within the delicate Arctic region, where increased pollutants—including emissions of black carbon that can decrease the reflectivity of the surface in the region when it lands on snow and ice, which allows greater warming—could further endanger the Arctic, and as such, policies should be developed that will limit and minimize climate impacts in the Arctic. Given the current climate emergency, continued warming in the Arctic will continue to deplete sea ice—to which, if all of the sea ice is lost, it would be like adding an additional trillion tons of CO2 to the atmosphere—and thaw permafrost, which will also amplify warming through its release of stored carbon dioxide and methane; all together, these and other feedbacks will lead to a hothouse Earth. Stephenson S. R., et al. (2018) Climatic responses to future trans-Arctic shipping, GEOPHYSICAL RESEARCH LETTERS 45:9898–9908; Arctic Council Secretariat (2017) EXPERT GROUP ON BLACK CARBON AND METHANE: SUMMARY OF PROGRESS AND RECOMMENDATIONS 2017, 17 (“Arctic shipping currently accounts for about 5 percent of black carbon emissions within the Arctic; absent emission controls, shipping emissions within the Arctic could double by 2030 under some projections of Arctic vessel traffic.”); Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA, 1 (“Changes in climate will have direct impacts on snow and ice, as well as on terrestrial, freshwater and marine ecosystems. In addition to climate change, the region’s ecosystems are also influenced by several other impacts of human activities, such as chemical pollution, invasive species, and increased shipping and industrial developments. The end result is cumulative and cascading impacts on ecosystems and societies in the area.”); Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES, 2	TAKEN INTO ACCOUNT: Within chapter 12 we generally avoid these secondary effects (where one CID affects another), choosing rather to evaluate the CID changes in their own right, inclusive of all factors, and in the manner that they affect sectoral assets. We have also revised the “air pollution” CID to more specifically relate to “air pollution weather”, as many aspects of future air pollution depend directly on emissions policy and other factors that are assessed in Working Groups 2 and 3. Changes in sea ice leading to societal changes with effects on air pollution or carbon budget changes are beyond the purview of Chapter 12.
34029	105	31			Modify sentence from « (Chapter 9 and (Turner et al., 2017; Onarheim et al., 2018; Stroeve and Notz, 2018; Meredith et al., 2019))” to “(Chapter 9 and specific references (Turner et al., 2017; Onarheim et al., 2018; Stroeve and Notz, 2018; Meredith et al., 2019))”. [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
34031	105	32	105	33	Unit format, homogenise. Change: “%/decade” by “% decade-1”. [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
34033	105	36			Avoid to start a sentence by numbers, although there is a date. [Guiomar Rotllant, Spain]	ACCEPTED: We have modified this sentence to avoid beginning with a number.
34035	105	37			Unit format, homogenise. Change: “days/decade” by “days decade-1”. [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
11929	105	40	105	40	fix spelling of Laptev [Amy East, United States of America]	ACCEPTED: typo corrected
34037	105	40			Unit format, homogenise. Change: “days/yr” by “days yr-1”. [Guiomar Rotllant, Spain]	ACCEPTED: Unit format homogenized
63793	105	46	105	53	more about sea ice desintegration: Massom, R. A., Scambos, T. A., Bennetts, L. G., Reid, P., Squire, V. A., & Stammerjohn, S. E. (2018). Antarctic ice shelf disintegration triggered by sea ice loss and ocean swell. Nature, 558(7710), 383-389. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have examined the Massom et al. (2018) study as part of our sea ice assessment. We cited Massom and Stammerjohn (2010) elsewhere in this section.
34039	105	48			Check for reference format. Change: “(Chapter 9; (Meredith et al., 2019))” by “(Chapter 9; Meredith et al. (2019))”. [Guiomar Rotllant, Spain]	ACCEPTED: format of parentheses has been corrected for this SROCC chapter.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14077	105	49	105	49	Change (Laliberté et al., 2016) by Laliberté et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43709	105	49			Read "Laliberté et al. (2016) noted that the" rather than "(Laliberté et al., 2016) noted that the" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34041	105	49			Check for reference format. Change: "(Laliberté et al., 2016)" by "Laliberté et al. (2016)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
14079	106	9	106	9	Change (Groisman et al., 2016) by Groisman et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
43711	106	9			ead "Groisman et al. (2016) used 40 years of" rather than "(Groisman et al., 2016) used 40 years of" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34043	106	9			Check for reference format. Change: « (Groisman et al., 2016) » by « Groisman et al. (2016) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
64001	106	16	106	16	GIA is mentioned for the first time in Chapter 12. Please write it as glacial isostatic adjustment instead of only GIA [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: We now use 'glacial isostatic adjustment'
14081	106	20	106	20	Change (Oppenheimer et al., 2019) by Oppenheimer et al. (2019) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
45325	106	20	106	22	Presently there is a little uplift going on in SW Greenland, but higher uplift rates are found elsewhere around the ice sheet. Thus, although I cannot recall a study that in-depth projects future uplift and RSL for the 21st century for Greenland, I would think the higher uplift rates in the southeast and northwest Greenland would out weigh sea level rise. In any case, I think the sentence should be revised to accommodate the different uplift rates found in Greenland by the GNET GNSS stations [Kristian Kjelden, Denmark]	TAKEN INTO ACCOUNT: We note the west/east gradient as a caveat in our CID assessment table and provide this further information about regional patterns of uplift in the text on Polar Region relative sea level.
43713	106	20			Read "Oppenheimer et al. (2019) projections indicate" rather than "(Oppenheimer et al., 2019) projections indicate" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
34045	106	20			Check for reference format. Change: "(Oppenheimer et al., 2019) » by « Oppenheimer et al. (2019) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
63795	106	24	106	28	information about Antarctica should be included [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We now mention that "Assessment of coastal flooding and erosion changes in Antarctica are limited by a lack of studies"
55261	106	26	106	26	Add Casas-Prat and Wang (2020a) reference related to increased erosion and flooding potential due to projected increase in wave extremes. Casas-Prat, M and Wang, X.L. (2020a), "Projections of extreme ocean waves in the Arctic and potential implications for coastal inundation and erosion", Journal of Geophysical Research: Oceans, accepted. [Nancy Hamzawi, Canada]	TAKEN INTO ACCOUNT: We have added a reference to Casas-Prat and Wang (2020) to note the effects of increased wave on sea-ice-free Arctic shorelines.
14083	106	27	106	27	Change (Vousdoukas et al., 2018) by Vousdoukas et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
11931	106	27	106	27	need a space after 1:100 [Amy East, United States of America]	ACCEPTED: typo corrected
34049	106	27			At a space between number an unit: "1:100yr". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43715	106	27			Read "Vousdoukas et al. (2018) project that the curren" rather than "(Vousdoukas et al., 2018) project that the curren" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
34047	106	27			Check for reference format. Change: "(Vousdoukas et al., 2018)" by "Vousdoukas et al. (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
63797	106	30	106	37	Include: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018GL081463 And: Llanillo, P. J., Aiken, C. M., Cordero, R. R., Damiani, A., Sepúlveda, E., & Fernández-Gómez, B. (2019). oceanographic Variability induced by tides, the intraseasonal cycle and Warm Subsurface Water intrusions in Maxwell Bay, King George island (West-Antarctica). Scientific Reports, 9(1), 1-17. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: These studies were more focused on localized ocean dynamics than the broader climate changes and associated shifts in marine heatwaves assessed in this section.
63799	106	39	106	45	information about Antarctica should be included [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have consolidated our discussion of ocean acidification into Section 12.4.0, with reduced space for region-by-region breakdowns given the broadly consistent trends in pH seen around the world.
447	106	39	106	45	Please refer to my comment on "lake Acidification". There are no references in the SOD text to "lake acidification" so far. I'd suggest rewriting this. Please note that this comment aims at strenghtening the WGI AR6 findings facing "climate deniers". [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: We have removed lake acidity from the CID assessment tables but still include ocean acidification in 12.4.0 and the regional CID Assessment Tables as this is an important driver of ecological changes along Arctic and Antarctic coasts.
14085	106	42	106	42	Change (Mathis et al., 2015a) by Mathis et al. (2015a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: typo corrected
34051	106	42			Check for reference format. Change: "(Mathis et al., 2015a) »" by « (Mathis et al., 2015a) ». [Guiomar Rotllant, Spain]	ACCEPTED: typo corrected
43717	106	42			Read "Mathis et al. (2015a) found that surface waters " rather than "(Mathis et al., 2015a) found that surface waters " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: typo corrected
63801	106	48	107	4	I am not sure about including CO2 as "other impact drivers": this molecule is one of the main responsables of climate change and measured with "essential climate variables" and "Climatic impact drivers", which are mentioned at the previous sections. From what is written, I guess that this section is the place to name some pollutants present in polar regions that may or may not have a impact on climate. Anyway, I would change the outline of the paragraph. I would start saying that the sources of pollutants in polar regions have two origins: in situ and far away to the poles. -If the origin of the pollutant is far away of the poles: in the future we can expect an increase of allochthonous pollutants into the poles, as the atmospheric and ocean isolaiton of poles is becoming more weak. -About the pollution produced in-situ: an example is the transit of vessels, that increase every year. Those vessels burn fossil fuels and increase CO2 concentrations in polar regions. See e.g.: Farreny, R., Oliver-Solà, J., Lamers, M., Amelung, B., Gabarrell, X., Rieradevall, J., ... & Benayas, J. (2011). Carbon dioxide emissions of Antarctic tourism. Antarctic Science, 23(6), 556-566 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We agree with the reviewer that it is important to distinguish the important effects of CO2 concentration on ecological systems from the larger greenhouse forcing caused by CO2. We have therefore adjusted the CID to be called "Atmospheric CO2 at surface" to distinguish this from the overall CO2 contribution as a greenhouse gas (which is dependent on the profile throughout the atmospheric column. In our introduction of this CID category in Section 12.2 we now devote additional space to justify and clarify Atmospheric CO2 at surface as a climatic impact driver.
88413	107	12	107	12	Be clear that you are referring to permafrost extent (and not duration as is the case of snow cover). For snow cover are you referring to spring snow cover extent or all months? [Sharon Smith, Canada]	TAKEN INTO ACCOUNT: We clarified this sentence so that it does not give the impression that we are discussing permafrost duration.
71195	107	12			what is decreasing permafrost? Do the authors mean permafrost degradation, or permafrost temperature warming? [Lukas Arenson, Canada]	TAKEN INTO ACCOUNT: This summary statement is intended to encapsulate multiple types of permafrost change affecting polar regions, including increasing active layer thickness, thawing of near-surface permafrost, and overall permafrost temperature warming. We have added clarifying text accordingly.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
63803	107	16	107	24	Table 12.11: same as the previous comment (#74): why include CO2 as a Climatic Impact Driver? Why include air pollution? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We better distinguish both "Atmospheric CO2 at surface" and "air pollution weather" from the larger concentrations of greenhouse gases and air pollution that drive shifts in the radiative forcing of the climate system. These are directly related to natural and human system impacts (CO2 --> photosynthesis and water efficiency for crops and wild plants; air pollution weather --> health, agricultural and water resource impacts; see Section 12.3) and therefore are important climatic impact drivers. The secondary effects based on large-scale radiative forcing are not climatic impact drivers as they drive radiative, chemical, and dynamical processes not directly assessed by Chapter 12 which then in turn lead to shifts in the CIDs that Chapter 12 assesses.
449	107	18	107	18	I would suggest to remove lake acidity/acidification from table 12.11 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: We have removed lake acidity from the CID assessment tables but still include ocean acidification as this is an important driver of ecological changes along Arctic and Antarctic coasts.
35361	107	18	107	24	Table 12.11 What is the basis for lower confidence for projected snow and land ice loss in Arctic North Eastern Canada, Russian Arctic and West Antarctica? There is now a new paper for projection of glacier mass that has equal confidence on projected mass loss in all regions (not same regions as presented here, but 19 RGI regions (see Ch9)) Marzeion et al, 2020, GlacierMIP paper: https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019EF001470 . It may be different for snow, therefore suggest to separate snow and land ice CID, see comment above [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: We have updated these to high confidence given the dramatic changes in glacier mass and area. Changes in snow are a bit less certain given that cold seasons and high elevations remain very cold and see positive snow changes given overall increases in precipitation. We note this with a table footnote (#1).
104435	107	18	107	24	12-107, L18, Table 12.11: East Antarctica - Mean Temperature: shown as 'medium confidence of increase' (orange color). It has to be 'high confidence of increase' (red color) as it is already in Table TS.20 and Box SPM.3. Justification: Figure Atlas.47, Atlas 5.9.1.4. [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have updated this to high confidence of increase given Atlas figures and assessments.
104437	107	18	107	24	12-107, L18, Table 12.11: Extreme heat - how this CID is defined for Antarctica? Section '12.3.1.2 Extreme heat' or section 12.4.9.2 'Heat and cold' for Polar Regions do not provide any relevant information for Antarctica. In Table 12.11 there is 'high confidence of increase' in Extreme heat for West Antarctica, and 'medium confidence of increase' for East Antarctica. In Table TS.20 and Box SPM.3 there is 'high confidence of increase' in Extreme heat for both West and East Antarctica. Traceback matrix TS.A.1 (TS-159) refers to [12.4.9.2] for Extreme heat for West and East Antarctica. However, there is no discussion or references for Extreme Heat in Antarctica in [12.4.9.2]. [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have ensured that the text in 12.4.9.2 supports the assessments displayed in the associated polar region climatic impact driver assessment table. We also added further explanation of extreme heat and cold thresholds for polar regions which reflect lower tolerance to heat and higher tolerance to cold (12.4.9.1).
104441	107	18	107	24	12-107, L18, Table 12.11: Justifications needed for West Antarctica and East Antarctica: Extreme heat, Cold spell, Frost (no reference for Antarctica: TS.A1 refs 12.4.9.2 where there is no info on these CIDs for Antarctica; no definition for extreme heat and cold spell in Glossary) [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have ensured that the text in 12.4.9.2 supports the assessments displayed in the associated polar region climatic impact driver assessment table.
104443	107	18	107	24	12-107, L18, Table 12.11: Frost in West Antarctica - checking with Interactive Atlas: Frost changes are not present on West Antarctic land areas. The approximate boundaries of the West Antarctic region include part of the coastal Southern Ocean where there is a decrease in Frost shown by IA - which is not relevant for the West Antarctic ice sheet. In any case, chapter 12 and TS.A1 do not refer to the Atlas for this statement. [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have further developed Section 12.4.9 on Polar region CIDs with strong collaboration with Atlas Polar region experts to ensure that the text and assessments are consistent across CH12 and the Atlas and Interactive Atlas.
104445	107	18	107	24	12-107, L18, Table 12.11: West Antarctica - Landslide: marked as white 'Low confidence in direction of change'. Shall it be marked as 'Not broadly relevant' (grey)? There is no discussion or references in Ch12; landslides in West Antarctica are not mentioned in Ch9. [Irina Gorodetskaya, Portugal]	TAKEN INTO ACCOUNT: We have labelled landslides in West Antarctica as "not broadly relevant"

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55263	107	25	107	27	See previous comment for page 86 regarding reporting of Slater and Lawrence results and ambiguous use of "sustainable" [Nancy Hamzawi, Canada]	ACCEPTED: We have added "shallow" (<3m) to the references of permafrost from Slater and Lawrence, and have removed the term "sustainable" as it is confusing to readers who are used to seeing that term in other contexts within the IPCC.
86685	108	1	113	55	We appreciate the structure of the one-pagers on specific zones and hotspots. However, we think that in addition to tropical forests, both boreal and temperate forests should also have their one-pagers, given their importance in the climate system. [Oyvind Christophersen, Norway]	REJECTED: Although we also recognize the importance of temperate forests, we followed the structure given by WGII CC Papers, and did not add another specific region. Climate change in temperate climates can be found in relevant regional sections of 12.4
63805	108	4	108	4	Polar regions were addressed in 12.4.8 and 12.4.9. Please include: "polar regions were addressed in more extensive detail in 12.4.8 and 12.4.9." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Done
63807	108	6	108	11	Please clarify this information, as is confusing. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This is rephrased
106535	108	14			WGII has a CCP on Biodiversity Hotspots. Care should be taken to ensure consistency between WGs in messages and uncertainty assessments of those messages. [camille parmesan, France]	TAKEN INTO ACCOUNT: Consistency has been checked with WGII CCPs.
99309	108	20	108	26	the biodiversity hotspot definition of WGII should be followed here which is more broader and the reference to Myers removed [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Section shortened making reference to WGII CCP
34053	108	20			Check for reference format. Erase comma in: « Myers et al., (2000) ». [Guiomar Rotllant, Spain]	ACCEPTED
99311	108	36	108	40	sentence is not very clear, what are unprecedented values, which species does this refer to plants or animals, water or land as they all react differently [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: This is rephrased and simplified.
99313	108	43			the species form the hotspots of biodiversity is an odd expression [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The sentence has been deleted
63809	108	54	108	54	Change "length" by "time" as follows: "An extension both in length and time in the fire weather season" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: This has been rephrased and combined with the previous paragraph as: "Longer dry seasons also extend the seasonal length and geographical extent of fire weather in all future scenarios (medium confidence) (Jolly et al., 2015; Abatzoglou et al., 2019)"
64051	108	54			More elaboration is required to identify the OTHER HAZARDS and how they are important in BIODIVERSITY REGIONS. The sentence that way is perplexing rather than directing. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Due to space constraints this paragraph was removed as it also contained only low confidence statements
99315	108	54			please add terrestrial hotspots [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Due to space constraints this sentence was removed
63811	109	1	109	5	Please include recent extreme episodes of wildfire e.g. australia https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.14987 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: Due to space constraints this paragraph cannot include specific cases
34055	109	1			Check for reference format. Erase comma in: "Jolly et al., (2015)". [Guiomar Rotllant, Spain]	ACCEPTED
99317	109	7	109	9	suggest to remove the paragraph as there is no novel assessment or information [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: paragraph removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11933	109	11	109	11	add "only": "are not exposed only to specific climate drivers". These areas are certainly exposed to some climate drivers, and the current wording makes it sound as though they experience no climate drivers. [Amy East, United States of America]	TAKEN INTO ACCOUNT: This has been rephrased
51911	109	11	109	11	Suggested addition: '...they are not consistently exposed to specific...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
39429	109	11	109	12	The statement is rather ambiguous. [Lourdes Tibig, Philippines]	ACCEPTED: This has been rephrased
110219	109	14	109	14	as written this implies these trends are increasing everywhere. Also trends that are increasing implies acceleration? This language requires careful review. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: This has been rephrased
51913	109	14	109	14	Suggested addition if correct: '...marked increasing trends in many biodiversity hotspots.' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
64053	109	17	113	51	The information seems to be repeated and it is advisable that it should be relocated in its proper sectors as per its climatic and geographical region. Since the core idea of the chapter is based on regional impact of the climate change impact, then the chapter should mainly be divided according to regions where each region should be precisely sliced into all possible related issues to impact of climate change drivers. Same applies to the following subsections of 12.4.10. Otherwise, if the author wants to divide the climate change impact drivers according to geological nature of the region and not its geographical or climatic position, then the main vision of the chapter should be altered and the title should be changed. Since, as per the actual chapter, each geographical region should be discussed in detail with all its geological features including deserts, mountains, forests, coastal areas, cities and islands. This is because, geographical zone plays a major role in climate change impact drivers. Also all geological features interact together in the ecosystem and its adjustment. Thus; climate change is the resultant of this interaction, hence; they cannot just be sliced away from one another when assessing the climate change impact drivers. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: Section 12.4 assesses trends and projected changes of CIDs for each of the AR6 regions, which are each defined according to broad geographic areas. Section 12.4.10 was designed to capture the aspect that the reviewer also notes here, which is that these regions contain distinct sub-regional characteristics that may be quite important to the past and future climate changes. 12.4.10 notes that some of these sub-regions (e.g., mountains, semi-arid regions, cities) have common CID change characteristics across multiple AR6 regions, which may be used to highlight climate information needs for planning in these sub-regions as well as to augment the rest of 12.4 with further information about potential sub-regional changes. Indeed, in some cases regional discussions earlier in 12.4 noted some of these sub-regional characteristics (e.g., landslide effects in mountainous regions). We considered the reviewer's suggestion to describe each of these characteristics for each region throughout 12.4, but this would necessarily require a subsetting of all AR6 regions to a scale not assessed within WGI CH10, CH11, CH12, and Atlas. This finer scale is not practical within the WGI outline, however the discussion in 12.4.10, along with the connections between CIDs and sectors within some of these sub-regions described in 12.3 and the broader regional assessment in 12.4, provides the reader with ample information to carry the importance of these sub-regional responses into adaptation and risk planning as well as the regional and sectoral assessments within WGI.
26455	109	19	109	22	The language needs some editing here [Mare Sundström, Sweden]	ACCEPTED. The paragraph has been rewritten considering also information in Box 10.2
102703	109	22	109	23	Not sure about this statement; smaller settlements often lack the resources to adapt as compared to larger cities, and therefore, have lower capacity to cope with SLR [Philippe Tulkens, Belgium]	ACCEPTED. The paragraph has been rewritten considering also information in Box 10.2
39431	109	24	109	26	Move "are increasing" to the last part of the sentence. [Lourdes Tibig, Philippines]	REJECTED. The sentence is within quotes, an exact statement of WGI
5547	109	24	109	26	In the sentence in brackets, add coastal river, estuary and delta flooding [Benoit Laignel, France]	REJECTED. The sentence is within quotes, an exact statement of WGI
44263	109	26	109	27	A comprehensive presentation of concepts, methods and recent advances in the scientific domain of urban climate are given by Oke, T.R., et al., 2017: Urban Climates. Cambridge University Press, Cambridge. This book also includes a special chapter on cities and global climate change (Chapter 13: Cities and Global Climate Change). [Nektarios Chrysoulakis, Greece]	NOT APPLICABLE. The paragraph has been rewritten considering also information in Box 10.2

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
20801	109	29	109	46	Aren't there cases where the proximity of open waters acts to limit the UHI effect? [philippe waldteufel, France]	ACCEPTED. We have added a statement on coastal effects on UHI
112819	109	29	109	46	Good to also mention that in particular informal settlements (slums) have higher exposure to heat risk. E.g. Wang et al. 2019 https://doi.org/10.1016/j.scitotenv.2018.09.324 [Maarten van Aalst, Netherlands]	ACCEPTED. We have added the proposed reference, but confidence is low as the study relies on a single city
44265	109	29	109	46	A recent study of the surface Urban Heat Island trends in Mediterranean cities, based on a long time-series of satellite observations, indicated that an increase in surface temperature is positively correlated with an increase in the respective surface Urban Heat Island (Benas, N., et al., 2017: Trends of urban surface temperature and heat island characteristics in the Mediterranean. Theoretical and Applied Climatology, 130, 807 - 816). [Nektarios Chrysoulakis, Greece]	REJECTED: Because there is a box (Box 10.2) the section is shortened especially on UHIs
26457	109	33	109	33	"However fast growing urbanization could be a major driver of such trends". "Such trends" supposedly refers to the exacerbation of the UHIs and not on the "major cities being located by the sea"? Some language editing would be recommended here. [Mare Sundström, Sweden]	NOT APPLICABLE. The paragraph has been rewritten considering also information in Box 10.2
34057	109	33			Add comma between words: "However fast". [Guiomar Rotllant, Spain]	NOT APPLICABLE. The paragraph has been rewritten considering also information in Box 10.2
34059	109	45			Check for reference format. Change: "(Coppola et al., submitted, b)" by "(Coppola et al., submitted b)". [Guiomar Rotllant, Spain]	TAKEN IONTO ACCOUNT: Note that urban areas have now a dedicated box, hence the drastic reduction of text here
110221	109	48	109	52	As currently written this implies this is a truism in all such cases. Does this really apply to all coastal cities? [Peter Thorne, Ireland]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
14155	109	49	109	50	It's recommend to explain some land surface properties, such as roughness, wind pattern changes, instability conditions, etc., have modified the precipitation patterns. [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
39433	109	49	109	52	"medium confidence, limited evidence"? [Lourdes Tibig, Philippines]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
34061	109	51	109	52	Check for reference format. Change: "...events (Mishra et al., 2015; Depietri and McPhearson, 2018)(Rahimpour et al., 2018; García-Cueto et al., 2019; Wu et al., 2019a) » by "...events (Mishra et al., 2015; Depietri and McPhearson, 2018 ; Rahimpour et al., 2018; García-Cueto et al., 2019; Wu et al., 2019a) ». [Guiomar Rotllant, Spain]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
43719	109	51		52	Read "(Mishra et al., 2015; Depietri and McPhearson, 2018; Rahimpour et al., 2018; García-Cueto et al., 2019; Wu et al., 2019a)" rather than "(Mishra et al., 2015; Depietri and McPhearson, 2018)(Rahimpour et al., 2018; García-Cueto et al., 2019; Wu et al., 2019a)" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
99319	109	55	110	2	very general statement, please refer to CCP and WGII assessment [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE. The paragraph has been removed considering also information in Box 10.2
5549	110	4	110	9	Not only the oceanic drivers but also the heavy precipitation teh temperature variations (froze) and the coastal river flood [Benoit Laignel, France]	TAKEN INTO ACCOUNT: Note that urban areas have now a dedicated box, hence the drastic reduction of text here
102705	110	7	110	7	please add these two references: Aerts et al., 2014 in Evaluating Flood Resilience Strategies for Coastal Megacities ""., Science; and Hinkel et al., 2018, The ability of societies to adapt to twenty-first-century sea-level rise, Nature CC [Philippe Tulkens, Belgium]	ACCEPTED: references added
55265	110	7	110	7	It should be noted that coastal settlements/infrastructure along Arctic coastlines are particularly vulnerable to increase of coastal erosion and flooding (Casas-Prat and Wang, 2020a; Gudmestad, OT, 2018) Casas-Prat, M and Wang, X.L. (2020a), "Projections of extreme ocean waves in the Arctic and potential implications for coastal inundation and erosion", Journal of Geophysical Research: Oceans, accepted. Gudmestad, OT (2018) The changing climate and the Arctic coastal settlements. International Journal of Environmental Impacts, 1(4), 2398-2659, https://doi.org/10.2495/Ei-V1-N4-411-419 [Nancy Hamzawi, Canada]	ACCEPTED: new statements on coastal erosion that cite these references have been added

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31665	110	10	110	12	Please add the reference "Berndtsson, R. et al. (2019) 'Drivers of changing urban flood risk: A framework for action', Journal of Environmental Management, 240(October 2018), pp. 47–56. doi: 10.1016/j.jenvman.2019.03.094." [Alessandro Pezzoli, Italy]	REJECTED: this reference refers more to adaptation and vulnerability, thus in the realm of WGII
24501	110	10	110	12	There is only gray literatures but it is obvious to increase composed flooding in low-lying area where SLRs and ESLs will be increased following the previous sections. It is better to rephrase as "Compound flooding due to simultaneous storm surges and high river flows are expected to be increasingly frequent in several cities and/or low-lying areas in Europe, the U.S. and Asia" [Nobuhito Mori, Japan]	REJECTED: the reference mentioned are for past trends, not future trends
131481	110	10	110	13	Are compound floods due to storm surge and extreme precipitation events also considered or only high river flows? It is surprising that the Asian mega-deltas should not be affected by this. [Hans Poertner and WGII TSU, Germany]	ACCEPTED: more references now added on Asia
39435	110	13	110	14	Same comment [Lourdes Tibig, Philippines]	REJECTED: the reference mentioned are for past trends, not future trends
63813	110	16	110	18	This is interesting but better for WGII report, not here as it is focused on Physical Science [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: this paragraph was felt as information more to be handled by WGII and was removed due also to space constraints
39437	110	16			Where are the cited references for this "high confidence" statement? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: this paragraph was felt as information more to be handled by WGII and was removed due also to space constraints
26459	110	17	110	17	Specify shortly what vibrios are - why is it important to mention these? [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: this paragraph was felt as information more to be handled by WGII and was removed due also to space constraints
39439	110	20	110	22	Medium confidence with only one study? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: this paragraph was felt as information more to be handled by WGII and was removed due also to space constraints
34063	110	27			Check for reference format. Change: « (Torres-Alavez et al., submitted) » by « (Torres-Alavez et al., submitted) ». [Guiomar Rotllant, Spain]	NOT APPLICABLE: This paragraph was removed due to space constraints
39441	110	29	110	31	"low confidence, limited evidence"? [Lourdes Tibig, Philippines]	NOT APPLICABLE: This paragraph was removed due to space constraints
63815	110	30	110	30	which coastal areas? not in the Mediterranean, for example. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This paragraph was removed due to space constraints
63817	110	31	110	34	Please rewrite the sentence, as it is not clear [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This paragraph was removed due to space constraints
110223	110	36	110	37	But you are discussing coastal cities and there are no major Arctic coastal cities to speak of and certainly none where the local population depend on ice for transport and hunting. [Peter Thorne, Ireland]	REJECTED: The section also covers "settlements", not only "cities"
99321	110	39	110	42	very general statement, [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: we added some details
63819	110	40	110	40	remove "that are changing with human influence on climate" as is confusing. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: our assessment is specifically on climate change drivers

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51915	110	40	110	42	Suggested edits: '...on climate, such as extreme heat, pluvial floods, coastal erosion, coastal flood (high confidence), with heavy rainfalls and tropical cyclones potentially compounding these hazards (low confidence).' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The paragraph was rephrased: Increasing relative sea level compounding with increasing tropical cyclone storm surge and rainfall intensity will increase the probability of coastal city flooding (high confidence).
41861	110	45	112	3	It would be good for Authors to visit the Global Land Outlook, published by UNCCD in 2017; it can help to improve the section "12.4.10.3 Deserts and semi-arid areas" [JACQUES ANDRE NDIONE, Senegal]	NOTED: however we could not find statements on climate impact-drivers specifically in this report, which is focused on vulnerability and societal challenges
63821	110	48	110	49	Interesting but better for WGII. Here we should focus on Physical Science Basis. Please remove the sentence "Climatic impact drivers in deserts and semi-arid regions of the world interplay with ecological and cultural diversity as well as reliance on traditional livelihood activities (Bizikova et al., 2015)." [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: The sentence has been removed
131483	110	48	110	49	This needs further elaboration on the cultural diversity and traditional livelihood activities. Why are they relevant? How are they impacted? [Hans Poertner and WGII TSU, Germany]	NOT APPLICABLE: the sentence has been removed, as this was more belonging to WGII
63823	110	52	110	54	Move the sentence "There is no evidence of a future global trend in aridification of drylands (medium confidence) (IPCC, 2019a), but high confidence of aridification in some areas (Mediterranean, Central America, South Africa) (IPCC, 2019a)." to line 2 page 111, between "considered" and "however" [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED:
14087	110	54	110	54	Change Huang et al., 2016 by Huang et al. (2016) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED
109901	110	54	110	54	In recent years, changes in land use and management, especially in the Mediterranean belt, have led to deforestation and intensive agricultural use on flat areas, resulting in soil erosion. In the Mediterranean, low annual precipitation, long droughts, severe evaporation, the presence of steep slopes and the occurrence of the latest tectonic activity are effective in the formation of erosion. In addition, as human activities; repetitive fires, overgrazing and agriculture are also effective in erosion (İkiel et al., 2019) C. İkiel, B. Ustaoglu, D. E. Koç and A. A. Dutucu, "Determination of Land Cover Change in Datça and Bozburun Peninsula in Turkey (1997-2018)," 2019 8th International Conference on Agro-Geoinformatics (Agro-Geoinformatics), Istanbul, Turkey, 2019, pp. 1-6, doi: 10.1109/Agro-Geoinformatics.2019.8820678. Publisher IEEE. [Beyza Ustaoglu, Turkey]	REJECTED: land use management is already mentioned with an IPCC reference. Due to space constraints we could not add studies with regional or local scope in this very short section.
41859	110	54	110	54	Please, instead of writing "Huang et al., 2016", write "Huang et al. (2016)" [JACQUES ANDRE NDIONE, Senegal]	ACCEPTED
34065	110	54			Check for reference format. Change: "Huang et al., 2016" by "Huang et al. (2016)". [Guiomar Rotllant, Spain]	ACCEPTED
43721	110	54			Read "Huang et al. (2016) found that drylands" rather than "Huang et al., 2016 found that drylands" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED
107919	111	1	111	3	This last sentence is not well connected to what precedes it. Why 'however'? Land cover change forms part of the scenarios, no? [Linda Mearns, United States of America]	ACCEPTED: we added "along with climate change"
14089	111	8	111	8	Change Also by also [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED
34067	111	21			To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	ACCEPTED: Corrected with final Coppola et al. references
39443	111	23	111	28	medium confidence with only 2 studies (Feng and Fu, 2013 and Park et al, 2018) [Lourdes Tibig, Philippines]	NOT APPLICABLE: due to space constraints, the paragraphs was not felt as essential.
14091	111	31	111	31	Change (Park et al., 2018) by Park et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: due to space constraints, the paragraph was not felt as essential.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
34069	111	31			Check for reference format. Change: "(Park et al., 2018)" by "Park et al. (2018)". [Guiomar Rottlant, Spain]	NOT APPLICABLE: due to space constraints, the paragraph was not felt as essential.
43723	111	31			Read "Park et al. (2018) suggested that early action " rather than "(Park et al., 2018) suggested that early action " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: due to space constraints, the paragraph was not felt as essential.
14093	111	34	111	34	Standardize the US or USA format [Maria Amparo Martinez Arroyo, Mexico]	Editorial. Professional copy-editing to be completed prior to publication. This kind of issues will be fixed then, if not before.
39445	111	50	111	53	Limited evidence is not an uncertainty language used in IPCC assessment reports. [Lourdes Tibig, Philippines]	REJECTED: "limited evidence" is an official uncertainty term
32791	111	51	111	53	Since (Iranian)National Report(s) are available on the dust storms in Iran in which the dust hotspots in the region are fully identified and some measures are suggested and lunched for action, it is highly recommended that more references be searched and analyzed for the subject. [sadegh zeyaeyan, Iran]	NOTED: This paragraph is essentially a summary of findings in other regional sections based on peer-reviewed literature. For Asia, more material can be found in Section 12.4.2. Increase in dust storm frequency has been noted in the past decade. However dust storm projection for future decades for West Asia remains undocumented, hence the large uncertainty on projections.
33121	111	51	111	53	Since (Iranian)National Report(s) are available on the dust storms in Iran in which the dust hotspots in the region are fully identified and some measures are suggested and lunched for action, it is highly recommended that more references be searched and analyzed for the subject. [Sahar Tajbakhsh Mosalman, Iran]	NOTED: same comment and answer as above
15743	112	6	113	2	This summary is overall quite disappointing, and I wonder how it can be used in the WG2 CCP on Mountains. For instance, there is very little quantitative information on past (including detection and attribution) and future trends for mountain CIDs, which WG2 could use. This means that WG2 will probably need to re-do the assessment on changes in climatic impact drivers (including for sectoral applications in natural and human systems), which is a pity. Also, what is missing is a statement about the main knowledge gaps for trends in CIDs in the mountain environment. [Samuel Morin, France]	TAKEN INTO ACCOUNT: we have improved the assessment and rewritten this section, but note the strong reduction on text due to space constraints. These sections are conceived as short summaries of previous sections. WGII devotes a CCP on mountains of almost the size of the CH12 chapter. So it is not conceivable that only 1/2 page here can be sufficient to support details of the CCP, and we would not be surprised that WGII would need to reassess literature, given the level of details required.
45669	112	15	112	18	Please include which are the scenario for each of the percentages of mass reduction. [Lucas Ruiz, Argentina]	NOT APPLICABLE: the sentence was removed to avoiding focusing on a topic largely covered by CH9
88115	112	20	112	31	The elevation dependent warming has been comprehensively discussed in SROCC, Ch2 Box 2.1. You may refer to it and keep your own text much shorter. [Georg Kaser, Austria]	TAKEN INTO ACCOUNT: text now refers more to SROCC
15741	112	21	112	21	I would advise to be more cautious on statements such as "Warming in mountain environments occurs faster at higher elevations (medium confidence, medium agreement and limited evidence)." In SROCC Chapter 2, we spent a lot of efforts trying to assess whether this statement holds, and the literature is not fully consistent on the matter. Furthermore, "elevation dependent" does not mean that the warming rate increases with elevation, but rather than the warming rate differs depending on elevation. See section 2.2.1 and Box 2.1 in SROCC Chapter 2. In some regions, warming is larger at low elevation than high elevation, and this also depends on the season. I think it would be a disservice to the scientific community and the policy-makers to simplify the complex pictures into a simple statement that warming is stronger at higher elevation. The evidence available simply does not support this statement. [Samuel Morin, France]	TAKEN INTO ACCOUNT: text now refers more to SROCC and has been shortened
104583	112	22	112	24	A recent study indicates that enhanced warming is over mountains in China, which is relevant to high lapse rate over there. As such, the citation '(Wang et al., 2016b)' ought to be updated as '(Wang et al., 2016b; He and Wang, 2020)'. Reference: He, Y., and Wang, K., Contrast patterns and trends of lapse rates calculated from near-surface air and land surface temperatures in mainland China from 1961 to 2014. Science Bulletin, 2020. [Chunlüe Zhou, United States of America]	REJECTED: for this paragraph we now refer to SROCC

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
80241	112	38	112	42	The original text is suggested to be completed: "Extreme precipitation and floods are projected to increase in major mountain regions, such as in the Alps, the Carpathians and Mediterranean mountains (high confidence)..". Several papers are available. [Lilian Fejes, Hungary]	ACCEPTED - more literature review has been done
83583	112	51	112	51	Replace "glacier lake outburst floods" with "glacial lake outburst floods" for consistency with phrasing in the rest of the chapter. [Rupert Stuart-Smith, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED
34071	112	53			Mountains need to go capitalize?: "In conclusion, Mountains". [Guiomar Rotllant, Spain]	ACCEPTED
51917	112	54	112	55	Suggested edits: 'climate change: observed increases in elevation-dependent warming (medium confidence), decreases in low-to-mid-altitude snow cover and snow season, reduction of glacier mass and permafrost thawing are..' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: This paragraph has been rewritten and made more clear.
14095	113	8	113	8	Change (IPCC, 2013) and (IPCC, 2018a) by IPCC (2013) and IPCC (2018a) [Maria Amparo Martinez Arroyo, Mexico]	REJECTED: citations merged
34073	113	8			Check for reference format. Change: "(IPCC, 2013) and (IPCC, 2018a)" by "IPCC (2013, 2018a)". [Guiomar Rotllant, Spain]	ACCEPTED: citations merged
14097	113	11	113	11	Change (IPCC, 2019a) by IPCC (2019a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: citations merged
39447	113	11	113	13	Please revise the statement-yes, forest, and can fires can sometimes be not and can be burning because of defforestation. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT! Sentence revised, the end of the sentence was removed in order not to confuse the reader with climate conditions which is the objective of this chapter
34075	113	11			Check for reference format. Change: "(IPCC, 2019a)" by "IPCC (2019a)". [Guiomar Rotllant, Spain]	ACCEPTED
43725	113	11			Read "IPCC (2019a) reports an enhanced risk" rather than "(IPCC, 2019a) reports an enhanced risk" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED
39449	113	17	113	20	medium confidence,limited evidence with only one study cited? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: we now cite sections of the chapter which contain also relevant literature
34077	113	19			Format, homogenise. Change: "21st" by "21st". [Guiomar Rotllant, Spain]	REJECTED: we do not understand the changes proposed.
34079	113	27			To which references correspond, a or b?: "Coppola et al., submitted". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: this has been checked
39451	113	29	113	35	please review use of uncertainty language. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: this has been checked. "Limited/robust evidence" in particular is used.
74371	113	37	113	39	Forest degradation might also affect the occult precipitation [Yulizar Yulizar, Indonesia]	TAKEN INTO ACCOUNT: references have been added
3217	113	37	113	46	Forest degradation in Amazon basin have potential impacts on regional and global water cycle. For instance regarding impacts on the Amazon-Andes connectivity (Espinoza et al 2020. doi: 10.3389/feart.2020.00064.) and over the hydrological cycle in South America (e.g. Martinez and Dominguez 2014. Journal of Climate 27(17):6737-6753. This information need to be included here. [Jhan Carlo Espinoza, France]	TAKEN INTO ACCOUNT: the references were added
45075	113	46	113	46	"more general" wrt what? Suggestion: more general ☐ generalized [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: sentence removed
51919	113	48	113	49	Suggested edits: 'In conclusion, most tropical forests have been observed to be exposed to increased heat, drought and lengthening of dry seasons, fire weather and CO2 increase. Patterns and amplitudes of future heat hazard change...' [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED. But last sentence removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
27487	114	1	114	1	We feel that it is quite unusual to discuss global changes after regional changes. Would not it be more logical to discuss regional changes after global changes? [Eric Brun, France]	TAKEN INTO ACCOUNT: We considered both ordering options and prefer to begin with the perspective of many stakeholders interested in climate information for their region. The global perspective allows these regional situations to be placed into a global context, following a pattern of questions by stakeholders. 1) What's happening in my region? 2) Is my situation unique?
110227	114	1			This section cross-cuts significantly with assessment performed in 2-3-4 particularly where the aggregation is of a very simple indicator. This yields redundancy of assessment which is made worse by not starting from and acknowledging these chapters in a systematic and consistent manner. The section needs to more clearly and cleanly differentiate itself from these prior chapters in addition to chapter 11. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We have revised this section substantially to better emphasize its added value in providing a global perspective on regional CID changes and in assessing aggregate/global CID change studies- both from a bottom up approach (12.5.1.1) and from a top down approach (12.5.1.2)
52631	114	7	114	8	Do the newer CMIP6 results included modify the assessments made? [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
114815	114	12	114	23	This paragraph already is careful to describe the relevant studies as "global-scale", not ones that use globally averaged metrics, but I think it might be clearer to more explicitly state that the global studies referred to generally (all?) use climate model output at the resolution of the model. It may be useful to then state that the motivation for looking at this type of information is that (1) these studies sometimes use different metrics than regional studies (which is already mentioned), and (2) the global metrics provide a useful summary measure of differences over time and across scenarios to understand that hazard component of the analyses. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: We have revised this section substantially to better emphasize its added value in providing a global perspective on regional CID changes and in assessing aggregate/global CID change studies- both from a bottom up approach (12.5.1.1) and from a top down approach (12.5.1.2)
105811	114	28	114	33	cooling degree days should also be mentioned here as they are very important to energy demand and building design and CDD is already present in Figure 12.15 [Trevor Murdock, Canada]	ACCEPTED: CDDs are now mentioned with reference to Arnell et al. (2019)
34081	114	31	114	33	I would suggest to modify the following sentence fragment: "...varies between regions and with indicator, e.g. (Gourdji et al., 2013; Perkins-Kirkpatrick and Gibson, 2017; Harrington et al., 2018; Jones et al., 2018; Lehner et al., 2018a; Shi et al., 2018; Tebaldi and Wehner, 2018; Russo et al., 2019)" by "...varies between regions and with indicator (cf. Gourdji et al., 2013; Perkins-Kirkpatrick and Gibson, 2017; Harrington et al., 2018; Jones et al., 2018; Lehner et al., 2018a; Shi et al., 2018; Tebaldi and Wehner, 2018; Russo et al., 2019)". [Guiomar Rotllant, Spain]	ACCEPTED: Modified as suggested
34083	114	34			Check for reference format. Erase comma in: "Lehner et al., (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
101641	114	35	114	51	One major open question is how important the role of adaptation is for future heat stress impacts on humans. I think that this is still largely unknown but would be of great relevance to include in future climate studies. [Clemens Schwingshackl, Norway]	TAKEN INTO ACCOUNT: Adaptation is assessed in Working Group II
14099	114	36	114	37	Change Tebaldi and Wehner, (2018) by Tebaldi and Wehner (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed
34085	114	36	114	37	Check for reference format. Erase comma in: "Tebaldi and Wehner, (2018)". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
102707	114	37	114	37	word missing: "...period **** 3-day annual maximum... [Philippe Tulkens, Belgium]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
63957	114	43	114	43	according to Fig. 12.15b: it is 45 (RCP2.6) to 70 (RCP8.5) % in 2050 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section has been overhauled. The sentence and figures in question do not appear anymore
41863	114	44	114	44	Instead of writing "Figure 12.15a and b", please write "Figures 12.15a and b" [JACQUES ANDRE NDIONE, Senegal]	NOT APPLICABLE: Section has been overhauled. The sentence and figures in question do not appear anymore

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102709	114	46	114	46	either "greatest"or "proportion " [Philippe Tulkens, Belgium]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34087	114	48			Check for reference format. Change: "(Schwingshackl et al., submitted)" by "Schwingshackl et al. (submitted)". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
68515	114	48			The position of the left parenthesis is incorrect [Yukiko Imada, Japan]	ACCEPTED: fixed
43727	114	48			Read "Schwingshackl et al. (submitted) show that" rather than "(Schwingshackl et al., submitted) show that" [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
101639	114	51	114	51	This should be exchanged by "impact-relevant thresholds" as the thresholds are not physiologically critical. [Clemens Schwingshackl, Norway]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
14101	114	53	114	53	Change (Gourdji et al., 2013) by Gourdji et al. (2013) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed
41865	114	53	114	53	Isntead of writing "(Gourdji et al., 2013)", please write "Gourdji et al. (2013)" [JACQUES ANDRE NDIONE, Senegal]	ACCEPTED: fixed
34089	114	53			Check for reference format. Change: "(Gourdji et al., 2013)" by "Gourdji et al. (2013)". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
68517	114	53			The position of the left parenthesis is incorrect [Yukiko Imada, Japan]	ACCEPTED: fixed
43729	114	53			Read "Gourdji et al. (2013) estimated that the areas " rather than "(Gourdji et al., 2013) estimated that the areas " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
27489	114				We strongly recommend checking with the publication which notes than the hottest summer on record, not the average as said by this sentence. [Eric Brun, France]	REJECTED: Not clear which sentence this comment refers to
38213	115	3	115	3	Conflicting acronym HWMI. Same is abbreviated as HWMIId at P34L5, P72,L17. Very minor style issue maybe, however, there are some terminologies abbreviated somewhere, but in full elsewhere. e.g., L115L9-10 growing degree-days and cooling degree-days vs GDD and CDD elsewhere. [Junhee Lee, Republic of Korea]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34091	115	3			Check for reference format. Change: « (such as the HWMI: (Russo et al., 2014))" by "(such as the HWMI: Russo et al. (2014))". [Guiomar Rotllant, Spain]	ACCEPTED: fixed
14103	115	6	115	6	A parenthesis remains to be closed in (e.g. (Matthews et al., 2017), [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed
38215	115	6	115	6	Missing parenthesis after (Mathews et al., 2017)" [Junhee Lee, Republic of Korea]	ACCEPTED: fixed
63959	115	6	115	7	Since you refer to Fig. 12.5 it is worthwhile mentioning North East South America and South Central America [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section has been overhauled. The sentence and figures in question do not appear anymore
68519	115	6			Unnecessary left parenthesis before "Matthews et al" [Yukiko Imada, Japan]	ACCEPTED: fixed
43731	115	6			Read "(Matthews et al., 2017)," rather than "(e.g. (Matthews et al., 2017)," [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
131485	115	13	115	14	Provide reference to underpin this statement. [Hans Poertner and WGII TSU, Germany]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
102711	115	15	115	16	both in rainfed and irrigated agriculture [Philippe Tulkens, Belgium]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
114819	115	16	115	17	Is it possible to make a statement here about how much the outcomes would change with warming? It would be more informative than a very high confidence statement that is only about the direction of change. That would apply to any other statements like this elsewhere in the section, except those where it is the direction of change that may be the important outcome (eg in precip-related hazard indicators). [Brian O'Neill, United States of America]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore, but there is now more information on impacts at different levels of warming in a box. Section 12.4 also describes the way CH12 assesses the direction of regional CID changes, which allows higher confidence than assessing a specific number for a specific CID index.
39453	115	18	115	23	Please be consistent in the use of uncertainty language. [Lourdes Tibig, Philippines]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore, but CH12 has been revised to ensure consistent use of uncertainty language.
38217	115	32	115	33	I doubt if Clausius-Clapeyron relation directly can conclude to increasing pluvial flood. C-C states warmer air can hold more water, but both RH change and precipitation efficiency should also be considered. recommend add a backup mechanism for that rather than saying "well-established" C-C finding that warmer air hold more water. [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: The physical mechanisms behind CID changes are described by previous Working Group I chapters. We have now supported this statement with references to Ch 8 and 11.
114821	115	32			what is the "aggregate global pluvial flood hazard"? How is it measured? [Brian O'Neill, United States of America]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
20803	115	33	115	33	Characterizing the Clausius-Clapeyron formula as a "finding" does not seem appropriate. This formula is derived from the laws of physics, and it has been demonstrated [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The physical mechanisms behind CID changes are described by previous Working Group I chapters. We have now supported this statement with references to Ch 8 and 11.
45567	115	45	115	52	The frequency of high flows is projected to increase in winter in the Northern latitudes with a high signal-to-noise ratio (Giuntoli et al., 2015). Giuntoli, I., Vidal, J.-P., Prudhomme, C., and Hannah, D. M. (2015) Future hydrological extremes: the uncertainty from multiple global climate and global hydrological models, Earth System Dynamics, 6, 267–285, https://doi.org/10.5194/esd-6-267-2015 [Jean-Philippe Vidal, France]	ACCEPTED: Giuntoli et al. (2015) has been added as reference
14105	115	49	115	50	A parenthesis is missing in the sentence (e.g., (Arnell and Gosling, 2016; Winsemius et al., 2016; Alfieri et al., 2017; Dottori et al., 2018; Arnell et al., 2019a) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: formatting has been fixed
34093	115	49	115	50	I would to suggest to modify the following sentence fragment: "... (e.g., (Arnell and Gosling, 2016; Winsemius et al., 2016; Alfieri et al., 2017; Dottori et al., 2018; Arnell et al., 2019a)" by "... (cf. Arnell and Gosling, 2016; Winsemius et al., 2016; Alfieri et al., 2017; Dottori et al., 2018; Arnell et al., 2019a)". [Guiomar Rotllant, Spain]	ACCEPTED: Modified as suggested
63961	115	50	115	50	Fig. 12.15e does not provide data for the year 2100 only until 2090. RCP8.5 shows a median of 20% in 2090 with median changes between 0 and 40%. I do not understand the 10-40% mentioned in the text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section has been overhauled. The sentence and figures in question do not appear anymore
45565	115	54	116	1	The frequency of low flows is projected to increase over most of the continents, with regionally and seasonally differentiated effects. Hot-spots include the Mediterranean and Southern America with a high signal-to-noise ratio (Giuntoli et al., 2015). Giuntoli, I., Vidal, J.-P., Prudhomme, C., and Hannah, D. M. (2015) Future hydrological extremes: the uncertainty from multiple global climate and global hydrological models, Earth System Dynamics, 6, 267–285, https://doi.org/10.5194/esd-6-267-2015 [Jean-Philippe Vidal, France]	TAKEN INTO ACCOUNT: We have added Giuntoli et al. (2015) reference earlier in this text. Due to space limitations we opted not to go into this level of detail on droughts here
14107	116	1	116	1	Change (Naumann et al., 2018) by Naumann et al. (2018) [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
43733	116	1		2	Read " Naumann et al. (2018) for example showed that " rather than " (Naumann et al., 2018) for example showed that " [Cyriaque Rufin Nguimalet, Central African Republic]	ACCEPTED: fixed
34095	116	1			Check for reference format. Change: "(Naumann et al., 2018)" by "Naumann et al. (2018) ». [Guiomar Rotllant, Spain]	ACCEPTED: fixed
27491	116	4	116	4	About ' [...] to 18.5 months with an increase [...] ' we are not sure if we understood correctly: do you actually mean a drought that lasts more than 1 year? [Eric Brun, France]	TAKEN INTO ACCOUNT: Yes, the Naumann et al. (2018) study indicates that the SPEI12 index includes longer duration droughts. The SPEI12 index generally captures slower moving droughts with lower magnitude than would be captured under the SPEI3 or SPEI6 indices, however the shift in SPEI12 is an important indication that long-term drought will be extended in ways that is likely to affect ecosystems, water resources, agriculture and other sectors that depend on long-term recharge of water resources.
14109	116	10	116	10	Change (Lin et al., 2018a) by Lin et al. (2018a) [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34097	116	10			Check for reference format. Change: « (Lin et al., 2018a)" by "Lin et al. (2018a)». [Guiomar Rotllant, Spain]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
43735	116	10			Read " Lin et al. (2018a) characterised 'aridity' by the ratio " rather than " (Lin et al., 2018a) characterised 'aridity' by the ratio " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
85081	116	14	116	19	Comment provided by Jennifer Weeks: Could mention these two studies on unprecedented yield shocks using the UNSEEN method: 1. Risk of coincident maize yield shocks in USA and China is 6% - Kent et al. (2017), Using climate model simulations to assess the current climate risk to maize production 2. Chance of experiencing unprecedented drought is 5% is China – Kent et al. (2019), Maize Drought Hazard in the Northeast Farming Region of China: Unprecedented Events in the Current Climate [Stacey New, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore as assessments of agricultural impacts is provided by Working Group II Chapter 5.
14111	116	17	116	17	Change (Trnka et al., 2019) by Trnka et al. (2019) [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34099	116	17			Check for reference format. Change: "(Trnka et al., 2019)" by "Trnka et al. (2019)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
43737	116	17			Read "Trnka et al. (2019) found that the proportion " rather than "(Trnka et al., 2019) found that the proportion " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
39455	116	21	116	27	Please synthesize with uncertainty language [Lourdes Tibig, Philippines]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
43739	116	22		26	Too long and unclear sentence " Although there is consensus that overall fire danger increases with climate change (Abatzoglou et al., (2019) showed that by 2050 60% of the global land area would see a significant increase in fire risk), there is less confidence in the projected distribution of change in danger across regions (Moritz et al., 2012) for example projected an increase in fire danger in mid and high latitudes but a reduction in the tropics, whilst (Yu et al., 2019) projected an increase in the tropics)." [Cyriaque Rufin Nguimalet, Central African Republic]	TAKEN INTO ACCOUNT: Paragraph has been revised for more clarity
14113	116	26	116	26	Change (Yu et al., 2019) projected an increase in the tropics). by Yu et al. (2019) projected an increase in the tropics. [Maria Amparo Martinez Arroyo, Mexico]	ACCEPTED: fixed
34101	116	26			Check for reference format. Change: « (Yu et al., 2019) » by « Yu et al. (2019) ». [Guiomar Rotllant, Spain]	ACCEPTED: fixed
110225	116	37	116	39	But this was thoroughly assessed in chapter 11 and also covered in sections prior. Is TC really a globally aggregated indicator? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We have now only briefly mentioned this and have cited Chapter 11

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
34103	116	37			I would to suggest to modify the following sentence fragment: « (e.g. Bacmeister et al., 2018) » by « (cf. Bacmeister et al., 2018) ». [Guiomar Rotllant, Spain]	ACCEPTED: Modified as suggested
14115	116	39	116	39	Indicate if 12.4 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: The first line of 12.5.1 indicates that 12.5.1 builds on Section 12.4. We label all figures as "Figure XX".
15593	116	41	116	42	The statement on "Total tropical storm event precipitation" should be placed under the Section 12.5.1.2 [SAI MING LEE, China]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
24503	116	46	116	47	The description of this sentence is differ from summary in Chapter 11.7.3. "There is medium confidence that changes in the intensity of ETCs, including wind speeds and precipitation, depend on the horizontal resolution of climate models and whether they include an explicit representation of convective processes." It should be revised. [Nobuhito Mori, Japan]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
14117	116	47	116	47	Indicate if 12.4 is a section or figure [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: typo corrected
14119	116	54	116	54	Change (12.4) by 12.4 [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: This is a reference back to Section 12.4 and makes more sense as a parenthetical reference. The first line of 12.5.1 indicates that this section builds on Section 12.4.
35379	116	54	116	55	note that seasonal snow is assessed in SROCC and Chapter 9.5.3 and a references should be made to there, not only 12.4 [Guðfinna Aðalgeirsdóttir, Iceland]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
14121	116	55	116	55	Remove parentheses in snowfall). [Maria Amparo Martinez Arroyo, Mexico]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34105	116	55			Erase parenthesis in this line: "...are very likely to reduce in the regions that currently experience snowfall). This matches projections in...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
43741	116	55			Read "in the regions that currently experience snowfall. " rather than "in the regions that currently experience snowfall). " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
35381	117	6	117	12	I Find missing reference to SROCC and suggest coordination with Ch9 LAs for consistency in confidence statements [Guðfinna Aðalgeirsdóttir, Iceland]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
35383	117	14	117	15	missins confidence statement and reference to Mountain chapter of SROCC, coordinate with ch9 for consistency [Guðfinna Aðalgeirsdóttir, Iceland]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
35385	117	15	117	15	here is a reference to 9.5.3 (which is a snow section) reference should be made to 9.5.2. (permafrost) [Guðfinna Aðalgeirsdóttir, Iceland]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
88415	117	15	117	15	A bit unclear how this conclusion regarding the largest changes occurring on QTP comes from. Section 9.5.3 focusses on snow cover not permafrost There is nothing in section 9.5.2 that backs up this statement. [Sharon Smith, Canada]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
5551	117	18	117	29	Why is not there text about the coastal erosion ? [Benoit Laignel, France]	ACCEPTED: Text on coastal erosion has been added
114905	117	18			12.5.1.5 Coastal and oceans -- in this section there is a confusion here in language about a change in return period of extreme water levels and an increase in flooding. Sea-level rise certainly increases extreme water levels, but it only increases flooding if there is no adaptation, In the UK our research suggests the incidence of flooding has declined through the 20th and early 21st Century despite measured sea-level rise as we have adapted faster than sea levels rose (Ruocco et al., 2011; Haigh et al., 2016) (see DOI 10.1007/s11069-011-9868-7 and DOI: 10.1038/sdata.2016.107). On the US east coast, the growth in nuisance flooding shows the opposite trend, reflecting adaptation is slower than sea-level rise over the last few decades. [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have added a caveat in 12.2 (which defines the river flooding and coastal flooding CIDs) to highlight the connection between potential flooding and adaptation measures.
39457	117	21	117	22	Please review the use of uncertainty language. [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: We have refined the use of uncertainty language in this section now

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
24505	117	26	117	29	There is no description of CID of 1:100 yr extreme sea levels ESLs. The showing projection is important but it is better to include driver to increase ESLs. Here is example to change. Here is an example. The 100-year extreme sea level has been projected to be on average 24-41cm higher than present day (1980-2014) levels by 2050 under RCP8.5, and 58-172 cm higher by 2100 (Vousdoukas et al., 2018), but with greater increases in the South Pacific, Australia, South America, South East Asia, and the west coast of North America depends on changes in TCs and ETCs (Figure 12.15g shows the global average height of the 100-year extreme sea level). [Nobuhito Mori, Japan]	ACCEPTED: Text on extreme total water levels has been added
63963	117	26	117	29	100-year extreme sea levels mentioned in the text does not fit to the graphs shown in Fig. 12.15. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore
114823	117	34	117	36	In this sentence the meaning of "on aggregate" is not very clear, it would be better to use more precise language here, since it is an important summary statement. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: the phrase "on aggregate" does not appear anymore here
114825	117	36	117	37	I don't think "impact" is used correctly here. Are you talking about the amount of change in the indicator for a climatic impact driver? Also, I would replace "between" with "across", since I think you mean across indicators and across scenarios. [Brian O'Neill, United States of America]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore
34107	117	38			I guess you are talking about several regions, then I would suggest to change "between" by "among" in this line: "...although the amount of change differs between regions". [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We have modified the sentence
20293	117	39	117	39	Please provide more detailed references than (section 12.4): hazard decreases are scarce, and not easy to locate across these 71 pages. [philippe waldteufel, France]	NOT APPLICABLE: Section has been overhauled. The sentence in question does not appear anymore. Sections 12.1-12.3 indicate how CIDs are connected to hazards. Discussions of all CID changes throughout the chapter therefore connect to the risk framework; when a CID is connected to a detrimental impact/risk it can be labelled a 'hazard'. See also FAQ12.1.
114827	117	46			It is unclear what "at least one period" means here [Brian O'Neill, United States of America]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore
114829	118	8	118	16	I think all of this text needs to go in the figure caption, so that the figure can be understood on its own. I first looked at the figure and had many questions that were only later answered when I got to this text. [Brian O'Neill, United States of America]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore
110229	118	8	118	16	This is really figure caption material. Why is it in the main text here? [Peter Thorne, Ireland]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore
63955	118	8	118	16	In my opinion, this information belongs clearly to the figure caption. Without this information, some features of the figure e.g. dashed lines can not be understood. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore
34109	118	15			Add a space between number and unit: "250km". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Section has been overhauled. The figure in question does not appear anymore, however we have revised to ensure consistent formatting of units throughout CH12.
39459	118	19	118	28	What is the label "not broadly relevant"-what does it mean? [Lourdes Tibig, Philippines]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft. We use "not broadly relevant" in our tables within Section 12.4 to indicate that this CID is not a common phenomenon of concern in this region. It is possible that there may be a rare exception where its relevance matters, but this would apply to things like tropical storms in polar regions.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
102713	118	21	118	21	Table 12-12 shows that wildfire risk increases with high confidence while arid and drought increases with medium confidence. This is not entirely in line with their statements on page 12-56 where it is stated that there is high confidence (CMIP6) that times of drought will increase. On page 12-57 lines 47-48 it says weather conditions for wildfires will increase (very likely) [Philippe Tulkens, Belgium]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
451	118	21	118	21	I would suggest to remove lake acidity/acidification from table 12.12 [Leticia Cotrim da Cunha, Brazil]	ACCEPTED: We have removed lake acidity from the ocean acidity CID throughout Chapter 12.
66431	118	21	118	26	I feel like there should be high confidence in permafrost loss wherever it is currently present, which would include at least Europe and Asia as dark blue boxes? [Charles Koven, United States of America]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
35363	118	21	118	28	table 12.12. Why is there lower confidence in direction of change for Asia and Africa, what is the basis for this assessment? And why is not 1 in Asia, as the snow in Himalayas may increase, as is observed in Karakorum [Guðfinna Aðalgeirsdóttir, Iceland]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
63965	118	21	118	28	There is no link between text and table 12.12. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
63967	118	21	118	28	The four European regions show medium confidences of an increase in pluvial flooding Table 12.7. How is it possible that pluvial flooding in Europe in Table 12.12 has a high confidence of increase? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
105443	118	21	118	28	It would be informative to indicate the relative increase and/or decrease of the CIDs over the different continents. Or are the averages all the same? Continents are large areas, and although interesting to have a summary on the scale of continents, it would be more useful to have a similar table for sub-regions of the continents according to the regional divisions in the Atlas for example, but indicating relative/percentage increase/decrease. This information does not appear in the Interactive Atlas. [Zelina Ibrahim, Malaysia]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
88417	118	21			Table 12.12 - Should there be a note with respect to permafrost in Central and South America to indicate that this is largely in high elevation areas? [Sharon Smith, Canada]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
114831	118	21			This is a useful figure. Do the results depend at all on which indicator of each impact driver is used? That should probably be clarified. [Brian O'Neill, United States of America]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
31625	118	25	118	25	For Europe, I suggest to highlight that river flood hazard is both increasing and decreasing depending on the actual location and causes of flooding (see e.g., Blöschl et al 2019); may be also add a caveat for relative sea levels that sea level in Fennoscandia would decrease, at least under RCP2,6 (also in table 12,7) Blöschl, G. et al., 2019: Changing climate both increases and decreases European river floods. Nature, 573 (7772), doi:10.1038/s41586-019-1495-6. [Gonéri Le Cozannet, France]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
126771	118	25	118	26	Table 12.12 could be updated for sand and dust storms in Australasia from "not broadly relevant" to "low confidence in direction of change" consistent with North America. [Trigg Talley, United States of America]	NOT APPLICABLE: We have removed Table 12.12 from the final governmental draft
114783	119	1	125	41	This is a clear, useful and well structured section synthesising knowledge from previous chapters; providing a solid link to WGII [Jan Fuglestedt, Norway]	NOTED. Thank you, however it was decided that it will become a cross-chapter box, residing in Chapter 12, and it has been somewhat reframed to be in support of the assessment of Representative Key Risks as well as RFCs.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64055	119	1	125	46	All factors used for risk assessment need to be more profoundly introduced and their selection should be justified. Although the chapter vision targets risk assessment, however; it only occupies a collective data of assessed risk factors in previous chapters. Also risk assessment is stated as a concluded risk assessment data where no models are presented or explained and no justification for the risk assessment factors is presented. Risk assessment should be either presented in a separate chapter where it can be detailed or should take broader spectrum within this chapter. Although i recommend its independence in a single chapter, to be able to elaborate into a contingency plan based on the risk assessment. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: This section has been eliminated and its content reframed as a cross-chapter box. The choice of the various "factors" is now made mostly according to the assessment of Representative Key Risks from Chapter 16 of Working Group2, and only when not already covered, for some of the Reasons for Concern assessments in the same chapter, where the justification for the identified factors is made.
110231	119	1			Does this section use as its basis the updated assessment of change to date in GSAT arising from chapter 2? Does it use the emulator approach to warming levels arising from chapter 4? These details should be explicitly stated early in this section. [Peter Thorne, Ireland]	NOT APPLICABLE. The content of the section (now a cross-chapter box, 12.1 is derivative of other chapters' assessment so we rely on that first step to be consistent with Chapter 2 final estimates.
34111	119	5	119	6	Check for reference format. Change: "...further elaborated in (Smith et al., 2009; O'Neill et al., 2017) and also adopted in assessments at the national scale, e.g., (Yohe, 2010)." By "...further elaborated in Smith et al. (2009) and O'Neill et al. (2017), and also adopted in assessments at the national scale, (cf. Yohe, 2010)." [Guiomar Rotllant, Spain]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
34113	119	8	119	28	Check for reference format. Change: "(Hoegh-Guldberg O., Jacob D., 2018)" by "(Hoegh-Guldberg and Jacob, 2018)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
34115	119	10			Add a space between parenthesis in: "(SRCLL)(Hurlbert et al., 2019)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
114833	119	13	119	17	This sentence is hard to follow. I would suggest something that uses: "Although risk judgments are based primarily on impacts literature, they can be informed indirectly by consideration of changes in hazards across warming levels." [Brian O'Neill, United States of America]	NOT APPLICABLE: The narrative in the new Cross-Chapter Box no longer makes this point.
114835	119	13	119	17	I think the assesment in this section is also useful beyond WG2 chapter authors, to inform understanding of potential changes in hazards and their associated risks with temperature level more broadly, and that wider purpose should also be stated here. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: We have made this point now in the text of the Cross-Chapter Box
34117	119	15			Avoid to start a sentence with a number: "15 CMIP6 models...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
114781	119	19	119	24	Good that you celarly state which temp metric that is used. It is important to keep this clarity and transparence during the next revisions [Jan Fuglestedt, Norway]	TAKEN INTO ACCOUNT: Thank you, we have rewritten this but we specify that we are talking about GSAT in the Cross-Chapter Box caption.
126773	119	28	119	28	Hoegh-Guldberg reference is not correct. Please revise. [Trigg Talley, United States of America]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
114837	119	38	119	39	By the time of the WG2 SOD, there should be a mapping between RKR and RFCs in Ch 16 that can be drawn on to make this relationship more explicit in this section. [Brian O'Neill, United States of America]	NOTED. The new home of this material is now cross-chapter box 12.1 that uses RKR drivers as the main assessed quantities
39461	119	42	120	3	Table 12.13 is novel and incle. Expert judgement when used to assess how hazard indices drive risks associated with the 5 RFCs is minimized. [Lourdes Tibig, Philippines]	NOTED. Thank you, that is the goal
31667	119	44	119	48	I suggest to integrate the Table caption 12.13 with a short description of the "Dimension" to simplify the comprehension of the Table 12.13. [Alessandro Pezzoli, Italy]	TAKEN INTO ACCOUNT: We ensure that the Table caption clarifies what the dimension represents.
88419	119	44			Table 12.13 - Permafrost volume in upper 3m sees to be a rather arbitrary indicator for snow and ice. It implies that deeper permafrost thaw is not an issue when it is for landscape stability, ecosystems, hydrological systems etc. It also seems strange that this is the only indicator for snow and ice. [Sharon Smith, Canada]	NOTED. We rely on Chapter 9 for this assessment and permafrost volume in upper 3m is what Chapter 9 assesses.
11935	119	48	119	48	"interplay" should be "interact"; I have only seen "interplay" used as a noun before, not as an adjective [Amy East, United States of America]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
110233	119	48	120	1	The table text font is too small to be easily readable. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT. Editorial

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11937	119	54	119	54	"dryland" (it's being used as an adjective here) [Amy East, United States of America]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
64319	120	12	120	13	Table 12.13 contains only qualitative information relating to the RFC's yet this sentence claims that the table 'quantifies' perhaps reconsider this language? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT. Editorial.
114839	120	15	120	28	For this analysis of GSAT vs global mean SSTs, would it be possible and more relevant to compute SSTs in the regions where corals currently exist? Global mean SST seems like a rough measure of hazard for reefs. The reefs at risk are warm-water reefs. Possibly the relationship with GSAT is different.. This is not an area of expertise for me but would be worth checking into. [Brian O'Neill, United States of America]	NOTED: We have been unable to get that information from the Atlas as of the date of submission of the FGD. However the Interactive Atlas plans to make those patterns of SST by GWL eventually available.
110237	120	17	120	26	This text seems to be very inconsistent with the historical warming finding arising from SRCLL which gained widespread attention. Is this because its GSAT / SST rather than LSAT/SST? Probably but it might be worth being much clearer here? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We now rely directly on Chapter 2 for this type of statement. By making this section into Cross-Chapter Box 12.1 the text is able to more cohesively connect information and assessments from all WGI chapters.
110235	120	22	120	24	But chapter 2 use HadCRUT5 and HadSST4. Is there any reason that this can't be done here? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT. We now rely directly on Chapter 2 for this type of statement.
14123	120	32	120	32	Change 2, 3, 4.4 by 2°C, 3°C, 4.4°C [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
110239	120	32	120	32	These can't be given as deterministic warming estimates and must be made consistent with the assessment of chapter 4 which should be referenced here. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT. The final version of the Table containing all the quantitative information relies on the most up-to-date assessment from Chapter 4.
110241	120	41	121	1	As given these statements are grossly redundant. Were the second to be about the scenarios rather than immediately translated to warming levels it would contain useful information. As it adds no value to the chapter 4 statement which itself is derived similarly and thus the second part is redundant with the first. [Peter Thorne, Ireland]	NOT APPLICABLE: This text like the rest of the section has disappeared from the current version of this material in Cross-Chapter Box12.1.
114841	120	43			what does "is consistently occurring" mean? It is hard to reconcile the results for sea ice in this sentence (which is focused on above 3 C), with the results described next, saying that most models project an ice free arctic above 1.5 C. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: The final assessment of this quantity now relies on Chapter 4 for a complete characterization that was unavailable at the time of the SOD.
15747	121	5	121	5	The study by Kraaijenbrink, P.D.A., M.F.P. Bierkens, A.F. Lutz and W.W. Immerzeel, 2017: Impact of a global temperature rise of 1.5 degrees Celsius on Asia's glaciers. Nature, 549(7671), 257–260, doi:10.1038/nature23878. provides clear linkages between global temperature change and glacier mass balance in the Himalaya. This seems highly relevant to this subsection. [Samuel Morin, France]	NOTED. This information was passed to Chapter 9, from which our treatment of the glacier mass behaviour under GWLs derives.
15745	121	17	121	23	Verfaillie et al. (2018 : https://doi.org/10.5194/tc-12-1249-2018) and Spandre et al. (2019 : https://doi.org/10.1038/s41598-019-44068-8) provide changes in CID for mountain temperature, natural (Verfaillie et al.) and managed (Spandre et al.) snow cover per degree of global warming in the French Alps. There are few such studies, but they exist, and could be mentioned here as relevant efforts towards linking global temperature changes to regional/local changes in CIDs in the mountain environment. Number from these studies could directly fit in Table 12.14 [Samuel Morin, France]	NOT APPLICABLE. We are attempting to maintain a "global scale" perspective therefore it would be difficult to include single regional studies without opening the gate to many different aspects of CIDs and warming levels for individual regions.
14125	121	32	121	32	Change Fig by Figure [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
43743	121	33			Read "the results from Rasmussen et al. (2018) who estimated changes " rather than "the results from (Rasmussen et al., 2018) who estimated changes " [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box.
14127	121	34	121	34	Change 1.5 by 1.5°C [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
43745	121	44			Read "(following the method of Spinoni et al. (2014))" rather than "(following the method of (Spinoni et al., 2014))" [Cyriaque Rufin Nguimalet, Central African Republic]	NOT APPLICABLE: Editorial but not relevant as the entire section was rewritten as a Cross-Chapter Box. Editorial
131487	121	46	121	48	Reporting the model parameters is too specific for this purpose. Only provide confidence level. [Hans Poertner and WGII TSU, Germany]	NOTED. However, this is now reworded, based on Chapter 2 and 4 assessment.
63969	121	47	121	48	Text and table are not consistent 11 vs 12 % and R2 0.36 vs 0.3 [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	EDITORIAL - Fixed
114843	121	51			For this section on extreme events, marine heat waves are likely relevant to RFC1, and may be an important indicator to consider. [Brian O'Neill, United States of America]	NOTED. MHW are addressed by Chapter 9 but not by GWL, so we are not able to say something meaningful by warming level.
14129	122	10	122	10	Change 1.5, 2, 3, by 1.5°C, 2°C, 3°C, [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
110243	122	10	122	14	Chapter 1 had a piece on time of emergence should that not be linked here? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We now include information about changes "to-date" in the Table.
34119	122	13			Add a point or semi-column in between: "... (Tebaldi et al., submitted) See..." [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
14131	122	17	122	17	Indicate if 11.4, 11.7 are figures or sections [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
14133	122	19	122	19	Indicate if 11.5 is a figure or section [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
14135	122	20	122	20	Indicate if 11.6 is a figure or section [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
14137	122	21	122	21	Change 1.5, 2, 3 by 1.5°C, 2°C, 3°C [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
110245	122	23	122	28	This is an over-narrow interpretation of compound events that can also include consecutive or daisy-chained events? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We now use text directly from Chapter 11 where the assessment (and definition) of compound events resides.
34121	122	35			Add a comma between words: "Therefore there...". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
64321	122	52	123	17	Consider here that as current agricultural lands become less suited to their use, other areas will become more similar to land suitable for agriculture. Have you used the same process to assess how much land is likely to become agricultural? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: Outside the scope of WG1
63971	123	19	123	30	Page 122 Line 54 mentions indices relevant to agricultural impacts. I do not see direct connections to agricultural impacts. Please provide connections to agriculture similar to lines 1-17. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOT APPLICABLE: the entire section was rewritten as a Cross-Chapter Box. The text has been removed altogether in the transition from Section to Cross-Chapter Box
34123	123	28			Add a space between number and unit: "600ppm". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
126775	123	32	123	32	El Niño - Southern Oscillation should have a hyphen between "Niño" and "Southern". [Trigg Talley, United States of America]	EDITORIAL - Fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
14139	123	32	123	32	Change Nino by Niño [Maria Amparo Martinez Arroyo, Mexico]	EDITORIAL - Fixed
80731	123	32	126	32	It is El Niño, not El Nino [Helene Jacot Des Combes, Marshall Islands]	EDITORIAL - Fixed
101653	123	40	123	49	While I appreciate to include hazard variables to capture non-economic damages, variables driving economic damages (in IAMs or econometric models like Burke et al. 2015, 2019 or Kahn et al. 2019) should not be neglected. See also Chapter 16 of WGII. [Birgit Bednar-Friedl, Austria]	TAKEN INTO ACCOUNT: We have used Chapter 16 to glean CIDs relevant to the various RFCs/RKRs
114845	123	40			Note that in RFC4, global aggregate impact assessment will now depend on recent literature evaluating this impact in empirical models, usually based on county or national or even more aggregated measures of interannual temperature variability and possibly other variables. I'm not sure this implies any particularly relevant indicator to assess here, but it is no longer the case that this assessment relies only on IAM-based results. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: We have used the latest version of Chapter 16 to glean CIDs relevant to the various RFCs/RKRs
52097	123	52	123	53	To be Calculated' is it a mistake? [Amarasinghage Tharindu Dasun Perera, Switzerland]	NOT APPLICABLE: This variable is not assessed in the final version for lack of literature on its relation with GWLs.
34129	124	15	124	23	Table 12.14. Regarding second column, the title indicates: "Sensitivity (change/°C)", then several units are shown in this column. Please fix it and check units format and their separation with the numbers. [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
110247	124	17	124	21	This seems completely tangential to the point being made here. The important aspect is that chapter 4 has low confidence in triggering tipping points by end of century. How much chapter 4 expects the climate to warm on that timescale is immaterial unless that information is key to translate into the RfC framework in which case that needs to be made explicitly clear. At the moment the juxtaposition makes little sense to the reader and perhaps assumes knowledge that cannot be readily assumed. [Peter Thorne, Ireland]	NOTED: We have eliminated this discussion altogether and just provide the assessment of tipping points from Chapter 4 and 9.
66433	124	23	124	30	Please ensure coordination with Ch. 5 section 5.4.8 here [Charles Koven, United States of America]	TAKEN INTO ACCOUNT: Cross-chapter Box 12.1 includes co-authors from Chapter 5.
34125	124	29			Add a comma between words: "Therefore there...". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
35387	124	32	124	37	Note that although results are from Edwards et al, the model simulations that are input for the emulator are ice sheet models contributing to ISMIP6, they should be cited here ,not only the emulation study, see Ch9.4 [Guðfinna Aðalgeirsdóttir, Iceland]	NOTED. Text has been eliminated so we do not elaborate on the sources, but refer to Chapter 9 for details.
110249	124	36	124	36	2.5m not cm surely? GiS would contribute 9m if it all melted which it would do by c.4C according to chapter 9. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Typo corrected.
35389	124	39	124	41	what is the reference for these numbers? Why mention only these regions? Note the new GlacierMIP paper (Marzeion et al 2020) that informs the assessment of projected glacier mass loss in Ch9 [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: This assessment is now directly provided from Chapter 9, with CH9 co-authors contributing to Cross-Chapter Box 12.1.
15749	124	39	124	41	This statement is given without reference, it is no even clear what it deals with (sea level rise ? Other ?). This needs clarification. [Samuel Morin, France]	NOT APPLICABLE: Statement is no longer in the new version of this material.
11939	124	40	124	40	need a space after "0.35" [Amy East, United States of America]	EDITORIAL - Fixed
110251	124	40	124	40	Similar units question to that for GiS earlier in same section. These seem far too small potentially. Should rather be 0.35m etc? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Typo Corrected
34127	124	40			Unit format, homogenise. Change: "0.35cm/°C, 0.45cm/°C, 0.25cm/°C and 0.2cm/°C" by "0.35cm °C-1, 0.45 cm °C-1, 0.25 °C-1 and 0.2 °C-1" [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
66435	124	43	124	49	Please ensure coordination with Ch. 5 section 5.4.8 here [Charles Koven, United States of America]	TAKEN INTO ACCOUNT: Cross-chapter Box 12.1 includes co-authors from Chapter 5.
55267	125	1	125	1	Sigmond et al (2018) should be Sigmond et al (2020) see Chapter 4 for full reference [Nancy Hamzawi, Canada]	EDITORIAL - Fixed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
28263	125	6	125	7	Drijfhout et al. dis not investigate whether ENSO variability shows threshold behaviour. One might use a different reference here (e.g. Lenton et al., 2008; https://doi.org/10.1073/pnas.0705414105), or reformulate that key variables in CMIP5 models did not show threshold behaviour in the tropical Pacific (Drijfhout et al.). [Sebastian Bathiany, Germany]	NOTED. Statement is no longer in the new version of this material. The assessment of changes in ENSO variability are coming directly from Chapter 4 assessment.
35365	125	15	125	23	table 12.14 Numbers for glaciers shown in table are for volume loss, NOT surface mass BALANCE, suggest to change to mass loss of glaciers in line 6 [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: We now rely directly on Chapter 9 and include CH9 authors in Cross-Chapter Box 12.1.
35367	125	15	125	23	Table 12.14 it is not clear what "different types of glaciers/regions" means here, suggest to reformulate to something like "variable between regions and size of glaciers" [Guðfinna Aðalgeirsdóttir, Iceland]	EDITORIAL - Fixed
35369	125	15	125	23	table 12.14, note that that sensitivities of NH snow cover and permafrost volume can be found in sectin 9.5 [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: We now rely directly on Chapter 9 and include CH9 authors in Cross-Chapter Box 12.1.
35371	125	15	125	23	Table 12.14, note that the ice volume changes in Greenland and Antarctica are not only uncertain, but warming levels are not very relevant because of the long dealy to equilibrium [Guðfinna Aðalgeirsdóttir, Iceland]	TAKEN INTO ACCOUNT: We now rely directly on Chapter 9 and include CH9 authors in Cross-Chapter Box 12.1.
83689	126	1	126	25	12.5.3. This topic seems to be something to be discussed in WG2, and not here? [Robbert Biesbroek, Netherlands]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
73997	126	1	127	9	In this chapter only geoengineering measures are mentioned and discussed, but not any other measures (like social, economic, policy etc.) The title is misleading. [Elena Kozlovskaya, Finland]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
64323	126	1			Section 12.5.3: What about the effect of behaviour change in response to knowledge exchange on the global and regional climates? I.e. We are encouraged to not use disposable plastic bags - however, if you switch to disposable paper bags they usually have a greater CO2 footprint - Bell and Cave , 2011 (Comparison of Environmental Impact of Plastic, Paper and Cloth Bags) [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
131489	126	15	126	25	The review is too broad and missing references. What are the key points, and where can they be found? [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
39513	126	25	126	27	It could also benefit from adding the perspective of the co-benefits of mitigation and adaptation, for instance with regard to 'afforestation' that is mentioned here with regard to removal/reduction of greenhouse gas emissions and reducing river flood and drought risks. [Tamara van 't Wout, Qatar]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
39463	126	28	126	31	Uncertainty language [Lourdes Tibig, Philippines]	NOT APPLICABLE: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
27493	126	39	126	39	About ' [...] (e.g., Boucher et al., 2004; Kueppers et al., 2007).': there are many more recent references that are cited in IPCC SRCLL or you may cite the SRCLL report. [Eric Brun, France]	NOT APPLICABLE: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
27495	126	41	126	42	About ' [...] are negligible to small, [...]': we're surprised by this conclusion as there are many papers discussing significant impacts of wind or solar farms on local to regional climate which is in contradiction with your statement. We suggest this deserves verification. [Eric Brun, France]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
27497	126	44	126	47	This is an important message especially because land changes will affect extreme weather events more strongly than mean climate. You may want to emphasize that. [Eric Brun, France]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
85083	126	49	126	50	Comment provided by Jennifer Weeks and Tyrone Dunbar: Perhaps could explicitly mention that SRM is in Chapter 6. A search for the term 'geoengineering' in Chapter 6 and Chapter 7 does not return anything itself in the text of those chapters. [Stacey New, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
17321	126	49	126	50	Chapter 7 does not mention geoengineering. According to Table 1.6 the geoengineering methods are discussed in Chapters 4,5 and 8. According to section 4.6.3 the term "geoengineering" is avoided in AR6 [David Neubauer, Switzerland]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68483	126	49	127	8	Suggest clarifying terms, including geoengineering, solar radiation management (SRM), and carbon dioxide removal (CDR) to avoid blurring different climate interventions. See Chapter 4 of this draft (4.6.3 at page 4-81) (“Anthropogenic climate change can be limited by both mitigation through reduced emissions of GHGs and intentional large-scale interventions in the climate system referred to as geoengineering, climate engineering, or climate intervention (e.g., Royal Society, 2009; National Research Council, 2015a, 2015b). Two categories of fundamentally different climate intervention have been proposed: carbon dioxide removal (CDR) and solar radiation modification (SRM). CDR refers to anthropogenic activities that remove CO2 from the atmosphere and durably store it in geological, terrestrial or ocean reservoirs, or in products (SR1.5, Glossary). SRM refers to intentional modification of the Earth’s shortwave radiation budget to reduce surface warming (SR1.5, Glossary). As in SR1.5, use of the term “geoengineering” is avoided here because of inconsistencies in the literature, which uses this term to refer to SRM, CDR or both, whereas CDR and SRM are explicitly differentiated here. While there is some overlap between mitigation and CDR, as in SR1.5, they are treated separately here to distinguish between activities that reduce the emissions of greenhouse gases (mitigation) and those that reduce CO2 concentrations already in the atmosphere (CDR).”). [Durwood Zaelke, United States of America]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
112821	126	49	127	8	Strongly suggest not to speak about geo-engineering in general but explicitly separate treatment of Solar Radiation Management and Carbon Dioxide Removal -- as per most recent IPCC practices (including the AR6 outline). [Maarten van Aalst, Netherlands]	TAKEN INTO ACCOUNT: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
83693	127	2	131	2	section 12.6. offers a nice narrative of the climate services literature, but it would be even better if the authors would manage to assess the literature when it comes to what works where and why. For example, it would be nice to illustrate under which (country-specific?) conditions certain services prove to be more effective compared to others. Which options are more feasible than others? Are there certain design criteria that are necessary to consider? Such insights would be particularly useful for policy makers (in my view). [Robbert Biesbroek, Netherlands]	TAKEN INTO ACCOUNT: there are many examples of climate service efforts, but due to space constraints it is only possible to cover three examples in the Cross-Chapter Box
85085	127	3	127	5	Comment provided by Jennifer Weeks: These are useful case studies. Another case study could be referenced which has been through all stages of the prototyping cycle: CSSP China Yangtze River Basin seasonal forecast - Golding, N., C. Hewitt, P. Zhang, M. Liu, J. Zhang and P. Bett, 2019: Co-development of a seasonal rainfall forecast service: Supporting flood risk management for the Yangtze River basin. [Stacey New, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: We have added the Golding et al. (2019) study within Section 12.6

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
51921	127	3	127	5	Suggest this sentence is reworded - lots of negatives in there; making sense of it is difficult in current form. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI 6.4.6, Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.
20805	127	11	127	45	This title generates some misunderstanding, because what is really meant here is "climate change services" rather than "climate services". This is acknowledged on line 13. Climate services have existed and been operated for decades before IPCC was created. According to the WMO definition, they aim at providing any kind of information about the past, present and future climate. Therefore, one must not write "IPCC AR5 WGII introduced climate services as institutions that bridge generation and application of climate knowledge, also describing its history and concept" By the way these last few words are problematic: information about physics is quite distinct from information about the history of physics, and this goes for climate too. Hopefully this section should be improved with these remarks in mind. [philippe waldteufel, France]	NOTED: both Chapter 1 and section 12.6 now more explicitly explain the timescales of climate services covered in the WG1 report
126777	127	11	133	55	The climate services section might benefit from some additional concrete examples of service efforts over the past few decades. It would be very useful to include examples of different types of climate service activities. The focus on "gaps" seems to suggest that there hasn't been any progress in this area. [Trigg Talley, United States of America]	NOTED: there are many examples of climate service efforts, but due to space constraints it is only possible to cover three examples in the Cross-Chapter Box
126779	127	11	133	55	[SCOPE] Recommend moving Section 12.6, "Climate change information in climate services," to WGII. The provision of climate services is an adaptation. The section seems like an odd fit with the rest of the chapter. At minimum, reframe as a better bridge/transition to WGII. [Trigg Talley, United States of America]	NOTED: section 12.6 has been reframed to provide a better bridge with WG2, in particular with their chapter 17.
107935	127	11	133	55	Of course Climate Services is discussed in a number of the regional chapters and Chapter 1. This is OK, but I think it's most natural home is in Chapter 12, the Chapter leading the way to WGII. The sections in the Atals are more on communication of various sorts and don't discuss Climate Services very much. And I think this is fine. The sections in Chapter 12 on Climate Services are also for the most part, apposite, but may be overlong. It also has a 'how to' feel to it, rather than an actual assessment of climate messaging and climate services research. This aspect of chapter 10 should be carefully reviewed. [Linda Mearns, United States of America]	NOTED: we have reduced the section to make the text leaner. Because of the large number of climate services, their diversity and the importance of user context, only a partial assessment is feasible at present; more research is needed.
112815	127	11	133	55	Good to make an explicit reference to WGII ch17 (forthcoming) which will discuss climate services as well. And great box to illustrate the value of both top-down and bottom-up approaches. [Maarten van Aalst, Netherlands]	ACCEPTED: explicit reference to WG2 Ch17 made were relevant
104827	127	11	134	2	In section 12.6 (Climate change information in climate services), the issues of climate related forums organized by National Meteorological and Hydrological Services (NMHSs) or WMO's Regional Specialized Meteorological Centers (RSMCs) (e.g. monsoon forum, elnino forums, COFs) can be mentioned. These national and regional forums are becoming more common to many Asian countries in last decade or so. [Atiq Kainan Ahmed, Thailand]	REJECTED: this section only covers 'climate change' timescales
57483	127	13	127	13	I'm not sure that climate services are really "new" in this sense, and this is confusing when reading line 47. I suggest rewording to "Climate services are a rapidly growing source of providing climate information to support adaptation and mitigation decisions and policies." [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Text has been revised.
110667	127	13	127	14	I think saying climate services are emerging is a bit pessimistic. Evolving significantly, yes, but climate services have a long history. [Bruce HEWITSON, South Africa]	ACCEPTED: sentence changed

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110669	127	13	127	18	The scope of climate services seems to defy definition; yet in this section seems to infer that climate services equates to boundary organizations (although it being broad is noted in 129:9-10). I would suggest that many climate services take place outside the formal institutions that fly under the label of a “climate services organization”, and perhaps the scope of climate services needs more recognition here. [Bruce HEWITSON, South Africa]	ACCEPTED: Multiple definitions of climate services mentioned
110253	127	21			This section contains good points but it is overlapping with chapter 10 and given respective charges arguably should be covered there not here? [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: Text has been cross-checked with Ch10 and overlaps have been removed or reduced to the essential.
40587	127	23	127	23	Note that the glossary has the following definition for 'climate services': "Information and products that enhance users' knowledge and understanding about the impacts of climate change and/or climate variability so as to aid decision-making of individuals and organizations and enable preparedness and early climate change action. Such services involve high-quality data from national and international databases on temperature, rainfall, wind, soil moisture and ocean conditions, as well as maps, risk and vulnerability analyses, assessments, and long-term projections and scenarios. Depending on the user's needs, these data and information products may be combined with non-meteorological data, such as agricultural production, health trends, population distributions in high-risk areas, road and infrastructure maps for the delivery of goods, and other socio-economic variables (WMO, 2019)." [TSU WGI, France]	TAKE INTO ACCOUNT: Definition of climate services has been revised for the glossary and added here.
57485	127	23	127	32	I have three suggestions for this section. One is to ask to include some additional highly relevant papers in this section. Secondly, I think that describing climate services as involving the generation of information and knowledge is a bit misleading, and open to misinterpretation (this could imply that all climate research is a climate service, which perhaps isn't a helpful way of describing it). Thirdly, it could be misleading to describe climate services as predominantly targeted at informing adaptation to climate variability and change and linking this to sustainable development. Many climate services are providing information about past and current climate, and not the future climate at all. While the text may not mean to imply that services are mostly based on climate predictions and projections of the future, it could be misinterpreted. I suggest the following text to address these three points: IPCC AR5 WGII introduced climate services as bridging the generation and application of climate knowledge, also describing their history and concepts (Jones et al., 2014). Since then, this transdisciplinary field has been growing rapidly (Brasseur and Gallardo, 2016, Hewitt et al., 2020). In general, climate services involve the provision and contextualization of information and knowledge derived from climate research for decision making at all levels of society (Hewitt et al., 2012; Vaughan and Dessai, 2014; Swart et al., 2017). Climate services differ from more research-driven vulnerability, impacts, and adaptation research in their orientation toward operational decision support (Stone and Meinke, 2005; Ruane et al., 2016; Golding et al., 2019), but overlaps exist (Bruno Soares and Buontempo, 2019). Climate services are targeted at building resilience to climate-related hazards (both current and future), often to inform adaptation to climate variability and change (Hewitt et al., 2012), widely recognized as an important challenge for sustainable development (Moss et al., 2010; Jones et al., 2014; Vaughan et al., 2018). Stone, R. C. and H. Meinke, 2005: Operational seasonal forecasting of crop performance, Phil. Trans. R. Soc. B, 360, 2109–2124, doi: 10.1098/rstb.2005.1753 Hewitt, C. D., E. Allis, S. J. Mason, M. Muth, R. Pulwarty, J. Shumake-Guillemot, A. Bucher, M. Brunet, A. M. Fischer, A. M. Hama, R. K. Kolli, F. Lucio, O. Ndiaye and B. Tapia, 2020: Making society climate-resilient: international progress under the Global Framework for Climate Services, Bull. Amer. Meteor. Soc., E237-E252, DOI: 10.1175/BAMS-D-18-0211.1	ACCEPTED: Text has been replaced.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
79573	127	23	131	22	I think it is critical to include and discuss (somewhere in this chapter) the challenge related to the (still) very limited role of the social sciences and humanities in the co-production of climate services which, given the wicked nature of climate change and the existing and well known challenges of effectively using climate information in decision-making processes require the efforts by multi-disciplinary teams including social sciences (Sreet, 2016). However, in practise this operational and research field, is still largely permeated and pretty much dictated by the natural sciences. I would recommend the final section of the paper by Bruno Soares and Buontempo (2019) on this subject. [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Text and references have been added.
88937	127	24	127	25	The growth of climate services has been mostly influenced by advancement in ICT. As computational power, storage and internet becomes cheaper it became easier to provide quality products and services faster and at minimum cost. This trend is going to increase as computing, IoT, connectivity and data analytics becomes cheaper and better. [Joseph Intsiful, Republic of Korea]	TAKEN INTO ACCOUNT: Text has been added to reflect comment.
26461	127	25	127	27	This information about what is meant by climate services should be given before anything else about climate services is discussed ("In general, climate services involve the generation, provision, and contextualization of information and knowledge derived from climate research for decision making at all levels of society") [Mare Sundström, Sweden]	TAKEN INTO ACCOUNT: Glossary definition of Climate Services has been added.
33233	127	25	127	27	This sentence (and actually throughout the entire section "12.6.1 Context of climate services") lacks the two-way communication within climate services, which is essential for building trust in the products of climate services. As the two-way communication is part of sections later on, it should be mentioned in the introductory part "Context of climate services". [Janus Willem Schipper, Germany]	REJECTED: this sentence has been deleted
105813	127	27	127	29	not all climate service providers would characterize their work orienting towards operational decision support, there is significant variation in how the different organizations perceive their role in climate services [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: the word 'operational' has been deleted
126781	127	29	127	29	Overlaps need to exist for research to inform operations and operations to inform research on needs in decisionmaking. [Trigg Talley, United States of America]	NOTED: the sentence already says that overlaps exist
26463	127	30	127	31	Add (health) risk assessment to the "for sustainable development" [Mare Sundström, Sweden]	ACCEPTED: Text has been added.
39465	127	34	127	42	You may want to consider the WMO Bulletin, Vol. 67 (2)-2018 as a reference. [Lourdes Tibig, Philippines]	ACCEPTED: Reference has been added.
73999	127	34	127	45	This report shows that there are still serious problems with regional-scale modeling that need to be improved. The question arise: how reliable is information provided by these systems to decision makers that mainly are interested in trustful information on regional and even community-scale? How to avoid misinterpretation of information that mainly comes from modelling at global scales? Climate storylines and tales on future weather are not alone overcoming the problem of misunderstanding, because they are not sufficient for professionals. [Elena Kozlovskaya, Finland]	TAKEN INTO ACCOUNT: Reference to Chapter 10 has been included where the process of generating climate information is described.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
57487	127	34	127	45	I suggest revising this text and including some more references as follows: Climate services are undertaken in the public and private sectors at global, regional, national, and local scales (Hewitt et al, 2012, 2020). At the time of IPCC AR5, climate services were mostly, but not entirely, provided by national meteorological and hydrological services (NMHSs) operating on a national scale to deliver specific information, typically seasonal climate information to agricultural decision-makers online (Vaughan et al., 2018). Today there are a diversity of climate services operating across regions, sectors (e.g., agriculture, water, energy, health, etc.), timescales (from historical climate information to future climate on sub-seasonal to multi-decadal) and target users (high confidence). In general, these services involve interpretation, analysis, and communication of diverse sources of information, often combining different types of knowledge (such as scientific, technical, experiential, indigenous), to a targeted group of decision-makers (Buontempo et al., 2014; Hewitt et al., 2017; Olazabal et al., 2018; Golding et al., 2019; Pezij et al., 2019). A literature assessment on the distillation of climate information into regional climate messages can be found in Chapter 10, Section 10.1.3. Intermediaries such as private sector consulting companies, national climate service providers and research organizations provide 'translation' services to provide relevant aspects of climate research to specific decision-makers. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text and references have been added.
39467	127	37	127	39	No cited references? [Lourdes Tibig, Philippines]	TAKEN INTO ACCOUNT: References have been provided in subsequent paragraphs where the examples given in this sentence are further addressed.
27501	127	38	127	39	About '[...] timescales (from sub-seasonal to multi-decadal) [...]': actually, daily weather forecasts (or dekadal) are also included in climate services. [Eric Brun, France]	TAKEN INTO ACCOUNT: The time periods/horizons for the Climate Service we consider in this section has been introduced more clearly, which is from past to present to future. It does not include seasonal/interannual prediction timescales
79557	127	38	127	39	I think this sentence could be improved by adding a few references that support such statement. [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: References have been provided in subsequent paragraphs where the examples given in this sentence are further addressed.
79559	127	40	127	42	The reference to the paper by Fallon et al. (2018) can be added here. Paper DOI is: http://dx.doi.org/10.1016/j.cliser.2017.08.002 [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: reference added where appropriate.
105815	127	43	127	43	translation services deserve additional attention here. It is not just intermediaries, in fact, many climate service providers also translate knowledge and in many cases this is among their primary activities [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: Reference to Chapter 10 has been included where the process of translating climate information is described.
29985	127	43	127	45	The term 'translation' should be defined here. Many intermediaries may be running climate models themselves or perform additional analysis on publicly available information. Translation in this context implies summary, which is certainly an important aspect, but does not cover all the services provided by intermediaries. Consider providing examples to define what is meant by translation. For example, intermediaries often provide additional analysis or calculations not directly provided by the climate services. The concern here is over simplification of services being provided by both organizations. [Janya Kelly, Canada]	TAKEN INTO ACCOUNT: Reference to Chapter 10 has been included where the process of translating climate information is described.
29987	127	43	127	45	It is not clear what is meant by research organizations and how these differ from government agencies or academic institutions, especially since many research organizations are linked to government or academic institution [Janya Kelly, Canada]	ACCEPTED: Sentence has been reworded.
126783	127	44	127	44	There are many examples of intermediaries. List is too narrowly focused. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Reference to Chapter 10 has been included where the role of intermediates is described.
27503	127	47	128	8	We suggest you should make it clear that in Europe for instance CS mean mainly climate projections although in developing countries (eg. Africa) climate services refer to weather and seasonal information. [Eric Brun, France]	NOTED: weather and seasonal prediction timescales are not covered in AR6
41867	127	47	128	8	It seems that this paragraphe should be the first paragraph of this section "12.6.1 Context of climate services" [JACQUES ANDRE NDIONE, Senegal]	TAKEN INTO ACCOUNT: Section 12.6.1 had been revised and text has been integrated there.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
57489	127	47	128	8	I'm wondering what this paragraph is trying to convey. To me it seems to provide a global history of climate services, then jumps to a European history (but no other regions of the world) and then various other topics relating to climate services, such as commercialization. Is this text any use: "While the idea of climate services is not new – it can be traced back to at least the US National Climate Program Act of 1978 (Henderson et al., 2016) – the development of the Global Framework for Climate Services (GFCS) after the World Climate Conference-3 in Geneva brought international attention and renewed impetus to the climate services field (Hewitt et al., 2012). As a result, large investments have been made globally and regionally in the development of user-driven climate services. For example, the European Union declared its ambition to stimulate "the creation of a community of climate services application developers and users that matches supply and demand for climate information and prediction", giving primacy to climate services that are user-driven and science-informed (Lourenço et al., 2016), thus embracing concepts of co-design, co-development and co-evaluation of climate services (Street, 2016). The EU Roadmap for Climate Services (Street, 2016) focuses on developing a market for climate services comprised of both public and private domains. The GFCS, under the leadership of several United Nations Agencies, emphasizes the public domain by supporting national and regional capacity building and development of climate services mainly through National Meteorological and Hydrological Services (Hewitt et al., 2012; Domingos et al., 2016; Sivakumar and Lucio, 2018; Hewitt et al., 2020). Hewitt et al. (2020) describe several key challenges and future directions, including the issue of commercialization of climate services (Brooks, 2013b; Webber and Donner, 2017; Hoa, 2018; Troccoli et al., 2018; Bruno Soares and Buontempo, 2019). (Keele, 2019) argues that climate services shift the incentives for climate science away from the public interest towards the ongoing pursuit of profit with a subsequent diversion of effort away from publicly accessible and transparent climate information to private knowledge for discrete clients. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Text has been revised to reflect the comment.
99323	127	50	128	18	the focus of the section in the assessment is not clear to me [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Section 12.6.1 had been revised to explain the focus better.
81681	127	54	127	55	Please include oribinal citation for the European Roadmap: EU (2015): A European Research and Innovation Roadmap for Climate Services', European Commission, Directorate-General for Research and Innovation, European Union 2015, Print: ISBN 978-92-79-44341-1, doi:10.2777/702151, KI0614177ENC; PDF: ISBN 978-92-79-44342-8, doi:10.2777/750202, KI0614177ENN. http://bookshop.europa.eu/en/a-european-research-and-innovation-roadmap-for-climate-services-pbKI0614177/ . [Swantje Preuschmann, Germany]	ACCEPTED: Reference has been added.
15753	127	54	127	55	I think the Copernicus Climate Change Service should also be mentioned here along with the EU Roadmap for climate services. [Samuel Morin, France]	REJECTED: C3S is covered in the Cross-Chapter Box and not as relevant in this sentence
11941	127	55	127	55	either "composed of" or "comprising" [Amy East, United States of America]	ACCEPTED: Text has been changed.
27499	127				Generally, the whole section really focuses a lot on Europe and developed countries. This is disappointing as CS are very popular tools in developing countries (see WMO report state of climate services- 2019. [Eric Brun, France]	NOT APPLICABLE+: We have eliminated Section 12.5.3 as the CID ramifications of geoengineering methods and other forms of mitigation, adaptation, and unpredictable events are discussed elsewhere in WGI and WGII. For example, Solar radiation modification (SRM) is discussed in WGI Chapters 4, 5, 6, 8; Carbon dioxide removal (CDR) is assessed in WGI Chapters 4, 5, 8; Volcanoes are discussed in WGI Cross-Chapter Box 4.1, land use change affects on global and local climate are discussed in WGI CH5 and WGI CH10, and the potential for maladaptation is discussed within WGII (e.g., for flooding in WGII CH4 and WGII CH6). Societal pathways and sustainability options are discussed in WGII CH17 and WGIII.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
81683	128	3	128	8	Please include a conclusion, meaning and evaluation. What is the purpose of this note? The tendency of commercialisation may be real in some cases, but it does not cover the whole field of climate service. It does not concern the CS projects supported by public funds which are obliged to transparency. Nevertheless, CS is a service and has the goal that a single user gets exactly the information he needs for his decisions. Financially this would not be possible with public funds. Climate service providers are dependent on being able to sell individual products and must, therefore, follow the rules of the market, including trade secrets. They cannot be blamed for this. [Swantje Preuschmann, Germany]	TAKEN INTO ACCOUNT: Text has been added to reflect comment.
109089	128	5	128	5	Change "(Keele, 2019)" to "Keele (2019)" [Seth McGinnis, United States of America]	Noted. This is a Mendeley format issue.
14141	128	5	128	5	Change (Keele, 2019) by Keele (2019) [Maria Amparo Martinez Arroyo, Mexico]	Noted. This is a Mendeley format issue.
29989	128	5	128	8	The reference to (Keele 2019) is one side of the argument and good point to discuss. On the counterpoint, it would be good to acknowledge that discrete clients may have regulatory requirements to consider detailed climate projections that are not publicly available or may require detailed projections to support climate disclosure (from a financial perspective). These detailed projections should be rooted in climate science but it would be challenging for climate services to meet the diverse needs of discrete clients. This is partially addressed in the following paragraph, however, it is important to acknowledge that discrete client needs may be more detailed than non-commercial climate services may be able to reasonably provide. [Janya Kelly, Canada]	TAKEN INTO ACCOUNT: Text has been added to reflect comment.
88941	128	5	128	8	The current business model where the government fully funds climate services is not sustainable due to competition for scarce budget. The needed investment to drive R&D to provide quality climate services as public good is being realized through cost recovery of specific services to the private sector (e.g. aviation, energy). Climate services is becoming increasingly important for investment and finance decisions. [Joseph Intsiful, Republic of Korea]	TAKEN INTO ACCOUNT: Text has been added to reflect comment.
131491	128	5	128	8	Problematic language "ongoing pursuit of profit". Better used "profit-seeking" as established by economic literature [Hans Poertner and WGII TSU, Germany]	ACCEPTED: Wording has been changed.
34131	128	5			Check for reference format. Change: "(Keele, 2019)" by "Keele (2019)". [Guiomar Rotllant, Spain]	Noted. This is a Mendeley format issue.
43747	128	5			Read "Keele (2019) argues that climate services shift " rather than "(Keele, 2019) argues that climate services shift " [Cyriaque Rufin Nguimalet, Central African Republic]	Noted. This is a Mendeley format issue.
81687	128	8	128	50	Please also refer to one of the first impact modelling chain projects aiming at providing decision-makers with information on climate change with cross-sectoral assessments for both impacts and adaptation to the "2°C period": Jacob D and Solman S 2017 IMPACT2C - an introduction Clim. Serv. 7 1-2 https://doi.org/10.1016/j.cliser.2017.07.006 [Swantje Preuschmann, Germany]	ACCEPTED: Reference has been added.
15751	128	10	128	10	With the above definition, IPCC is actually a climate service. [Samuel Morin, France]	TAKEN INTO ACCOUNT: Reference to the Atlas as Climate Service Product from IPCC have been made.
64283	128	10	128	15	Perhaps it would be helpful to emphasize the Summary for Policymakers included in the IPCC assessments and Special Reports in one of these two sentences? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: the sentence has been changed so this comment is no longer applicable
79561	128	14	128	14	It is not clear what is meant by being 'too disciplinary' - some clarification on this is required. [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: it means dominated by one discipline
34133	128	14	128	15	I would suggest to change e.g. by cf. in : "(e.g., Howarth and Painter, 2016; Nissan et al., 2019)". [Guiomar Rotllant, Spain]	ACCEPTED: Text has been changed.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66533	128	15	128	18	<p>Important not just to mention "local and sectoral" but also the "national" aspect. In many cases the "translation" is not just of scientific information and global climate model results to the local or sectoral scale but to the national scale. Translation also means translation into other national languages (other than english) and to the national context. An example for Sweden is Kjellström et al 2016 where the service has been built over a ten-year time period in close collaboration in a participatory manner with national and regional agencies in Sweden. There are other examples for other countries that could also be mentioned (like the services built around national scenarios in the UK, the Netherlands and in Switzerland). It is noted that the national context is mentioned later in the chapter (p130, l12-18) but I think it is important to lift it up already here. Also, the language issue is not mentioned as far as I can see.</p> <p>Kjellström, E., Barring, L., Nikulin, G., Nilsson, C., Persson, G., and Strandberg, G., 2016. Production and use of regional climate model projections – a Swedish perspective on building climate services. Climate Services, 2-3, 15-29, DOI: 10.1016/j.cliser.2016.06.004. [Kjellström Erik, Sweden]</p>	ACCEPTED: Text has been changed.
81685	128	16	128	18	One conclusion is missing- [Swantje Preuschmann, Germany]	REJECTED: The comment is inconclusive.
57491	128	20	128	20	Many, if not all, of the examples listed in this paragraph are summarised in Hewitt, C. D., C. Buontempo, P. Newton, F. Doblas-Reyes, K. Jochumsen and D. Quadfasel, 2017: Meeting summaries - climate observations, climate modelling and climate services. BAMS, 98, 1503-1506. I suggest adding this reference at the end of the first sentence at line 20 [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
33235	128	20	128	20	"In return, climate services also ..." should be "By exploring user demand, climate services also ..." [Janus Willem Schipper, Germany]	ACCEPTED: Text has been changed.
109091	128	20	128	25	This sentence is ungrammatical and appears to have been mangled by the editing process. I think it would be easier to parse if the examples were moved to the end or even into a separate sentence instead of being parenthetical in the middle, so it would read "Many questions... object of intense research. Examples include..." [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
57493	128	24	128	24	The examples listed in lines 21-24 are the subject of a large European project (EUCP) and are described in Hewitt, C., and J. Lowe, 2018: Towards a European Climate Prediction System, Bull. Amer. Meteor. Soc., 99, 1997-2001, doi:10.1175/BAMS-D-18-0022.1. I suggest simply adding Hewitt and Lowe (2018) to the list of references in line 24 [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
27505	128	25	128	25	About 'Other challenges related to climate services are [...]': one other key challenge that I do not think you touch upon is the possibility to disentangle the climatic signal from internal variability for the following decade/s. Those who are expecting climate services often ask questions about what will happen within the following 15 to 30 years which is very challenging for climatologists. [Eric Brun, France]	TAKEN INTO ACCOUNT: We found that a lack of published literature limits our ability to back this up and assess specific approaches. We have added an assessment of CID emergence in Section 12.5.2 that will better introduce these ideas.
57495	128	25	128	28	"Other challenges related to climate services" - Hewitt et al. (2020) lists several other key challenges as identified by a group of experts from around the world which I think should be usefully added to this list of challenges here, or in Section 12.6.3 if all challenges are moved into one sub-section. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added and text on challenges has been included in the respective subsection.
109093	128	26	128	26	Change "access to (open/FAIR...) data" to "access to data (open/FAIR...)". Also, should the [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
107921	128	34	128	36	Not clear what the 'usefulness of the underlying methods' really means in this context. Needs clarification. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Text has been revised.
15755	128	38	128	41	This sentence seems to be copied/pasted to the executive summary (see comments made there). I think it requires some clarifications (see comment on the corresponding sentence in the ES). [Samuel Morin, France]	TAKEN INTO ACCOUNT: The statements in the ES have been revised and text in the chapter accordingly.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
57497	128	38	128	41	I agree with the statement in line 38 and there is a wealth of literature which could/should be cited here. From my work there are the following relevant papers, but note that there are others too: Hewitt, C. D., R. C. Stone and A. B. Tait, 2017: Improving the use of climate information in decision-making, <i>Nature Climate Change</i> , 7, 614-616. Hewitt, C. D., E. Allis, S. J. Mason, M. Muth, R. Pulwarty, J. Shumake-Guillemot, A. Bucher, M. Brunet, A. M. Fischer, A. M. Hama, R. K. Kolli, F. Lucio, O. Ndiaye and B. Tapia, 2020: Making society climate-resilient: international progress under the Global Framework for Climate Services, <i>Bull. Amer. Meteor. Soc.</i> , E237-E252, DOI: 10.1175/BAMS-D-18-0211.1 Hewitt, C. D., N. Golding, P. Zhang, T. Dunbar, P. E. Bett, J. Camp, T. D. Mitchell and E. Pope: The process and benefits of developing prototype climate services – Examples in China, <i>Journal of Meteorological Research</i> (Accepted) Golding, N., C. D. Hewitt, A. Taylor, J. Strachan, R. Parfitt and L. Vilarkin : The Rules of Engagement: Refining approaches to effective engagement for climate services, <i>Climate Services</i> (Submitted) Golding, N., C. Hewitt, P. Zhang, M. Liu, J. Zhang and P. Bett, 2019: Co-Development of a Seasonal Rainfall Forecast Service: Supporting flood risk management for the Yangtze River Basin, <i>Climate Risk Management</i> , 23, 43-49, https://doi.org/10.1016/j.crm.2019.01.002 Hewitt, C., and N. Golding, 2018: Development and pull-through of climate science to services in China. <i>Advances in Atmospheric Sciences</i> , 35, 905–908, https://doi.org/10.1007/s00376-018-7255-y Golding, N., C. Hewitt and P. Zhang, 2017: Effective engagement for climate services: Methods in Practice in China, <i>Climate Services</i> , 8, 72-76. Golding, N., C. Hewitt, P. Zhang, P. Bett, X. Fang, H. Hu and S. Nobert, 2017: Improving user engagement and uptake of climate services in China, <i>Climate Services</i> , 5, 39-45. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: References have been added where appropriate
34135	128	49	128	50	I would suggest to change e.g. by cf. in : "(e.g., (Felder et al., 2017; Hegdahl et al.; Schaller et al., Schaller et al. 2016). [Guiomar Rotllant, Spain]	REJECTED: This is an editorial issue with Mendeley formatting.
110671	128	53	128	53	Awkward language. Perhaps "... this approach is slowly seeing wider adoption in some climate services". [Bruce HEWITSON, South Africa]	NOTED: this paragraph has been deleted
11943	128	53	128	53	awkward wording, "becomes now more used". Suggest instead, "this approach is now being used more commonly in climate services" [Amy East, United States of America]	NOTED: this paragraph has been deleted
67065	128	53	128	53	for clarity and flow change "becomes now also more used" for "is increasingly used" [Liese Coulter, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: this paragraph has been deleted
117157	128		128		This paragrap on IPCC looks like "self promoting" here. What about describing the IPCC as a co-construction process (demands from governements, scoping, nominations, review, approval) which considers a number of the key aspects mentioned in ch 10 and 12. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: Text has been revised and reference to Chapter 10 has been made.
14143	129	1	129	1	Indicate the year in (Jack et al.) [Maria Amparo Martinez Arroyo, Mexico]	NOTED: this paragraph has been deleted
126785	129	1	129	1	Incomplete reference: Jack et al. [Trigg Talley, United States of America]	NOTED: this paragraph has been deleted
67067	129	2	129	2	change "Section 1.4.3" which does not relate to storylines to "Section 1.4.4" which relates to storylines [Liese Coulter, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: this paragraph has been deleted
41871	129	6	130	31	The section "12.6.2 Assessment of climate services practice and products related to information on climatic impact drivers" should cover a regional analysis. In which continent and where do we find the best practices? How's today climate services implementation with regards to GFCS and Paris Agreement for example? This issue is critical to be known. Just to remind to Author's attention that this ection is dealing with "Assessment" [JACQUES ANDRE NDIONE, Senegal]	REJECTED: Even regionally the practices and products can vary widely. We reflect the diversity in the references we cite in this section. There isn't the primary research to answer these questions with confidence

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
79627	129	6	130	35	<p>The whole discussion about climate services is surprisingly silent about a wealth of experience from the WMO Members Countries on the long established GFCS climate services information system (CSIS) and this needs to be reflected for the IPCC to provide a balanced view on both the operational and academic perspectives on climate services</p> <p>Please note that CSIS is the principal GFCS mechanism through which information about climate – past, present and future – is observed/monitored, archived, analysed, modelled, exchanged and processed. The CSIS is the "operational core" of the GFCS enabling the delivery authoritative climate information products through operational mechanisms, technical standards, communication and authentication. [Wilfran MOUFOUMA OKIA, Switzerland]</p>	TAKEN INTO ACCOUNT: Text on CSIS has been added.
79629	129	6	130	35	<ul style="list-style-type: none"> • More importantly, as far as the IPCC WGI AR6 report is concerned, there are several entities and functions involved in implementing the CSIS on a sub-regional scale and cascading climate predictions (from seasonal to annual and decadal (near-term) from global to regional and national levels. These include the WMO Global Producing Centres for Long Range Forecasting (GPCLRFs) using state-of-the-science ocean-atmosphere coupled General Circulation Models (GCMs) to generate multi-model ensemble of global predictions (Graham et al. 2012). <p>These CSIS entities also include the WMO Regional Climate Centres (RCCs) – which are centre of excellence designated by WMO to create regional climate products, including long-range forecasts to support regional and national climate services activities. Thus, the challenge is to link together all of the CSIS components and create the full climate services value chain that will meet the specific needs of stakeholder groups (e.g. farmers, energy planners, health authorities, water resource managers). This context requires WMO Members to pool together resources, adopt standardized best practices, share data and knowledge within the region and from global entities in order to provide advanced climate services.</p> <ul style="list-style-type: none"> • For more information, please read the 2019 WMO report on state of the climate services (https://library.wmo.int/doc_num.php?explnum_id=10089) <p>Graham, R., A. Colman, M. Vellinga, and E. Wallace, 2012: Use of dynamical seasonal forecasts in the consensus outlooks of African Regional Climate Outlook Forums (RCOFs). ECMWF Semin. Seas. Predict., [Wilfran MOUFOUMA OKIA, Switzerland]</p>	REJECTED: these timescales (seasonal, annual, decadal prediction) are not addressed in this section and AR6.
99325	129	6	133	55	<p>the focus of the section 12.6.2 is not clear to me, especially given the box 12.2.. The text here is a narrative and not an assessment [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]</p>	TAKEN INTO ACCOUNT: The focus of the section has been added and better reference to the (and in the) Cross-Chapter Box have been made.
110255	129	9	129	12	<p>These statements should be made without allusion to confidence language. There is no traceable account that can support these and that climate services consist often of grey literature is simply and verifiably a truth and so should be reported as such. There is no ambiguity on the matter. [Peter Thorne, Ireland]</p>	TAKEN INTO ACCOUNT: Confidence statements have been revised throughout the section.
41869	129	9	129	36	<p>The two paragraphs should be well seperated! [JACQUES ANDRE NDIONE, Senegal]</p>	ACCEPTED: Change made.
74001	129	9	130	24	<p>A challenge that there is a gap between demand-driven and supply driven data services is correct. But this chapter proposes no sotation or recommendation how the problem can be treated.A trend that private companies are trying to take lead in climate services need to be considered as negative, because the quality of such services, in particular, projections to the future, is very difficult to evaluate. Particularly dangerous is that they may be source of information for decision making and help 'adapt' information to the user's needs. [Elena Kozlovskaya, Finland]</p>	TAKEN INTO ACCOUNT: Text about private versus public climate services and climate services as a public good has been added to the text.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
131493	129	10	129	12	What is the medium confidence about? That it is published in "grey literature"? [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: Confidence statements have been revised throughout the section.
131495	129	10	129	12	Replace "grey literature" with non-peer reviewed or non-academic [Hans Poertner and WGII TSU, Germany]	ACCEPTED: Text has been revised.
107923	129	11	129	12	Climate services products also show up in a number of NGO and other reports that are part of the grey literature. It is not solely private consultancies. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Point has been added to the text.
45077	129	15	129	16	The statement " Furthermore, information moves from useful to usable only when users effectively incorporate this information into a decision process" is controversial at best. Useful information is us-able when it is organized and presented in a way that makes it easy and compelling to be used. [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: This sentence makes a valid point and we have added references as well as reference to WGII Chapter 17 that includes a deeper discussion on this matter.
79571	129	15	129	17	I suggest including the reference to the paper by Bruno Soares and Dessai (2016) as the paper explores the use of forecast information in organisational contexts in Europe. The paper DOI is: DOI 10.1007/s10584-016-1671-8 [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
39515	129	17	129	19	Consider to add the word 'dissemination of knowledge' as one of the climate services activities and consider to add words to enhance activity 4 'build capacity through informed decision-making'. [Tamara van 't Wout, Qatar]	ACCEPTED: Text has been changed.
19381	129	19	129	19	"in press" should be replaced by "2020" [Juergen Weichselgartner, Germany]	ACCEPTED: Reference has been updated.
14145	129	20	129	20	Change (Reinecke, 2015) by Reinecke (2015) [Maria Amparo Martinez Arroyo, Mexico]	Noted. This is a Mendeley format issue.
34137	129	20			Check for reference format. Change: "(Reinecke, 2015)" by "Reinecke (2015)". [Guiomar Rotllant, Spain]	Noted. This is a Mendeley format issue.
105817	129	22	129	22	missing line spacing [Trevor Murdock, Canada]	ACCEPTED: Change made.
64325	129	22	129	23	Consider Baztan et al 2017 (Life on thin ice: Insights from Uummannaq, Greenland for connecting climate science with Arctic communities) here too - great example of Arctic climate research and keeping it pertinent to the community. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	ACCEPTED: Reference has been added.
20807	129	22	129	27	The weakness of such passages about user's needs is that very seldom are users invited to express themselves. Testing the 8 references quoted in this passage, it appears that user's opinions are mentioned in two cases, including a survey; however even in that case they are mute witnesses, since every author is an academic or a professional of climate science. Possibly there exist grey literature where users are allowed to speak their mind. Chapter 12 authors are encouraged to assess them. [philippe waldteufel, France]	REJECTED: in some of these studies, users are directed asked about climate services
110673	129	22	129	36	I suggest that recognizing the "upstream" role of climate services in steering research foci warrants a point here, as it speaks to the fact that climate services have a responsibility to not only be a one-directional linear supply chain.. [Bruce HEWITSON, South Africa]	NOTED: this is addressed in section 12.6.3
88117	129	22			Your assessment should start from SROCC, Ch2, not only from AR5. [Georg Kaser, Austria]	ACCEPTED: Reference has been added.
27507	129	23	129	23	We recommend to add :Sultan et al (in press). Current needs for climate services in West Africa: Results from two stakeholder surveys . Climate Services (in press) [Eric Brun, France]	ACCEPTED: Reference has been added.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
57499	129	23	129	23	Please consider including the following as relevant references to the topic of progress in understanding user needs: Hewitt, C. D., N. Golding, P. Zhang, T. Dunbar, P. E. Bett, J. Camp, T. D. Mitchell and E. Pope: The process and benefits of developing prototype climate services – Examples in China, Journal of Meteorological Research (Accepted) Golding, N., C. D. Hewitt, A. Taylor, J. Strachan, R. Parfitt and L. Vilarikin : The Rules of Engagement: Refining approaches to effective engagement for climate services, Climate Services (Submitted) Wang, Y., L. Song, C. Hewitt, N. Golding and Z. Huang, 2020: Improving China's Resilience to Climate-Related Risks: the China Framework for Climate Services, Weather, Climate and Society (Accepted) Bessembinder, J., M. Terrado, C. Hewitt, N. Garrett, L. Kotova, M. Buonocore and R. Groenland, 2019: Need for a common typology of climate services, Climate Services, 16, 100135, https://doi.org/10.1016/j.cliser.2019.100135 Golding, N., C. Hewitt, P. Zhang, M. Liu, J. Zhang and P. Bett, 2019: Co-Development of a Seasonal Rainfall Forecast Service: Supporting flood risk management for the Yangtze River Basin, Climate Risk Management, 23, 43-49, https://doi.org/10.1016/j.crm.2019.01.002 Hewitt, C., and N. Golding, 2018: Development and pull-through of climate science to services in China. Advances in Atmospheric Sciences, 35, 905–908, https://doi.org/10.1007/s00376-018-7255-y [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: References have been added.
105819	129	25	129	25	co-design and co-development is widely used by regional climate services to talk about collaboration with users (as it is in the previous page and later in this section) if these words are also going to be used to describe cross-disciplinary academic collaborations (which it would be better to simply avoid)-perhaps the section that is currently on page 129 line 47 to pg 130 line 3 could precede this paragraph [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: Text has been moved.
57501	129	28	129	28	Please add the Hewitt et al. (2017) reference here to the Vincent et al. reference [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
90971	129	29	129	29	Another contribution discussing user values in climate services is Parker and Lusk (2019) in Bulletin of the American Meteorological Society. https://doi.org/10.1175/BAMS-D-17-0325.1 [Wendy Parker, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
27509	129	36	129	36	We recommend to consider that in Africa, users also ask for capacity building activities about climate change basic knowledge (terminology, what is a climate model etc...) Sultan et al (2020). Current needs for climate services in West Africa: Results from two stakeholder surveys. Climate services 18 [Eric Brun, France]	ACCEPTED: Text and reference have been added.
109097	129	47	129	47	Change "forms of how" to "forms in which" [Seth McGinnis, United States of America]	TAKEN INTO ACCOUNT: Text has been reworded.
126787	129	47	129	47	A climate service cannot be considered a service unless there is user engagement. [Trigg Talley, United States of America]	ACCEPTED: Text has been changed.
45079	129	48	129	51	The sentence is confusing [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Text has been revised.
109099	129	49	129	49	Change "group activities to focused relationships" to "group activities, to focused relationships" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
109101	129	50	129	50	Change "yield in" to "yeild" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
126789	129	50	129	50	"yield in different types" doesn't make sense. [Trigg Talley, United States of America]	ACCEPTED: Text has been changed.
79563	129	51	129	53	The refence to the paper by Bruno Soares and Buontempo (2019) can be added here as the paper discusses the idea of co-production as a key process (as well as a challenge) in the development of climate services. Paper DOI is: DOI: 10.1002/wcc.587 [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
52633	129	54			The statement that co-production is not very well defined could be supported by citation of Goodess et al., 2019 Advancing climate services for the European renewable energy sector through capacity building and user engagement, Climate Services. https://doi.org/10.1016/j.cliser.2019.100139 [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
70323	129	55	130	3	climate services scholars and practitioners could more fully realize the potential of the knowledge co-production process ~~~~ pedagogical, empowerment) As this intelligenc quite useful for climate services providers, this should be also included in the SPM D.5.4. As SPM is meant to educate the decision makers. how climate service could be improved based on intelligence could increase the value. [Masako Konishi, Japan]	TAKEN INTO ACCOUNT: CH12 now includes an executive summary statement (referring to CH12.6) that emphasizes the importance of co-production processes ("The decision-making context, level of user engagement and co-production between scientists, practitioners and intended users are important determinants of the type of climate service developed and its utility supporting adaptation, mitigation and risk management decisions."). SPM.C notes the importance of climate services but does not reach this level of detail.
109103	130	1	130	1	Change "if recognising" to "by recognizing" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
16293	130	5	130	9	add a sector: "and cultural heritage" The Future of Our Pasts: Engaging cultural heritage in climate action). Available at https://www.icomos.org/en/77-articles-en-francais/59522-icomos-releases-future-of-our-pasts-report-to-increase-engagement-of-cultural-heritage-in-climate-action Citation: ICOMOS Climate Change and Cultural Heritage Working Group. 2019. The Future of Our Pats: Engaging Cultural Heritage in Climate Action, July 1, 2019. Paris: ICOMOS. [Sarah Sutton, United States of America]	ACCEPTED: Sector and reference added.
57503	130	8	130	8	This is a nice list of examples. Could we also add disaster risk reduction (as identified as a key sector by the GFCS), so perhaps modify the text to be "Hurk et al., 2016; Vano et al., 2018), disaster risk reduction (Golding et al., 2019), ocean and coastal ..." [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
15757	130	9	130	9	Copernicus Climate Change Service has fostered the development of climate services in many sectors, including Tourism. See the following Proceedings (paper in preparation) describing the development of a pan-European Mountain Tourism component : Morin, Samuel, Bruno Abegg, O. Cenk Demiroglu, Marc Pons, Fabian Weber, Anna Amacher Hoppler, Hugues François, Emmanuelle George, Jean-Michel Soubeyroux, Raphaëlle Samacoits, Matthieu Lafaysse, Sam Franklin, Debbie Clifford, Adeline Cauchy, Ghislain Dubois, The mountain component of the Copernicus Climate Change Services - Sectoral Information Service "European Tourism": towards pan-European analysis and projections of natural and managed snow conditions, 542 – 547, International Snow Science Workshop Proceedings 2018, Innsbruck, Austria, 2018. https://arc.lib.montana.edu/snow-science/item.php?id=2593 [Samuel Morin, France]	ACCEPTED: Reference has been added.
10937	130	9	130	9	Consider including a more updated and recent paper on urban climate services: Gidhagen, L., Olsson, J., Amorim, J.H., Asker, C., Belusic, D., Carvalho, A.C., Engardt, M., Hundedcha, Y., Körnich, H., Lind, P., Lindstedt, D., Olsson, E., Rosberg, J., Segersson, D., and L. Strömbäck (2019) Towards climate services for European cities: lessons learnt from the Copernicus Climate Change Service Urban SIS, Urban Clim., 31, 100549, doi: 10.1016/j.uclim.2019.100549. [Jonas Olsson, Sweden]	ACCEPTED: Reference has been added.
64285	130	9	130	16	I feel as though there is something missing here regarding the differences in climate services/service centers available across countries (and the effects of such differences). How do these differences affect governments' and institutions' abilities to ingest and apply climate information in their decision-making processes? What steps need to be taken to eliminate these disparities? I suppose my comment assumes that there has been a systematic review of the various climate services deployed around the world, but I understand that the field is still in its relative infancy and so such a review may not exist. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: such a systematic review does not exist; further research is needed to answer these questions

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
109105	130	19	130	19	Change "span" to "range" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
109107	130	23	130	23	Change "elaborate more in detail on" to "elaborate in more detail" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
105821	130	30	130	30	can focused --> can focus [Trevor Murdock, Canada]	ACCEPTED: Text has been changed.
43749	130	33			Read " Adapted from Hamaker-Taylor et al. (2018)" rather than " Adapted from (Hamaker-Taylor et al., 2018)" [Cyriaque Rufin Nguimalet, Central African Republic]	Noted. This is a Mendeley format issue.
79565	130	38	130	38	I would suggest to amend the title of this sub-section to 'Challenges to successful climate service applications' or something along those lines in order to better distinguish with the broader challenges presented at the beginning of the section. [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: The Challenge section refers to more challenges than only to the successful CS application, and the section has been streamlined to cover all challenges mentioned previously across the chapter in only section 12.6.3
57505	130	38	131	22	Some challenges have already been discussed in sub-sections 12.6.1 and 12.6.2 and it is a bit confusing having a sub-section 12.6.3 "Challenges", especially since the challenges listed here are not necessarily the same as identified earlier. I don't have a simple solution but could you move all references to challenges from 12.6.1 and 12.6.2 to 12.6.3? And please assess the challenges in Hewitt et al. (2020) which has provided several challenges identified by international experts to include in the discussion in Section 12.6.3 [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Challenges are now all addressed in Section 12.6.3
83685	130	38	131	22	This 'Challenge' section involves value-dependence of climate services. How about pointing to the value section of Ch.1 (1.2,3) for putting your discussion in a wider context of value-dependence of climate science? [Seita Emori, Japan]	TAKEN INTO ACCOUNT: Reference to Chapter 1 and Chapter 10 has been made in section 12.1 where the aspect of values for developing climate information is discussed.
79631	130	38	133	47	<p>Over the last 20 years, Regional Climate Outlook Forums (RCOFs) have brought together scientific experts, sector-specific experts, and stakeholders in a climatologically homogeneous area/region to produce regional-scale climate information services and products for societal benefits based on input from NMHSs, regional institutions, WMO Regional Climate Centres (RCCs), Global Producing Centres for Long Range Forecasts (GPCLRFs) and other climate prediction centers (Daly and Dessai 2018; Walker et al. 2019; Gerlak et al. 2018). But, surprisingly none of the lessons from the RCOFs process is reflected in the discussion on the challenges of climate services?</p> <p>Please note that through interaction with sectoral users, extension agencies and policymakers, RCOFs assess the likely implications of the climate information on the most pertinent socio-economic sectors in a given region, and explore the ways in which use can be made of them</p> <p>Daly, M., and S. Dessai, 2018: Examining the Goals of the Regional Climate Outlook Forums: What Role for User Engagement? <i>Weather. Clim. Soc.</i>, 10, 693–708, https://doi.org/10.1175/WCAS-D-18-0015.1.</p> <p>Gerlak, A. K., and Coauthors, 2018: Building a framework for process-oriented evaluation of regional climate outlook forums. <i>Weather. Clim. Soc.</i>, 10, 225–239, https://doi.org/10.1175/WCAS-D-17-0029.1</p> <p>Walker, D. P., C. E. Birch, J. H. Marsham, A. A. Scaife, R. J. Graham, and Z. T. Segele, 2019: Skill of dynamical and GHACOF consensus seasonal forecasts of East African rainfall. <i>Clim. Dyn.</i>, https://doi.org/10.1007/s00382-019-04835-9. [Wilfran MOUFOUMA OKIA, Switzerland]</p>	REJECTED: because AR6 and this section is focused on 'climate change' timescales it has not drawn from examples of other timescales

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110675	130	40	130	42	I think a critical challenge is missing here; the fact that choosing one service or another can lead to differing (at best), or incomplete or biased and skewed (most often), or directly contradicting (at worst) conclusions and constructed messages. One at hand example is Hewitson et.al. (2017) (sorry for the self citation) which looked initially at this in portals, but the wider issue persists and permeates the climate services landscape more generally and seriously undermines the user experience in seeking actionable climate information. I think this warrants more attention (and also relates to a discussion on uncertainty that perhaps could see more attention in this chapter as noted in an earlier comment. [Bruce HEWITSON, South Africa]	ACCEPTED: this topic has been added as quality control and assurance challenge for climate service products
105823	130	40	130	42	The section on challenges does not capture the following issues: 1. the lack of understanding of users by the climate service and climate science community, 2. what would successful application even look like - there is no definition for this, 3. the inability to scale up services and the tendency to serve individual users bilaterally, 4. the lack of trained specialists who understand users, co-production, and adaptation and can do knowledge translation to staff the organizations [Trevor Murdock, Canada]	ACCEPTED: three points were added
33237	130	40	130	42	One of the greatest challenges of climate services is building trust. Only, if the users needs and requests are fully understood, the user will except the information from the climate sciences. This should be mentioned as 4th challenge of climate service applications. [Janus Willem Schipper, Germany]	ACCEPTED: Text and reference have been added.
45081	130	40	130	55	The paragraph is difficult to precisely understand [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Text has been revised to improve clarity.
109109	130	41	130	41	Change "data quality, overabundance and accessibility and" to "data quality, overabundance, and accessibility, and" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
68933	130	41	131	9	Section 12.6.3 lists recurring challenges related to successful climate service applications, including 2) data quality, overabundance and accessibility. However, a big hurdle we face is not necessarily the overabundance/accessibility but the amount of unreliable climate/weather station data we rely on to conduct our assessments (when characterizing the historical/current climate). Even in well-populated areas, climate stations may not be well calibrated, experience errors in recording, etc. and will produce unreliable results that can have an impact on our analysis of comparing historical climate to the future projections. [Mikaela Comella, Canada]	TAKEN INTO ACCOUNT: Text has been added to reflect that point.
109111	130	42	130	42	Change "unsure how they would" to "unsure how to" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
45083	130	53	130	53	Point (a) is unclear [Christophe Deissenberg, Luxembourg]	TAKEN INTO ACCOUNT: Text has been revised.
88939	130		131		12.6.3 discusses challenges in the CIS lanscape but there is no section on opportunities. The 2015 Agendas (Paris Agreement, SDG and Sendai Framework) calls for increased use of robust climate information for decision making (climate action). This is also reflected in the NDCs, NAPs and growing investments by climate funds and MDBs to support climate services as public goods. The Global Hydromet Alliance and established by the major donors and technical institutions attest to the attention being placed on climate services. [Joseph Intsiful, Republic of Korea]	TAKEN INTO ACCOUNT: Opportunities for Climate Services have been included in 12.6.1
109113	131	3	131	3	Change "added-value" to "added value" [Seth McGinnis, United States of America]	ACCEPTED: Text has been changed.
79567	131	3	131	4	The paper by Bruno Soares (2017) explores the challenges of assessing the added value of climate services (including in economic terms) and so I would suggest including it here. Paper DOI is: https://doi.org/10.5194/asr-14-175-2017 [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
31407	131	3	131	5	"Willingness to pay" may be an odd choice to bring up as a singular example, as it probably does not reflect the value of climate services, such as climate adaptation, to many of the stakeholders. Adaptation often benefits the whole society on one hand and those with small means on the other. Could the issue be developed a bit more in the text? [Markku Rummukainen, Sweden]	ACCEPTED: Text and references have been added to elaborate more on this matter.
79569	131	4	131	6	Please refer to the correct paper by Bruno Soares et al from 2018 here and in the reference list noting that there are two papers used in this report from the author from 2018. The 2018 paper that should be used here is this: DOI: 10.1002/wcc.523 [Marta Bruno Soares, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: Reference has been added.
27511	131	6	131	9	We suggest to see Vaughan et al (2019) for a review in Africa https://onlinelibrary.wiley.com/doi/full/10.1002/wcc.586 [Eric Brun, France]	ACCEPTED: Reference has been added.
105825	131	14	131	14	unpacked is colloquial [Trevor Murdock, Canada]	ACCEPTED: Text has been revised.
131497	131	16	131	18	"real world decisions" is probably meant in comparison to decisions in simulations/ models but it still sounds quite odd [Hans Poertner and WGII TSU, Germany]	TAKEN INTO ACCOUNT: Text has been revised.
105827	131	20	131	20	it would be worth noting in brackets after past practice: (which often has never been designed to make optimal use of even past climate information) [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: Text added to reflect the point.
81691	131	25	133	55	The Cross-Chapter Box 12.2 promotes C3S and FRACTAL. Both are great projects, no question about it, but for the CCB12.2 some international objectivity is in order. In the box, it is announced that two examples of climate services will be used to show how information is generated and made available. In my view, a generalised life cycle can be derived from both C3S and FRACTAL. Since it is a cross-chapter box, it should also include where, how and what information that is summarised in AR6 is relevant for climate services and their products. It could also be used to expand the conclusion, which has little meaning at present. Please consider what message the CCB12.2 should convey. [Swantje Preuschmann, Germany]	TAKEN INTO ACCOUNT: The Cross-chapter Box has been revised. It now uses three case studies that span different user-provider level of engagement. There is now a case study in Asia and the messages from other chapters/WG2 are included in each case study
105829	131	25	133	55	I don't think this box provides almost any value and certainly not enough value for the real estate that it takes up - it gives a misleading idea that there are two ways of implementing climate services (top down and bottom up) when the reality is that there are almost as many ways as there are climate services - a much more useful summary of these could be made with just a few paragraphs - if these two examples are to be contrasted the details should be shortened and a complete rewrite undertaken keeping the purpose of the box in mind as: to give the reader a sense of two different approaches to delivery, rather than what we have now which is: two full summaries of everything deemed important about these two organizations in a way that is too long to be easily readable and yet too high level to provide any real detailed information [Trevor Murdock, Canada]	TAKEN INTO ACCOUNT: The Cross-chapter Box has been revised to make clear that these are three examples of a multitude of possible climate services; the case studies have been made shorter and linked better to other chapters/WG2
80243	131	25	133	55	The content of the cross-chapter box should be completed with the introduction of European and North-American best practices of decision support systems, both information- and knowledge sharing platforms and map-based GIS systems that support adaptation planning, impact studies and related activities (e.g. Climate-Adapt, Cal-Adapt, NAGIS, Copernicus C3S, ISpedia, etc.). [Lilian Fejes, Hungary]	REJECTED: the purpose of the box is to illustrate the diversity of climate services using three case studies. It cannot be comprehensive in covering all regions; however, the selected examples are intended to show the diversity of contexts and approaches.
41873	131	27	133	55	With regards to the "Cross-Chapter Box 12.2: Climate information for climate services", there is a conclusion subsection, but nowhere there was an introduction... According to my point of view, it'll be better to delete "Conclusion" and to replace it by "Key messages"... [JACQUES ANDRE NDIONE, Senegal]	TAKEN INTO ACCOUNT: the conclusion section was deleted and messages from other chapters/WG2 inserted into the case studies text

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44267	131	27			A comprehensive presentation of the integrated urban hydrometeorological, climate and environmental services of the World Meteorological Organization (WMO) was recently given by Grimmond, S., et al., 2020: Integrated urban hydrometeorological, climate and environmental services: Concept, methodology and key messages. Urban Climate 33, 100623. [Nektarios Chrysoulakis, Greece]	TAKEN INTO ACCOUNT: Thanks to the reviewer for the suggested study. Assessment of specific hydrometeorological, climate and environmental services of the WMO is beyond the scope of this assessment, which focused more on advances and common practices.
108095	131	42	131	43	I think there is more than one community. I suggest to change “users community” to “users communities” [Claas Teichmann, Germany]	REJECTED: this word is no longer used
20809	131	49	131	49	Here is a title wisely chosen by the European Commission for the climate part of Copernicus [philippe waldteufel, France]	TAKEN INTO ACCOUNT: The Copernicus Climate Change Service (C3S) is a well-known effort and is a useful case study for this box.
11945	131	51	131	51	awkward. Delete “In view of”, and just start the sentence with “Responding to...” [Amy East, United States of America]	REJECTED: this word is no longer used
6825	131	52	131	53	It should be made clear that implementation, including the development of specific services, of C3S was entrusted to ECMWF by the European Commission, and that C3S has entered its operational phase. I suggest replacing “the European Commission developed the Copernicus Climate Change Service (C3S). The service intends to support ...” by “the European Commission entrusted the European Centre for Medium-Range Weather Forecasts with implementation of the Copernicus Climate Change Service (C3S). The service supports ...”. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: the text has had to be shortened
107925	132	6	132	8	The last half of this sentence is way too abstruse. Perhaps a member of this community of operators in one of the intermediate steps between producers and beneficiaries would be useful here. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: The text indicates that the definition of intermediate users is “loosely defined” because there is no clear definition of this space. This loose definition matches the assessed state of the climate service landscape.
81689	132	10	132	19	It reads as if the CORDEX and CMIP data are also only accessible via the C32 portal. It is not the case and must be made clear! [Swantje Preuschmann, Germany]	REJECTED: we don't think the sentence gives this impression
66535	132	15	132	16	Here, it could also be mentioned that C3S not only provides regional climate model simulations but also actively supports production of additional simulations in a designed experiment aiming at optimally filling the RCP-GCM-RCM EURO-CORDEX matrix. References to two papers documenting part of that work is already in the reference list of the chapter (Coppola et al 2020a&b - note that these are the same!, Vautard et al both submitted to JGR). Another submitted paper discussing more of the design of the experiment is by Christensen and Kjellström (submitted before the cutoff date). Christensen, O.B. and Kjellström, E., 2020. Partitioning uncertainty components of climate change in a large ensemble of European regional climate model projections. Clim. Dyn., DOI:10.1007/s00382-020-05229-y. [Kjellström Erik, Sweden]	REJECTED: because of space constraints
108097	132	18	132	18	It could be good to mention an example sector for the example indicator “heating degree-days”. [Claas Teichmann, Germany]	REJECTED: we mention key sectors but don't elaborate further because of space constraints
20811	132	44	133	55	This part of the box CCB12.2 raises some remarks. i) It is not clear that the drought which faced Namibia and motivated the activity reported by Scott et al was a consequence of climate change. ii) finding ways to remedy to poor water resources seem to belong to adaptation WG2 rather than climate science (WG1). Concerning the paper by Scott et al, out of 16 pages, about 5 deal with the “burning issue” while the remaining consists of general discussions and reflexions about methodological aspects. An example not to be followed... [philippe waldteufel, France]	NOTED: this box is trying to act as a bridge between WG1 and WG2
11947	133	14	133	14	within boxed text: “critical element were” should be “critical element was” [Amy East, United States of America]	REJECTED: word no longer used

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
34139	133	21	133	22	Modify sentence from: "In practice however the burning issues often centered around water in peri-urban areas e.g., in Windhoek (Scott et al., 2018)." To "In practice, however, the burning issues often centered around water in peri-urban areas as in Windhoek (Scott et al., 2018)". [Guiomar Rotllant, Spain]	NOTED: the sentence was changed
108099	133	51	133	55	National institutions and activities could be mentioned. [Claas Teichmann, Germany]	REJECTED: this sentence was deleted
117159	133		133		Are there other examples of climate services which could be developed? In Asia or S America? [Valerie Masson-Delmotte, France]	ACCEPTED: Case study #3 now focuses on Asia. The Box cannot be comprehensive in covering all regions; however, the selected examples are intended to show the diversity of contexts and approaches.
41875	134	4	136	39	Is it relevant to present at the end of the chapter the section "12.7 Knowledge gaps and limits to the assessment". According to my perspective, it would be better to present this issue dealing with limits at the beginning of the chapter... The main objective is to help results understanding and the guidance of chapter writing. [JACQUES ANDRE NDIONE, Senegal]	TAKEN INTO ACCOUNT: Knowledge gaps and limitations are integrated throughout the chapter, and the new section on 'Final Remarks' captures some overarching remarks that will aid contextual analyses of the CH12 assessments and frameworks employed.
69275	134	4	136	39	In the Executive Summary of Chapter 12, it would be better to describe the gaps and limitations referred to in Section 12.7. Such information, especially "challenges in interpreting projected changes" and "regional gaps and limitations" is important information. [Kaoru Magosaki, Japan]	REJECTED: The ES consists of statements that are built on a careful assessments of confidence, which result implicitly from these considerations, and one of its paragraphs addresses specifically CIDs with uncertain future evolutions, therefore the effects of these challenges, gaps and limits is present already if not explicitly mentioned.
110259	134	4			This section is considerably longer and very much more specific than similar sections are for other chapters. A degree of homogenisation would appear warranted. Many of them are not really actionable issues. [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: We have homogenised to other chapters' format ("Final Remarks") and shortened considerably, avoiding non-actionable issues.
81187	134	14	134	17	As explained in the page 12-16 line 27, there are also cascading or secondary effects in the impacts of climate change, as well as the direct sectoral connections of hazard. In the climate risk management, the role of CIDs as indirect drivers should be considered. In our study, the interconnections between climate drivers and climate risks are surveyed and visualized in a comprehensible manner. We also discussed the role of CIDs as indirect drivers. Yokohata, T., Tanaka, K., Nishina, K., Takahashi, K., Emori, S., Kiguchi, M., Iseri, Y., Honda, Y., Okada, M., Masaki, Y., Yamamoto, A., Shigemitsu, M., Yoshimori, M., Sueyoshi, T., Iwase, K., Hanasaki, N., Ito, A., Sakurai, G., Iizumi, T., Nishimori, M., Lim, W. H., Miyazaki, C., Okamoto, A., Kanae, S., and Oki, T.: Visualizing the Interconnections Among Climate Risks, Earth's Future, 7, 85-100, 2019 https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018EF000945 [Tokuta Yokohata, Japan]	REJECTED: Thank you for the pointer, but we have considerably shortened this section and we consider this discussion too detailed for its current nature. Section 12.3 briefly discusses knock-on effects of CID changes and sectoral responses, including compound events and interactions between CID changes and vulnerability of affected systems.
34141	134	16			Add a space between parentheses: "(Chapter 1)(WGII)". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
79163	134	18	134	22	maybe this is relevant here as a study demonstrating the benefits of such a cooperation between climate scientists, impact scientists, and stakeholders? Undorf et al., BAMS, 2020 (https://doi.org/10.1175/BAMS-D-19-0177.1) [Sabine Undorf, Sweden]	NOTED: Thank you for the pointer, but according to the style common to all the chapters this section remains fairly general and does not include citations.
57507	134	21	134	21	I think the work of Golding et al. (2019) is a good example here where the science and services communities worked well together to better meet the needs of the decision-makers, as is the broader Hewitt et al. (2020) work on co-developing prototype climate services with users engaged with scientists [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: Thank you for the pointer, but according to the style common to all the chapters this section remains fairly general and does not include citations.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
57509	134	21	134	21	I've not come up against the term "climatic impact driver" (or "climate impact driver" as it is sometimes called in this Chapter) relating to climate services, and this is the first place I see it in the Chapter. I'm not sure I fully understand it in relation to climate services, and I wonder if others will have a similar reaction. [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: In our chapter the 'climatic impact-driver' term is adopted precisely because it has a broad definition and interpretation, therefore we believe should be applicable to most areas of climate impacts research or practice. This is now further supported in Sections 12.1-12.3, Chapter 1, and the IPCC Risk Guidance document (Reisinger et al., 2020).
34143	134	21	134	22	Change: "(e.g., (Ruane et al., 2016))." By "(cf. Ruane et al. (2016)).". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
20813	134	26	135	3	Lines 26-27 in this passage are stimulating, because fog and lightning, discarded in your selection, share another characteristic: they are not projected. They are absent or marginal in numerical simulations. Owing to this lack of interest, the risk is to let the climate, as seen by the climate change community, diverge from the climate as lived by the population. Coming to lines 1-3 on page 135, the divergence discussed by Bartok et al is attributed to different behaviours of cloud covers between GCMs and RCMs. The point is that in climate modelling nobody seems to care about cloud cover (and this includes fog by the way) for its own sake; clouds have to be represented because they are part of i) the water cycle and ii) the radiative balance. But, for the man in the street, cloud cover is a major element of climate. Ways of living, tourism industry, depend on cloud cover. Of course forecasting cloud cover and particularly fog is very difficult. So it is a challenge. But a description of climate change which does not try to say anything about cloudiness is not completing the job. [philippe waldteufel, France]	NOT APPLICABLE: We have considerably shortened and generalized the points of discussion in this section so the passage is no longer there.
107927	135	9	135	10	Why is the confidence low? Just because they are yet-unseen? But that makes no sense. Please say more here about why the confidence is low. [Linda Mearns, United States of America]	NOT APPLICABLE: We have considerably shortened and lightened this discussion so the passage is no longer there.
110677	135	12	135	29	There seem to be other important gaps here; how to integrate uncertainty, reconciling contradictions dependent on source, and how to select/constrain information sources. [Bruce HEWITSON, South Africa]	NOT APPLICABLE: Thank you to the reviewer for pointing these aspects out, but these areas are covered within Chapter 10. We have meanwhile considerably shortened the section.
33239	135	15	135	16	This is because the GCM grid is designed to answer questions on a global and coarser level, rather than quantify processes at regional and local scale. This means that the coarse resolution is not necessarily a deficit of the GCM, it's just meant to answer different questions. This should be mentioned here, otherwise it sounds like GCMs are insufficient models. [Janus Willem Schipper, Germany]	NOT APPLICABLE: We have completely rewritten this section so the passage is no longer there.
34145	135	18			Add a space between parentheses: "(Foley, 2010)(Chapter 10)". [Guiomar Rotllant, Spain]	EDITORIAL - Fixed
107929	135	21	135	22	Which downscaling methods? This last half of the sentence is untrue. We know very well that higher resolution simulations using, for example. High resolution RCMs reproduce much better the extreme tails of variables such as precipitation (see Kendon et al., 2014, and much of what is covered in fChapter 10. [Linda Mearns, United States of America]	NOT APPLICABLE: We have completely rewritten this section so the passage is no longer there.
104829	135	32	136	2	In section 12.7.2 (Regional gaps and limitations (identified across 12.4)) some gaps among the National Meteorological and Hydrological Services (NMHSs) can be portrayed with examples. [Atiq Kainan Ahmed, Thailand]	REJECTED: We have received guidance to maintain a more general approach to this section, so we thank the reviewer for the suggestion but we consider this to be too detailed a discussion.
114901	135	32			12.7.2 Regional gaps and limitations (identified across 12.4) -- is salinisation in coastal issues missing and worth including here? [Robert Nicholls, United Kingdom (of Great Britain and Northern Ireland)]	REJECTED: We have received guidance to maintain a more general approach to this section, so we thank the reviewer for the suggestion but we consider this to be too detailed a discussion.
14157	135	35	135	39	In addition, it is necessary to include the perception of hazards by the population, and through their experience can contribute to the information obtained by the scientific community. [Maria Amparo Martinez Arroyo, Mexico]	REJECTED: We have received guidance to maintain a more general approach to this section, so we thank the reviewer for the suggestion but we consider this to be too detailed a discussion.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
11949	135	40	135	42	true, but there is a lot more literature on some of these subjects that the report has not yet cited. I hope the references provided above on wildfire causes, landslide behavior in response to hydrologic fluctuations, and mass movement induced by permafrost thaw have been helpful. [Amy East, United States of America]	NOTED: Thank you for those pointers. Sounds however as the reviewer is not disagreeing with the statement.
15761	135	44	135	44	"are also more rare for some regions and CIDs" : this is vague and not really informative to the reader. Is there a table where such gaps could be mapped, for various regions and CIDs ? [Samuel Morin, France]	REJECTED: We have received guidance to maintain a more general approach to this section, so we thank the reviewer for the suggestion but we consider this to be too detailed a discussion. A discussion of regional data gaps could also be taken up in the WGI Regional Chapters
15759	135	54	135	54	"More studies are needed" : this is prescriptive. [Samuel Morin, France]	NOTED: Thank you for pointing that out, we have reworded to avoid prescriptive formulas.
20815	135	54	136	2	This is true, and reflected in the present chapter. But even the present sentence is biased! Rather than balancing potential beneficial effects against negative impacts, one should balance them against potential negative impacts. [philippe waldeufel, France]	NOTED: The sentence is not aiming at balancing, just stating that literature on positive aspects is lacking. Sounds as if the reviewer agrees with that.
107931	136	4	136	17	This section seems very weak. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: Section 12.7.4 has been substantially shortened as part of the new "Final Remarks" approach.
110679	136	20	136	39	(a) There is a significant gap in understanding how world views and personal/institutional values on the part of the scientists, climate service practitioner, and decision maker factor into the construction, communication, interpretation and application of climate information. (b) Secondly, there is gap in how best the context understanding of the climate information user/decision maker is recognized, understood, and fed back into shaping and framing the science. [Bruce HEWITSON, South Africa]	TAKEN INTO ACCOUNT: Section 12.7.4 has substantially be shortened. The concerns have been integrated in section 12.6.3 (Challenges) and are part of section 10.5
57511	136	20	136	39	I don't understand this sub-section. What is the "climate services approach to climatic impact drivers"? And I don't understand how the first 3 bullet points here (and possibly also the fourth) relate to "climatic impact drivers". If climate services (12.7.4) has to be included in sub-section 12.7 then perhaps it needs to be introduced at line 22? And perhaps the bullet points need to be thought through again to make them relevant to "climatic impact drivers"? [Chris Hewitt, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The new version of this section has been significantly shortened and reworked as a "Final Remarks" section -- the subtitles have been eliminated.
33241	136	23	136	23	Building trust between users and climate services is one of the most important issues on the regional/local scale concerning a long-term co-production of climate service products and their subsequently effective implementation. Unfortunately, due to temporally limited projects, especially on the regional/local scale, trust is hard to build and fails completely now and then, which is why this issue should be mentioned in the list of gaps and limitations related to climate services. [Janus Willem Schipper, Germany]	TAKEN INTO ACCOUNT: Section 12.7.4 has substantially be shortened. The concerns have been integrated in section 12.6 and Cross-Chapter Box12.2
20817	136	24	136	26	This kind of statement, to be taken seriously, should go all the way. Is it suggested that information obtained through commercial consultancy operation should be granted free and open access for everybody? [philippe waldeufel, France]	REJECTED: This would become prescriptive, which is not meant for an IPCC report, so we disagree that "this should go all the way".
20819	136	27	136	31	This item shows that Chapter 12 writers, after all, are not against the market economy as hinted by the previous item. Perhaps a step toward the solution would be to invite gentle(wo)men from insurance companies to join the group of writers [philippe waldeufel, France]	NOTED: Thanks for the suggestion, possibly the next assessment cycle will consider enlarging the pool of authors.
107933	136	30	136	31	But this is also changing. At least in the U.S., many academic and agency programs emphasize co-production activities. [Linda Mearns, United States of America]	TAKEN INTO ACCOUNT: We have substantially shortened 12.7.4, and co-production is discussed now only in section 12.6 and 10.5
64287	136	32	136	39	In my opinion, the tone of these two bullet points implies that bottom-up strategies like those employed in FRACTAL are often better or more effective than top-down strategies like those employed in C3S. I did not get that impression from Section 12.6 or from Cross-Chapter Box 12.2. It might be useful to re-examine the tone and points put forth in Section 12.6/Cross Chapter Box 12.2 and those put forth in these bulletpoints, and reconcile them if necessary. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have substantially shortened 12.7.4, and the examples are discussed now only in the Cross Chapter Box 12.2

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64003	137	0			I think all FAQ are quite basic and not fully covered regarding what we have discussed in Chapter 12. Please add FAQ related to each regional impact or related to climatic impact drivers [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have revised the FAQs to better reflect the main points of Chapter 12. What is a CID? What can we learn by examining changes in important climatic thresholds? What characteristics of hazards can shift with climate change?
40331	137	0			General FAQ12.x : FAQs are too short as they should have a length of 650-750, with a short summary independent from the rest of the text [TSU WGI, France]	ACCEPTED: We have lengthened the FAQs.
40333	137	0			General FAQ12.x : it would be good to have a better idea of what you mean by "asset" [TSU WGI, France]	TAKEN INTO ACCOUNT: We now jump right to the meaning of the term rather than defining asset here.
40123	137	0			FAQ12.1: the first paragraph (L5-11) would be a good introduction but then a summary is missing here. [TSU WGI, France]	TAKEN INTO ACCOUNT: We have updated and reconfigured these FAQs and have followed the recommended structure including stronger introduction and summary statements.
40125	137	0			FAQ12.1be careful not to overlap with WG2 [TSU WGI, France]	TAKEN INTO ACCOUNT: We have revised all FAQs to avoid overlaps with Working Group II. The direct assessment of beneficial/detrimental is left clearly to WGII
110681	137	1	137	1	Its too late to change the FAQs at this point, but it seems a logical FAQ for anyone wanting climate information at regional scales would be "how do I (an adaptation practitioner / decision maker) assess and handle uncertainty, differences and messages, and choices inherent in developing regional information". Certainly in my work thats one of the most common "FAQ"s [Bruce HEWITSON, South Africa]	TAKEN INTO ACCOUNT: This proposed FAQ may fall more in the remit of Chapter 10. We do address the identification of climate information and the types of changes to look out for, but the uncertainty discussions are quite challenging on an FAQ level. Chapter 12 does address uncertainty throughout (and in the Climate services section).
33243	137	1	137	1	As this chapter also deals with climate services to a large extent, an additional FAQ should be: FAQ12.4: What is a climate service and what is their role in facing climate change? [Janus Willem Schipper, Germany]	TAKEN INTO ACCOUNT: We agree that climate services are a topic of great importance. Climate services are the subject of Section 12.6 and this question is quite complex for a short FAQ given that climate services can have a number of forms, engagements, and actions depending on region, sector, stakeholder and time scale. Climate services are a prominent organizing focus of our discussion in FAQ12.1 and FAQ12.2.
81677	137	1	137	36	Very nicely written. For emphasizing the variety of connections, more examples could help the reader to guess the complexity. [Swantje Preuschmann, Germany]	ACCEPTED: Thanks to the reviewer for the positive words. We have aimed to balance the use of illustrative examples with overall space practicalities.
39469	137	1	139	33	Can you combine FAQ 12.1. and FAQ 12.2, and FAQ 12.3 can become FAQ 12. 2. [Lourdes Tibig, Philippines]	ACCEPTED: We have combined elements of the previous FAQ12.1 and FAQ12.2 in order to better describe the Climatic Impact Driver approach.
3655	137	5	137	11	Suggest adding the following to the answer "An extreme event or trend is considered a climate hazard if the extreme event of trend has the potential to affect an asset beyond the biophysical or engineered tolerances of the asset." [Dhunraj Danny, South Africa]	TAKEN INTO ACCOUNT: We have focused more on climatic impact drivers and less on the determination of hazard/benefit, as this is the domain of WGII. Our introduction to FAQ12.1 now reflects the reviewer's suggestion by including this line: "Stakeholders and sectoral experts are particularly alert to detrimental conditions that will challenge the tolerance of their systems or the opportunities that come with beneficial conditions, so the identification of CIDs ensures that climate services provide impact- and risk-relevant information"

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126791	137	5	137	11	Recommend expanding the definition of "climate hazards" to include population health. Rewrite as: "Climate change can alter many aspects of the climate system, but efforts to identify impacts and risks usually focus on a smaller set of changes known to affect, or potentially affect, things that society cares about, including population health. The term 'climate hazard' refers to a level of change in a specific aspect of the climate system (such as temperature, rainfall, or humidity) that is directly associated with potential impacts on one or more sectoral assets (such as farms, roads, wildlife, human health, or reservoirs) and overall public well-being. Furthermore, a climate risk exists only when a climate hazard has the potential to affect an asset or a population that is both exposed to and vulnerable to that hazard." [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have reconfigured FAQ12.1 to better focus on a practical definition of climatic impact drivers. Our intent here is not to focus on the sectors and assets, so it is not necessary to introduce a new concept such as population health particularly if that is the only included example. We do touch on examples from all sectors (including human health) in FAQ12.1, and our introduction to FAQ12.1 is now prominently built around understanding tolerance levels. Our overall discussion of the risk framework is reduced given that this topic is handled also by Chapter 1 and WGII and WGIII, but we do note connections to vulnerability and exposure components of risk within FAQ12.1 and FAQ12.2
16295	137	22	137	22	The double negative here makes this sentence unnecessarily challenging. [Sarah Sutton, United States of America]	NOT APPLICABLE: We have dropped this sentence given that our focus in FAQ12.1 is now more on the definition of the Climatic Impact Driver term rather than the overall risk framework (covered in Chapter 1, Sections 12.1-12.3 and Cross-Chapter Box 12.1, WGII, and WGIII)
81679	137		139		Very well done. It is pleasantly readable, concise and precise. The questions are clearly answered. Please keep it in any case. [Swantje Preuschmann, Germany]	ACCEPTED: Thanks to the reviewer for the positive words. We have kept many FAQ elements and augmented others in response to reviewer comments.
64333	137		139		This section should have question like 'Do climate change impact drivers vary according to regions' [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: The updated draft does not have this direct question, although the answer would be "yes, CIDs do vary according to regions...". In the updated FAQ text we do mention that CIDs vary by region in nearly all FAQs.
40127	138	0			FAQ12.2: very interesting FAQ but very dry/to the point and a bit too short, it would help to have a better contextualization and a longer introduction and conclusion [TSU WGI, France]	TAKEN INTO ACCOUNT: We have expanded this FAQ and add more compelling examples.
40129	139	0			FAQ12.3: The text lacks some contextualization/explanations [TSU WGI, France]	TAKEN INTO ACCOUNT: We have expanded this FAQ and add more compelling examples.
40131	139	0			FAQ12.3: very interesting FAQ with a very clear summary [TSU WGI, France]	ACCEPTED: Thanks to the reviewer for the positive words. We have kept many FAQ elements and augmented others in response to reviewer comments.
14147	139	1	139	5	To include fisheries importance as a global asset at risk. Food security is not only reflected in terrestrial crop yields, but also fisheries play an important role as human (and animal) protein consumption. Fisheries are a good example of how wild caught fish will change and how proper management can minimize the negative effects of poleward displacement, or even local extinction (i.e. coral reefs). A good and brief scientific paper that synthesizes the effects of most of the Climatic Impact Drivers (i.e. heatwaves, acidification, oxygen depletion) described in chapter 12 related to the ocean and coastal systems can found in Plagányi (2019) Climate Change impacts on fisheries. Science Vol. 363 Issue 6430 (930-931) DOI:10.1126/science.aaw5824. [Maria Amparo Martinez Arroyo, Mexico]	TAKEN INTO ACCOUNT: We have reduced any impression that this FAQ provides a comprehensive overview of global assets at risk. We examined Plagányi (2019) for further connections between CIDs and fisheries for the assessments within Sections 12.3 and 12.4.8, however it is a short perspective piece that does not add new connections or regional changes beyond what is already in those sections.
8939	139	1	139	33	FAQ 12.3: this section should say something about the asymmetry of effects, i.e. there are likely to be more detrimental than beneficial effects!?! Currently, the reader might think there will be as many losers as there will be winners from climate change. This is not likely to be the case. If possible, refer to an estimate of how many people will experience detrimental to how many people will experience beneficial impacts. [Thomas Wiedmann, Australia]	NOT APPLICABLE: We have dropped this FAQ in favour of alternative questions. A deeper discussion about the asymmetry of effects belongs in Working Group II.
105433	139	1	139	35	Some examples of how climate change benefits should be briefly indicated/provided [Atiq Kainan Ahmed, Thailand]	NOT APPLICABLE: We have dropped this FAQ in favour of alternative questions. A deeper discussion about the asymmetry of effects belongs in Working Group II. We do note some example benefits within the figure for FAQ12.1.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
3657	139	3	139	9	Suggest adding the following to the answer "Yes, climate change be both hazardous and beneficial." [Dhunraj Danny, South Africa]	TAKEN INTO ACCOUNT: We now ensure that we directly answer each FAQ in the text, although the new FAQ titles are less about a yes/no answer.
39517	139	17	139	19	Consider to remove the word 'also' and add the word 'may' into the sentence in line 18, thus as follows: 'but may allow' [Tamara van 't Wout, Qatar]	NOT APPLICABLE: We have dropped this FAQ in favour of alternative questions. A deeper discussion about the asymmetry of effects belongs in Working Group II.
26465	139	22	139	24	A comment - since the human dwellings in northern areas (cold climates) are built to keep out the cold, they often do not function at all during heatwaves, which is/may become a huge health risk [Mare Sundström, Sweden]	NOT APPLICABLE: We have dropped this FAQ in favour of alternative questions. A deeper discussion about the asymmetry of effects belongs in Working Group II.
83355	140	1	212	34	REFERENCE LIST - inconsistencies in reference formatting e.g., in the use of capitals in paper titles etc. [Robert Massom, Australia]	Accepted: formatting of references has been fixed
64005	145	22	145	25	Double writing for one journal. Why there is "a" and "b" after the year. If it is the different journal. Then, why the title and DOI number is the same? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Accepted: Duplicate references have been removed
64007	151	45	151	48	Double writing for one journal. The only different is the first reference uses "Cryosph" and the second one uses "Cryosphere". However, They are the same. Same DOI number and same title. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Accepted: Duplicate references have been removed
19383	153	25	153	25	"in press" should be replaced by "2020" [Juergen Weichselgartner, Germany]	Accepted: citation has been updated
8975	154	2	49	2	Atlas.5.6 page 85 L 16 make reference to evaluation of marine heatwaves but for projections only, no attribution or analysis of past trends [Bart van den Hurk, Netherlands]	TAKEN INTO ACCOUNT: It is not clear exactly which line in Chapter 12 the reviewer is referring to, but Chapter 12 includes a description of past trends and projections in regional marine heatwaves. Attribution is determined in Chapter 9.
64009	154	13	154	16	Double writing for one journal. Why there is "a" and "b" after the year. If it is the different journal. Then, why the title and DOI number is the same? [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Accepted: Duplicate references have been removed
8965	164	1	22	1	Change in mean temperature and mean precipitation is also assessed in Atlas.5.6 and assessed to be persistent (Executive Statement Atlas.Europe #1) [Bart van den Hurk, Netherlands]	NOTED: We have worked with the Atlas to ensure consistency in assessments
8967	164	1	22	1	Also change in extreme weather events related to extreme temperature are attributed to climate change in Atlas.5.6 (ES #2) [Bart van den Hurk, Netherlands]	NOTED: We have worked with the Atlas to ensure consistency in assessments. Attribution of extreme temperature is assessed in Chapter 11.
8969	164	1	22	1	Atlas.5.6 page 80 line 8 does state that there has been no formal attribution of European droughts found in literature [Bart van den Hurk, Netherlands]	NOTED: We have worked with the Atlas to ensure consistency in assessments. Attribution of droughts is assessed in Chapter 11.
8971	164	1	22	1	Previous IPCC assessments reported in Atlas.5.6 page 79/line 35 do give evidence of elevated bushfire risk in Northern Europe [Bart van den Hurk, Netherlands]	NOTED: We have worked with the Atlas to ensure consistency in assessments. Fire weather in Northern Europe is assessed in Section 12.4.5.2.
8973	164	2	22	2	It's a bit strange that Central Europe/Mediterranean show no evidence of changes in land ice, given the strong Alpine glacier retreat [Bart van den Hurk, Netherlands]	NOTED: We have worked with the Atlas to ensure consistency in assessments. Land ice in Central Europe and the Mediterranean is now assessed to decrease.
3911	180	34	1	78	Bruno et al. (2018) just use data from Henson et al. (2017) [also cited in this Chapter]. Please cite data originators. [David Schoeman, Australia]	TAKEN INTO ACCOUNT: Our assessments are based on both the data and discussions within each paper. Whenever possible we use the original dataset, but when value is added in further studies we use the most recent and relevant literature.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
64011	187	4	187	7	Double writing for one journal. They both have the same title. However, the year is different. Please check which year is the correct one [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	Accepted: Duplicate references have been removed
68513	207	6			WANG -> Wang [Yukiko Imada, Japan]	Accepted: formatting of references has been fixed
91127	208	39	208	41	Reference Wild et al. (2015) two times in reference list, can be merged into one [Martin Wild, Switzerland]	Accepted: Duplicate references have been removed
104561	211	50	211	50	The citation of Zhou and Wang (2016) should be listed here. Because this paper is citing in Line 26 to Page 42. Reference: Zhou, C., and Wang, K., (2016). Coldest temperature extreme monotonically increased and hottest extreme oscillated over northern hemisphere land during last 114 years. <i>Sci. Rep.</i> , 6, 25721. doi: 10.1038/srep25721. [Chunlüe Zhou, United States of America]	Accepted: Chapter has now been checked for references that were missing from the reference list
5565	213	1	213	11	In the figure, for key climatic impact drivers, add rain and river flooding for estuaries, tidal rivers and all coastal rivers including in the coastal systems [Benoit Laignel, France]	TAKEN INTO ACCOUNT: we added rain and river flood
117139	213		213		The figure could have a second part that would better explain what parts of the assessments of other chapters of WGI are used here. Add : forcings and large scale processes, feedbacks, causing trends and changes in extremes. The figure could include a link to WGIII to show that mitigation (and in fact adaptation) options can also affect forcings and therefore CIDs (eg emissions or removals of GHG; emissions of SLCF; land management). [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: we added large-scale processes and feedbacks in the figure to elaborate for a better understanding. However links to WGIII are not obvious to place in the figure
63845	214	0	214	0	reduce RHS box text, consider using bullet points. Suggestion for 12.2: Describe chapter methodology; identify and classify key climatic impact drivers following disaster risk reduction literature [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: We tested this approach but adding bullets threw off the balance of the text along the RHS.
28253	214				Both parts (sides) of Fig. 12.2 could be combined into one. [Sebastian Bathiany, Germany]	REJECTED: The two panels were conserved for clarity
63849	215	0	215	0	Figure 12.3 may be more compact and comprehensible if all T_subscripts are replaced with 1-2 word descriptors of what they represent. E.g. Permafrost melts instead of T_permafrost, would also allow for the caption to be more compact [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: We have examined the subscripts in the symbols within Figure 12.3 in order to simplify, and ensured that they are efficient and well connected to the figure caption.
5717	215	1	215	26	Please check and correct: Figure 12.3 shows "T_hotpest", the text below refers to "T_coldpest". [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: There is a hot and cold limit for pests and diseases that are both labelled in the figure and caption.
105543	215	1	215	27	The Figure 12.3 is a very useful figure. However, I felt that this figure and the corresponding messages need to be elaborated further so that the reader can make use if it more clearly. [Atiq Kainan Ahmed, Thailand]	TAKEN INTO ACCOUNT: We are limited for space but have cleaned this figure further to improve communication, with enhanced discussion in the main text at the end of the heat and cold CIDs section (12.3.1). This presentation is also an example of similar graduated thresholds that could be determined for most CID categories, which provides important context to the overall discussion of CH12 and the broader CID Framework.
7671	215	3	215	26	Is it possible to provide some more specific numbers for these thresholds? [Miao Ruiqing, United States of America]	TAKEN INTO ACCOUNT: This figure is not intended to define specific quantitative temperature thresholds, as these are often highly dependent on species, engineering design, or other factors that distinguish tolerance levels. This presentation is also an example of similar graduated thresholds that could be determined for most CID categories, which provides important context to the overall discussion of CH12 and the broader CID Framework.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
113713	215	6	215	6	"T_hotroads" instead of "T_roads" (as marked in the Figure) [Agnieszka Kowalczyk, Poland]	TAKEN INTO ACCOUNT: We have examined the subscripts in the symbols within Figure 12.3 in order to simplify, and ensured that they are efficient and well connected to the figure caption.
113715	215	6	215	6	"T_coldroads" are not described in the Figure caption [Agnieszka Kowalczyk, Poland]	TAKEN INTO ACCOUNT: We have examined the subscripts in the symbols within Figure 12.3 in order to simplify, and ensured that they are efficient and well connected to the figure caption.
113717	215	20	215	20	"T_hotpest" instead of "T_coldpest" [Agnieszka Kowalczyk, Poland]	TAKEN INTO ACCOUNT: We have examined the subscripts in the symbols within Figure 12.3 in order to simplify, and ensured that they are efficient and well connected to the figure caption.
31661	215	20	215	21	Same of above line (There are some differences between the caption and the Figure 12.3 (i.e.: Thotim in the caption that it is, probably, Tlim in the Figure, Tcoldpest in the caption that it is, probably, Thotpest in the Figure...). Please check and correct. [Alessandro Pezzoli, Italy]	TAKEN INTO ACCOUNT: We have examined the subscripts in the symbols within Figure 12.3 in order to simplify, and ensured that they are efficient and well connected to the figure caption.
51923	215	Fig 12.3	215	Fig 12.3	There are currently no numbers on the thermometer - or is it all relative and therefore no need for numbers? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: The thermometer has been removed to avoid confusion
38459	215		215		Figure 12.3. T(hotroad) is shown in the figure while T(road) is mentioned in the caption. [Mansour Almazroui, Saudi Arabia]	TAKEN INTO ACCOUNT: Figure has been updated to be consistent between figure and caption
34147	215				Figure 12.3. Do the thermometer have a meaning? Are you expressing differences of 2 °C? If yes, add number in the thermometer, if not take out the scale. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: The thermometer has been removed to avoid confusion
14149	216	1	126	19	Setting a threshold for all regions may give erroneous information, for example in Mexico the Tmax> 35 ° C are not significant throughout the country, and therefore the results show no change in the projections. [Maria Amparo Martinez Arroyo, Mexico]	NOTED: Figure 12.3 shows the importance of different temperature thresholds, and here we chose a threshold with broad relevance across regions and sectors (See also Technical Annex VI). Further analysis of regions such as North Central America (including much of Mexico) is available in the supplemental material.
80733	216	1	216	1	The region with the Pacific SIDS are not represented on Figure 12.4. It would be useful to include them [Helene Jacot Des Combes, Marshall Islands]	REJECTED: This isn't an official IPCC land region for this as far as I am aware. Could use ocean regions instead. For the smaller islands there is also the issue of whether they are really represented in the GCMs because of the grid resolution
107881	216	1	216	18	These figures (global maps with regional box plots) are really problematic. The global map part is OK, but the regional box plots are just trying to cover too much information. They are for the most part unreadable. Some choices need to be made about reducing the amount of information displayed. You don't want to drive your readers mad! [Linda Mearns, United States of America]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
66897	216	1	218	19	Figures in chapter 12 (e.g., 12.4, 12.5, 12.6) consider projected changes for 2041–2060 so near-term climate metrics useful for interpreting these in the context of mitigation measures for policymakers. Chapter 7 metrics should include shorter-term metrics to help policymakers discuss these near-term impacts. Speed is the metric of concern because of our proximity to 1.5C and drastic mitigation efforts needed to meet that goal. As a result, policymakers that will rely on the IPCC's scientific expertise would greatly benefit from the access and analysis of climate metrics that consider the shorter timescales like GWP20, which was used in past assessments and throughout policy work. SLCFs are featured in Chapter 6 of this report, but their impact on the climate—especially in the crucial near-term—should not be relegated to only that chapter but instead considered as part of the whole, most importantly short-lived climate pollutants (black carbon, methane, tropospheric ozone, and HFCs). [Kristin Campbell, United States of America]	NOTED: Thanks for these remarks, which however do not call for a specific figure change

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
66899	216	1	218	19	GWP* being used throughout the AR6 Report can be a useful metric, but does not completely negate the need and utility of a metric for a shorter timescales like GWP20. In the IPCC 1.5C Report, GWP* is noted for its ability to describe the impacts from SLCFs, even providing a Figure in Cross-Chapter Box 2 that shows the differences between GWP100, GTP100, and GWP*. This does not help for shorter timescale concerns. In the First Order Draft for WGIII for AR6, GWP* is explained in Chapter 2 as allowing the comparison of a sustained change in emissions for non-CO2 forcers in comparison with CO2, but the chapter also notes that there are limitations to using GWP* for policy applications, including those relevant for the Paris Agreement (see WGIII FOD 2-23–2-24). Further, Chapter 2 does suggest that GWP20 may be useful alongside metrics like GWP100 and GTP100 to compare changes in emissions (WGIII FOD 2-22). In Chapter 6 of WGIII FOD, the authors note that a chosen climate metric and the time horizon for which it covers affect assessing the timing of achieving climate targets like net-zero emissions (WGIII FOD 6-100). In discussing the balance of CO2 and non-CO2 emissions from aviation, Chapter 10 of WGIII's FOD suggests that time horizon is a subjective choice of the whomever is using the information, and that if longer time horizons are chosen, CO2 becomes more important (WGIII FOD 10-51: "Any GWP/GTP type emissions equivalency calculation always involves the user selection of a time horizon, over which the calculation is made, which is a subjective choice (Fuglested et al., 2010). In general, the longer the time horizon, the more important CO2 becomes in comparison with a SCLF [sic]."). [Kristin Campbell, United States of America]	NOTED: Thanks for these remarks
68471	216	1	218	19	Figures in chapter 12 (e.g., 12.4, 12.5, 12.6) consider projected changes for 2041–2060 so near-term climate metrics useful for interpreting these in the context of mitigation measures for policymakers. Chapter 7 metrics should include shorter-term metrics to help policymakers discuss these near-term impacts. Speed is the metric of concern because of our proximity to 1.5C and aggressive mitigation efforts needed to meet that goal. As a result, policymakers that will rely on the IPCC's scientific expertise would greatly benefit from the access and analysis of climate metrics that consider the shorter timescales like GWP20, which was used in past assessments and throughout policy work. SLCFs are featured in Chapter 6 of this report, but their impact on the climate—especially in the crucial near-term—should not be relegated to only that chapter but instead considered as part of the whole, most importantly short-lived climate pollutants (black carbon, methane, tropospheric ozone, and HFCs). Aggressive mitigation of SLCFs can cut the rate of warming in half, Arctic warming by two-thirds, and avoid up to 0.6C of warming by 2050. UNEP & WMO (2011) Integrated Assessment of Black Carbon and Tropospheric Ozone; Shindell D., et al. (2012) Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security, Science 335(6065):183–189; Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci. 114(39):10315–10323. [Durwood Zaelke, United States of America]	NOTED: Thanks for these remarks, which however do not call for a specific figure change

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
68473	216	1	218	19	GWP* being used throughout the AR6 Report can be a useful metric, but does not completely negate the need and utility of a metric for a shorter timescale like GWP20. In the IPCC 1.5C Report, GWP* is noted for its ability to describe the impacts from SLCFs, even providing a Figure in Cross-Chapter Box 2 that shows the differences between GWP100, GTP100, and GWP*. This does not help for shorter timescale concerns. In the First Order Draft for WGIII for AR6, GWP* is explained in Chapter 2 as allowing the comparison of a sustained change in emissions for non-CO2 forcers in comparison with CO2, but the chapter also notes that there are limitations to using GWP* for policy applications, including those relevant for the Paris Agreement (see WGIII FOD 2-23--2-24). Further, Chapter 2 does suggest that GWP20 may be useful alongside metrics like GWP100 and GTP100 to compare changes in emissions (WGIII FOD 2-22). In Chapter 6 of WGIII FOD, the authors note that a chosen climate metric and the time horizon for which it covers affect assessing the timing of achieving climate targets like net-zero emissions (WGIII FOD 6-100). In discussing the balance of CO2 and non-CO2 emissions from aviation, Chapter 10 of WGIII's FOD suggests that time horizon is a subjective choice of the whomever is using the information, and that if longer time horizons are chosen, CO2 becomes more important (WGIII FOD 10-51: "Any GWP/GTP type emissions equivalency calculation always involves the user selection of a time horizon, over which the calculation is made, which is a subjective choice (Fuglestedt et al., 2010). In general, the longer the time horizon, the more important CO2 becomes in comparison with a SCLF [sic]."). [Durwood Zaelke, United States of America]	NOTED: Thanks for these remarks, which however do not call for a specific figure change
112509	216	1	226	9	The texts in these figures are difficult to read [Tirthankar Roy, United States of America]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
96199	216	2	216	2	Figure 12.4: Is the blue signature ("Decrease") meaningful here? [Nicole Wilke, Germany]	NOT APPLICABLE: These figures have been simplified and now gathered in a single multi-panel figure
110263	216	2	219	1	These figures are really really complicated and many features as well as critical aspects such as axis scales and whisker labels are barely legible. Is this really the best way to show this information and are the individual small plots in each really actionable information? [Peter Thorne, Ireland]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
27515	216	6	216	7	About Figure 12.4: there are too many bars per region. I would suggest to choose only 35°C as a threshold and if needed add in annex the same graph with the 40°C threshold. Similar comment applies to following figures (Figure 12.5) [Eric Brun, France]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
99327	216	6			the figure is very rich in detail making it hard to extract the informatinon, (same for 12.5etc) [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
27517	216	17	216	18	About 'no bias adjustment is applied here, but it will be used in the FGD.': This will be useful and important but again if you do have both temperature thresholds it will make your satellite figures even heavier. [Eric Brun, France]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
51925	216	Figs 12.4-12	216	Figs 12.4-12	It would be clearer if these figures are enlarged (e.g. landscape, across the page), so the small graphs surrounding the map can be read. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
80735	217	1	217	1	The region with the Pacific SIDS are not represented on Figure 12.4. It would be useful to include them [Helene Jacot Des Combes, Marshall Islands]	TAKEN INTO ACCOUNT: We have revised the global figures as it is not practical to include satellite plot for all regions. Where we do show regional bar plots (Supplementary Material), we show the AR6 regions as defined by the Atlas.
5719	217	1	217	17	Figure 12.5: This figure is not legible. Drastically reduce number of panels shown. [Joachim Rock, Germany]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
10079	217	1	217	18	Be sure to use RSL projections consistent with ch. 9. Chapter 9 will also has ESL projections based on applying RSL projections to historic, tide-gauge-based return period curves. [Robert Kopp, United States of America]	NOTED: All RSL projections in Ch 12 are provided by CH 9 authors who are CAs in Ch 12. Please note that the ESLs assessed in Ch 9 and Ch 12 are different. ESWL in Ch 9 and ETWL in Ch 12.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
80737	218	1	218	1	The region with the Pacific SIDS are not represented on Figure 12.4. It would be useful to include them [Helene Jacot Des Combes, Marshall Islands]	TAKEN INTO ACCOUNT: We have revised the global figures as it is not practical to include satellite plot for all regions. Where we do show regional bar plots (Supplementary Material), we show the AR6 regions as defined by the Atlas.
5721	218	1	218	17	Figure 12.6: This figure is not legible. Drastically reduce number of panels shown. [Joachim Rock, Germany]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
80739	219	1	219	1	The region with the Pacific SIDS are not represented on Figure 12.4. It would be useful to include them. It is extremely important to include the Pacific SIDS in this figure since they are extremely vulnerable to sea level rise [Helene Jacot Des Combes, Marshall Islands]	TAKEN INTO ACCOUNT: We have revised the global figures as it is not practical to include satellite plot for all regions. Where we do show regional bar plots (Supplementary Material), we show the AR6 regions as defined by the Atlas.
5723	219	1	219	12	Figure 12.7: This figure is not legible. Drastically reduce number of panels shown. [Joachim Rock, Germany]	ACCEPTED: These figures have been simplified and now gathered in a single multi-panel figure
79101	219	1	219	12	Do these numbers represent the change of the 1:100yr ESL heights alone, or is it RSL + ESL, i.e. is there a part of these values that is an RSL projection, and if so, which part? [Aimee Slangen, Netherlands]	NOTED: ESL referred to here is ETWL. Definitions have been brought in line with those in Box 9.1
96201	219	4	219	4	Indicator "extreme sea level (1:100 yr return period total water level)" should please be explained here. [Nicole Wilke, Germany]	NOTED: ESL referred to here is ETWL. Definitions have been brought in line with those in Box 9.1
86277	220	0	220	0	Figure 12.8 (a) re South West Africa, those regions already have low rainfall of around 500mm/y, less further West, a bit more further East. A reduction in rainfall of 1-2 mm per day corresponds to over 365 mm per year. That would be a very significant impact. [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: The figure now includes river discharge and not precipitation
5725	220	1	220	19	Figure 12.8: Parts f), g), and h) of this figure are not legible. Drastically reduce number of panels shown here to 4 panels each (or less). [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
5729	220	1	220	19	Figure 12.10: Parts d), e), and f) of this figure are not legible. Please remove one panel each and reorder to 2 x 2 panels (or enlarge more). [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
110265	220	1	225	1	The maps in these figures are reasonable although the colour scale labels and panel titles are perhaps too small to be easily readable. The lower panels though are incredibly complicated and hard to read at the scale presented. Further without the reference it's unclear why the panels repeat three times across in each case [Peter Thorne, Ireland]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
51927	220	Fig 12.8	220	Fig 12.8	There are some quite big differences between a) and d) and between b) and e) - it would be helpful to spell out in the caption which of these results are assumed to be most authoritative. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
81237	220		220		Box plots illustration of North Africa is missing in Figure 12.8, Also it is not clear if boxplots of the Mediterranean in Europe part (Figure 12.12) includes North Africa!! [Fatima Driouech, Morocco]	TAKEN INTO ACCOUNT: North Africa is not an official region but is assessed within "Mediterranean". The available panels are located in the European figures (Supplementary Material)
5727	221	1	221	17	Figure 12.9: Parts d), e), and f) of this figure are not legible. Drastically reduce number of panels shown here.. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
2951	221	1	221	20	It should provide the numbers of CMIP5 and CMIP6 models. If it is possible, model names should be given. [Zong Ci Zhao, China]	NOTED: All information is available for each figure in data tables
34149	221				Figure 12.9. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. Titles in the top of the maps should be improved, can be shorter and with bold fonts. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
80741	222	1	222	1	This region does not cover all the Pacific SIDS. Where can the information about the other Pacific SIDS, in particular in Micronesia (which is not covered by this figure) can be found? [Helene Jacot Des Combes, Marshall Islands]	TAKEN INTO ACCOUNT: We have revised the global figures as it is not practical to include satellite plot for all regions. Where we do show regional bar plots (Supplementary Material), we show the AR6 regions as defined by the Atlas.
34151	222				Figure 12.10. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. Titles in the top of the maps should be improved, can be shorter and with bold fonts. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
5731	223	1	223	23	Figure 12.11: Parts d), e), and f) of this figure are not legible. Drastically reduce number of panels shown here.. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
85371	223	1	223	23	Two issues call my attention that from Fig. 12.11c: (1) coastal Colombia is the only region not included in the prediction of coastline recession by 2100 without an apparent reason; and (2) Colombia is included in the region of Central America / Mexico, which is geographically incorrect. First, I suspect that the reason may be that coastal Colombia was considered as a rocky coast. However, that argument implies that coastal South America is all sandy coast, which is also incorrect (e.g., Blanco-Chao et al., 2014, https://mem.lyellcollection.org/content/40/1/155.short) Second, geologically and geographically there are several regions already established for South America. One standard constitutes the Northern Andes as part of Northern South America, with their coastlines (Pacific coast of Ecuador and Colombia and southern Caribbean coast) as part of Northern South America. I acknowledge that this issue comes from another publication, but might highlight the need to include more representatives (coastal scientists?) from this region in the development of the Assessment Report. [Juan Felipe Paniagua-Arroyave, Colombia]	TAKEN INTO ACCOUNT: Vousdoukas et al (2020) presents the only global scale ensemble projections of shoreline change due to both ambient trends and climate change forcing. Like all other global scale assessments (e.g. of wind, storm surge, precipitation), naturally these projections will need to be further enhanced when considering hazards and impacts at local scale. The methods used by Vousdoukas et al (2020) are robust at the scale the study is intended for and is a significant improvement on previous global scale assessments of shoreline change (e.g. Hinkel et al., 2013) cited in previous IPCC reports. The scale of interest of Ch 12 is not local, it is regional. At that scale the methods and assumptions adopted by Vousdoukas et al (2020) are valid. Nevertheless, we will doublecheck this wrt Colombia and update the figure if possible.
51929	223	Fig 12.11	223	Fig 12.11	Is there a reason for including temperature map for S. America and not for the other regions? If so please clarify. [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible. Only two indices are kept.
34153	223				Figure 12.11. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. Titles in the top of the maps should be improved, can be shorter and with bold fonts. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
63887	223				Fig. 12.11 d-f please use proper x- and y-labels. In this figure arrangement, especially the y-labels at the legend box are not intuitive. I am suggesting to write proper y-labels at least at the furthest left satellite boxes as well as proper x-labels only at the bottom row of satellite boxes. Then you can get rid of the y and x labels at the legend box and the x labels in the first and second row of satellite boxes. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
63889	223				Fig. 12.11 d-f Subfigures are not referenced and discussed in the chapter text. Please incorporate figure description in the text or delete these subfigures since they are not supporting the main text. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
63903	223				Fig.12.11 a-c please provide a label with a unit at the colour bars [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
63857	224	0	224	0	Fig 12-2, the titles of (a) and (d) don't match, as well as (c) and (d), although I believe they show the same thing adding unnecessary confusion [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
96203	224	1	224	1	Figure 12.12: A map on droughts would be fine! [Nicole Wilke, Germany]	TAKEN INTO ACCOUNT: we now include two drought indices (Soil Moisture and a SPI-based index). But this is shown as global, in Figure 12.4
5733	224	1	224	20	Figure 12.12: Parts d), e), and f) of this figure are not legible. Please remove one panel each and reorder to 2 x 2 panels (or enlarge more). [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
96205	224	5	224	20	Figure 12.12: Plotting SSP5-8.5-CMIP6 and RCP8.5-CMIP-CORDEX data together suggests that these data and the scenarios are comparable. According to other parts of the report this is not fully the case. Please add this information to the figure caption. [Nicole Wilke, Germany]	REJECTED: we do not think this distinction, which is an assessment statement, should be place in the caption.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
81239	224		224		Figure 12.8 Same remark regarding North Africa (please see the remark above) [Fatima Driouech, Morocco]	TAKEN INTO ACCOUNT: North Africa is not an official region but is assessed within "Mediterranean". The available panels are located in the European figures (Supplementary Material)
34155	224				Figure 12.12. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. (a) could include former a, d & g; (b) could include former b, e & h; (c) could include former c, f & i. Titles in the top of the maps should be improved, can be shorter and with bold fonts. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
5735	225	1	225	18	Figure 12.13: Parts d), e), and f) of this figure are not legible. Drastically reduce number of panels shown here.. [Joachim Rock, Germany]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
63879	225	5	225	18	While which subplot is which can be deduced from the descriptions in the caption, the placement or absence of letters labelling the subplots of the figure create confusion. The letters of subplots a-c are in the upper left-hand corners while the letters of subplots d-f are in the lower left-hand corners. For d-f, it is unclear if they are labelling the CORDEX plots or the "satellite boxes". Further, the "satellite boxes" are referred to as subplots g-i in the caption but these letters are absent from the figure. Likely typographical error, it looks like this figure was meant to mirror Figures 12.8 and 12.12. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
34157	225				Figure 12.13. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. (a) could include former a, d & g; (b) could include former b, e & h; (c) could include former c, f & i. Titles in the top of the maps should be improved, can be shorter and with bold fonts. [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: these figures have been redesigned in the hope to be more legible.
86279	226	0	226	0	Figure 12.14: please convert all global maps to the version where Africa is in the centre. Having one continent split as in (c, e, f) just so the oceans are intact, makes no sense for the readers of this report, which are all sitting on land. – in (d) you could zoom in a bit more? [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: Figure 12.14 has been removed
34159	226				Figure 12.14. Increase size of figures, otherwise it is not possible to read them properly. Make three independent figures (a, b, c) instead of one. [Guiomar Rotllant, Spain]	NOT APPLICABLE: Figure 12.14 has been removed
86281	227	0	227	0	Figure 12.15: the codes "TMX98 2+ days" etc are not sufficiently informative for the reader, especially for such a high level, summary figure. Please describe each driver adequately. Especially the temperature variables are potentially confusing, e.g. how is the Tmax 98th percentile calculated for the reference period? Is that the temperature that is only exceeded by 2% of total days (the very hottest of days)? - "annual cooling degree days" is that total number of days below 18? Mean Temperature? Minimum? Averaged by year? - Similar question for "average annual heating degree days" - Please include how the "Standardised Precipitation Index" is calculated. – reset the Y-axis minimum on all except the top right graph, it doesn't need to go down to zero (or -20), to spread out the graph better to make it easier to read. [Debra Roberts and the Durban WGII TSU, South Africa]	NOT APPLICABLE: Figure 12.15 has been removed
112511	227	1	227	19	Increase the font size of the legends. [Tirthankar Roy, United States of America]	NOT APPLICABLE: Figure 12.15 has been removed
51931	227	Fig 12.15	227	Fig 12.15	Will both CMIP5 and CMIP6 results be blended in the final figure, or will just CMIP6 be covered? The CMIP6 projections over time could be inconsistent with the likely ECS and TCRE ranges, as stated in the SPM etc, so it would be important to explain this in the figure annotation. The figure annotations - e.g. 'Heatwaves TMX98 2+days' - please also explain this in plain English and in terms of likelihood (in non stats jargon). [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: Figure 12.15 has been removed
34161	227				Figure 12.15. Regarding Y axis legends, please modify de following: "°C-day/year" to "°C-day year ⁻¹ ", "Doughts/decade" to "Doughts decade ⁻¹ "; % change in magnitude" to "Change in magnitude (%)". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Figure 12.15 has been removed
52205	228	0	228	0	Poor quality on Figure 12.16. [Maritza Jadrijevic Girardi, Chile]	NOT APPLICABLE: Figure 12.16 has been removed

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
113719	228	1	228	1	Please replace the panel (d) with a higher-resolution image. [Agnieszka Kowalczyk, Poland]	NOT APPLICABLE: Figure 12.16 has been removed
112513	228	1	228	1	This is not super important but using a consistent map projection will make the maps look more uniform. [Tirthankar Roy, United States of America]	NOT APPLICABLE: Figure 12.16 has been removed
5737	228	1	228	16	Figure 12.16: Please rework left panels, the colouring is too pale, so the content is not legible. [Joachim Rock, Germany]	NOT APPLICABLE: Figure 12.16 has been removed
34165	228	39	228	40	I would suggest to change e.g. by cf. in: "...and water balance at the surface (e.g., Boucher et al., 2004; Kueppers et al., 2007). Several studies (e.g., Fiedler and Bukovsky, 2011; Fitch, 2015; Keith et al., 2004)...". [Guiomar Rotllant, Spain]	NOT APPLICABLE: Figure 12.16 has been removed
34163	228				Figure 12.16. (a): add scale of colors: (b), (c), (d): should be bigger to read them properly. [Guiomar Rotllant, Spain]	NOT APPLICABLE: Figure 12.16 has been removed
109095	229	0	229	0	Although it's reproduced directly from Hewitt et al 2017, I don't think the visual "stair-step" metaphor in figure 12.17 is doing the best job of communicating the ideas in the figure for the IPCC context. The slanted text on the sides of the blocks is very difficult to read. If it's feasible to rework the figure, I think it would be better to present the data in a simple tabular infographic. Put the info on the front of the blocks (graphic and type of engagement) in the first column, the descriptive tag on the side of the blocks in the second column, and the bullet points in the third column. To support the "upward" progression, add an upward arrow labeled "engagement" and/or change the color scheme from green-yellow-blue to yellow-green-blue. [Seth McGinnis, United States of America]	NOTED: This figure was well-received and we did not feel we had sufficient material with which to re-work this figure.
126793	229	1	229	5	In Figure 12.17, there is no mention of mutual learning, or social learning. "In-depth understanding" doesn't quite articulate that the understanding or learning is mutual. [Trigg Talley, United States of America]	NOTED: This figure was well-received is directly associated with one of the case study groups in the Cross-Chapter Box, and therefore we did not feel we had sufficient material with which to re-work this figure.
105649	229	1	229	5	The Figure 12.17 (Schematic overview of different categories of user engagement in climate services) is a good one but it seems can be improved further by showing the feedback loops from various sources of information and levels. The figure as it is looks very unidimensional linear process but in practice the user engagements are often happen through multiple level of interactions, feedback and iterations as well. Would be great if this figure can be improved a bit further. [Atiq Kainan Ahmed, Thailand]	NOTED: This figure was well-received is directly associated with one of the case study groups in the Cross-Chapter Box, and therefore we did not feel we had sufficient material with which to re-work this figure.
99329	229	3			it is not clear to me what the function of the figure in an assessment it [Daniela Schmidt, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: This figure was well-received is directly associated with one of the case study groups in the Cross-Chapter Box, and therefore we did not feel we had sufficient material with which to re-work this figure.
27519	230	3	230	3	About Figure 12.18: This is a very important figure. I think examples are indeed very useful and references for examples could also be useful. The very generic & integrated remains still vague for the moment How useful can some very generic information be? Needs some improvement but I trust the team to make the final version very interesting [Eric Brun, France]	TAKEN INTO ACCOUNT: This figure has been further updated to increase clarity, with the bottom-left quadrant now being one of the more substantial quadrants.
64289	230				Figure 12.18: Spell out "C3S" in examples list in Graphics & Apps quadrant—Figure 12.18 is referred to before the Copernicus Climate Change Service is introduced (in Cross-Chapter Box 12.2). [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	NOTED: This acronym made it into the FGD but we have included a correction in the Corrigenda.
64291	230				Figure 12.18: Include the FRACTAL example described in Cross-Chapter Box 12.2 as an example in the illustration? From my understanding, it would be an example of the "Climate-Inclusive Approaches" category. [APECS, MRI, PAGES ECN, PYRN and YESS ECS group review, Canada]	REJECTED: This quadrant does not include specific projects as this could lead to a long list of potential groups to include with no clear way to determine which ones to list.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
4713	233	7	233	10	I would suggest breaking sentence into two separate sentences. [Sinead Mellett, Ireland]	This comment seems to have been attached to the wrong line (no text on page 233 line 7-10) and it is not clear which sentence this was intended for.
4715	233	8	233	8	It is unclear what the word ensemble refers to here, is it necessary in the context of the sentence or could it be omitted. [Sinead Mellett, Ireland]	This comment seems to have been attached to the wrong line (no text on page 233 line 8) and it is not clear which sentence this was intended for.
51933	233	Fig FAQ 12.3	223	Fig FAW 12	It is quite confusing to have a link between 'decrease in cold spells' and the 'warm season mortality in hot regions' box. Please can this be removed? [Jolene Cook, United Kingdom (of Great Britain and Northern Ireland)]	NOT APPLICABLE: We have dropped this FAQ in favour of alternative questions.
29513	Pag 80	line 21	Pag 80	line 21	... conditions in almost Mexico (the southern region is typically wet) and Western [Mercedes Andrade, Mexico]	ACCEPTED: Text updated to indicate drier conditions in "much of Mexico" rather than implying that all of Mexico is dry.
29515	pag. 82,	line 41	pag. 82,	line 41	sec 12.4.6.1 Heat and cold, line 41 Montero-Martínez et al. 2018 show for two different regions in Mexico, northern and southern, there is a warming in both regions by WMO indexes (ETCCDI, see annex VII). [Mercedes Andrade, Mexico]	TAKEN INTO ACCOUNT: The Montero-Martínez et al. (2018) study highlights diurnal temperature range, summer days, and annual minimum temperature trends for the Concho Basin in Northern Mexico but uses a 1960-1991 time frame that ends 30 years before present. Conclusions are consistent with our current assessment and those in CH11.
29517	pag. 82,	line 41	pag. 82,	line 41	Montero-Martínez MJ, Santana-Sepúlveda JS, Pérez-Ortiz NI, Pita-Díaz O and Castillo-Liñan S. 2018. Comparing climate change indices between a northern (arid) and a southern (humid) basin in Mexico during the last decades. <i>Advances in Science and Research</i> , 15, 231237. https://doi.org/10.5194/asr-15-231-2018 [Mercedes Andrade, Mexico]	TAKEN INTO ACCOUNT: The Montero-Martínez et al. (2018) study highlights diurnal temperature range, summer days, and annual minimum temperature trends for the Concho Basin in Northern Mexico but uses a 1960-1991 time frame that ends 30 years before present. Conclusions are consistent with our current assessment and those in CH11.
29519	pag. 83,	line 27	pag. 83,	line 27	sec 12.4.6.2 Wet and dry, line 27. Southern Mexico is a wet region, there is a light trend positive of the wet days and total annual precipitation by observation data in recent time period (Montero-Martínez et al. 2018). While for the northern Mexico the conditions are drier (Méndez & Magaña 2010, Montero-Martínez et al. 2018). [Mercedes Andrade, Mexico]	TAKEN INTO ACCOUNT: We now clarify that we are looking at the AR6 "Northern Central America Region" which includes most of Central and Northern Mexico, but not the Southern River basin analysed in Montero-Martínez et al. (2018). Chapter 12 relies on the Atlas for precipitation trend assessment, and we have passed along information about the Montero-Martínez et al. (2018) study to be factored into their assessment. In the Atlas' assessment all of Mexico becomes drier, even as the Southern Portion of the country is much wetter than the North.
29521	pag. 83,	line 27	pag. 83,	line 27	Montero-Martínez MJ, Santana-Sepúlveda JS, Pérez-Ortiz NI, Pita-Díaz O and Castillo-Liñan S. 2018. Comparing climate change indices between a northern (arid) and a southern (humid) basin in Mexico during the last decades. <i>Advances in Science and Research</i> , 15, 231237. https://doi.org/10.5194/asr-15-231-2018 [Mercedes Andrade, Mexico]	TAKEN INTO ACCOUNT: We now clarify that we are looking at the AR6 "Northern Central America Region" which includes most of Central and Northern Mexico, but not the Southern River basin analysed in Montero-Martínez et al. (2018). Chapter 12 relies on the Atlas for precipitation trend assessment, and we have passed along information about the Montero-Martínez et al. (2018) study to be factored into their assessment.
29523	pag. 83,	line 27	pag. 83,	line 27	Méndez M and Magaña V. 2010. Regional aspects of prolonged meteorological droughts over Mexico and Central America. <i>Journal of Climate</i> , 23 (5), 11751188. https://doi.org/10.1175/2009JCLI3080.1 [Mercedes Andrade, Mexico]	TAKEN INTO ACCOUNT: The Méndez and Magaña (2010) study is more focused on the regional dynamics of drought in Northern and Southern Mexico, which would be covered in Chapter 11 although the focus there is on trends in drought conditions. Chapter 11 has assessed several more recent studies of drought in Mexico and Central America that are consistent with this study.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
55437	table 12.2				The colours indicating relevance do not seem to make sense. If I read the table correctly it says that e.g. for coastal seas mean temperature or extreme temperatures are not relevant or have little to no impact. [Friederike Otto, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: Section 12.2 distinguishes air and ocean temperature CIDs. The reviewer refers to CID categories for air temperature and atmospheric heat extremes, which are not as strongly connected to marine ecosystems as ocean temperatures and marine heatwaves.
90625					"impact- and risk-relevant climate information" the hyphen is confusing. Instead, it should have been written " the climate information relevant to both impact and risk" [Boubakeur Guesmi, Algeria]	REJECTED: It is not clear where the statement lies
15881					For the submitted papers / books chapters etc., check if they have been published before the edition of the final version of AR6. [Emmanuel Garbolino, France]	TAKEN INTO ACCOUNT: This was carefully checked
114965					Concerning the photovoltaic field, please assess the recent Gutierrez et al. 2020 https://doi.org/10.1088/1748-9326/ab6666 and Gutierrez et al. 2018 https://doi.org/10.1016/j.solener.2018.09.085 [SAMUEL SOMOT, France]	ACCEPTED: the reference was added
114967					For the tourism comfort index, please assess Dubois et al. 2016, https://doi.org/10.1186/s40322-016-0034-y [SAMUEL SOMOT, France]	REJECTED: A reference for tourism comfort index was not needed in the FGD
114969					Sorry for not having the time to do more on this chapter [SAMUEL SOMOT, France]	NOTED: We appreciate all reviewers' efforts in providing feedback on the chapter!
33567					General: all over the chapter. Avoid starring sentences with abbreviations: AR5, C35, CID, CMIP5, CO2, CRNs, GCM/s, IPCC, NSA, RFC1, RFC2, RFC3, RFC4, RFC5, RSL, SES, SR1.5, SROCC, UHIS [Guiomar Rotllant, Spain]	TAKEN INTO ACCOUNT: We improved this aspect
39967					Assessment on the model performance at regional scale is mainly provided in the Atlas. Recommend to provide concise summary for model performance here for each region like that has been done for Africa, to support the extensive discussion and results from downscaled climate model projections in this chapter. [TSU WGI, France]	REJECTED: model performance cannot easily be summarized in a short paragraph as it depends on CID, but is accounted for in the assessment
33569					General: all over the chapter. Regarding precipitation, why there is not an analysis and prediction of number of days (even hours each day) per year that will rain? It is not the same to have for instance 100 mm in 10 days that in 200 days. I only found to annotations about precipitation expressed in mm day-1 in Page 65_L29-32 (S America SCA) and Page 93_L37-38 (small islands). Could you include these data in other areas (Precipitation in mm day-1). [Guiomar Rotllant, Spain]	REJECTED: Chapter 12 does not assess in detail changes in mean climate which is in the remit of the Atlas Chapter, and for CH8, the water cycle.
117037					Chapter 12 is way overlength (by around 25%) and it must be shortened. Please make the best use of concise approaches, to shorten and sharpen the assessment. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: We have largely reduced the chapter length
38191					Regions are referred mostly in acronyms but sometimes by their full names (e.g., P42L32 SAS, WAS, ARP, EAS versus P44L17 East Siberia and Russian Far East). Standardizing can improve readability. [Junhee Lee, Republic of Korea]	TAKEN INTO ACCOUNT: We have homogenized the presentation and used the region acronym in most cases
126795					The manuscript needs to devote time addressing the biological aspects of climate change. For example, many niche and mechanistic models have predicted wholesale changes to biotic communities. The tipping point for many ecosystems will begin in earnest soon, in the next 10 to 20 years. This will have a huge impact on how restoration is approached. There is a large body of literature with strong support that ecosystems/species are on the move or being displaced by invasives. This is often instigated by wildfires. This is not mentioned but occupies the time of many in land management. [Trigg Talley, United States of America]	REJECTED: This type of assessment belongs to WGII
126797					[ACCESSIBILITY] To make the Executive Summary useful to readers, strongly recommend that, in the first paragraph, authors define the phrase "climate impact driver," and give tangible examples. Without this kind of set up, the rest of the language in the key message statements is vague and arbitrary ... leaving it to readers to concoct their own definition of the phrase. It seems that the authors assume that the reader will read beyond the Executive Summary. Yet, as is the case for an abstract in a scientific paper, most will not. Thus, the Executive Summary must provide some definitions, or refer the reader to a Glossary. [Trigg Talley, United States of America]	ACCEPTED: The introductory paragraph now includes a definition of the CIDs

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
81231					Thank you to the authors for the work done [Fatima Driouech, Morocco]	NOTED: We appreciate all reviewers' efforts in providing feedback on the chapter!
126799					[PRECISION] If only the Executive Summary is read, many of the messages will not make sense, due to vague language and jargon. Some statements require the reader to be familiar with scientific terms. Recommend that authors define terms in the Executive Summary (using endnotes?) or refer the reader to a Glossary. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have now restructured and improved the ES
126801					It is unclear what is in Chapter 12 and what is elsewhere. It seems that Chapter 12 assesses climate information that is applied in Chapters 2-8? Overall, much of the introductory text for Chapter 12 could be written much more clearly. Much of this text seems to expect the reader to understand the entire report. Making the report easier to understand for all readers will increase access to the information in the report. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: we have revised 12.1 and hope the objectives are more clearly stated
126803					[RISK] The report assesses climate impact drivers based on likelihood of a future event. Where is information on the potential consequence of the future event? In order to prepare risk and impact assessments, it is important to integrate information about consequence of the hazard event with likelihood. For example, there may be a climate hazard that is low probability ("unlikely" or "likely") but the consequence would be horrendous, so decisionmakers would want to focus on mitigating that high consequence event. [Trigg Talley, United States of America]	REJECTED: The information about consequence of the hazard event with likelihood is typically the information assessed in WGII. However note that Section 12.3 develops such links.
126805					To be applied in decisionmaking, it would be preferable to integrate exposure and vulnerability assessments together with the CID assessment. Without that integration, it is unclear how CID assessments sections would be applied in decision systems. For example, the vulnerability section of the report noted the prevalence of rainfed smallholder staple crop production in Africa and the extreme vulnerability of these agricultural systems to drought and high heat, so CIDs should then examine extreme heat and projected temperature increases and potential for drought for those geographic regions with rainfed staple cropping systems. [Trigg Talley, United States of America]	REJECTED: This information belongs to WGII. However note that Section 12.3 develops such links.
126807					Chapter 12 did not incorporate adaptation/mitigation measures that are already in place but how can one describe likely impacts without taking into consideration adaptation/mitigation measures (or at least large-scale ones) that will modulate those impacts? For example, it would be meaningless to discuss drought in the US without consideration of large-scale irrigation systems, dams and reservoirs, etc. Perhaps this information is in other chapters of the larger report? [Trigg Talley, United States of America]	REJECTED: the chapter does not cover climate impacts; it covers the climatic drivers of impacts that could inform decision-making. it is devoid of humans and their actions (except through the RCP-SSP emissions/forcings); it focuses exclusively on physical elements. for example, drought is purely a meteorological drought rather than an agricultural or socio-economic drought. the impact of mitigation measures could be implied if the assessment is expanded to a wider range of RCPs
126809					The chapter is inconsistent in including impact information for each CID. Suggest more consistency in the report by adding statements to each CID regarding broad/concerning impacts - e.g., increased temperatures impact production of staple rainfed crops, particularly maize, beans, sorghum, millet. [Trigg Talley, United States of America]	REJECTED: This information belongs to WGII. However note that Section 12.3 develops such links.
93531					In the Executive Summary (L17-20) please put southern Europe (and also where appropriate) instead of Mediterranean. Mediterranean includes also parts of North Africa and Asia [Omar Chafki, Morocco]	NOT APPLICABLE, the ES was restructured not by region
31835					The usage of different scenarios (RCPs and SSPs), time horizons and GWL in the same paragraph is confusing to the reader to get a clear message. The authors should clarify if they are equivalent or not. If the change is independent of the scenario then it raises a question to by when is the projected change? [Izidine Pinto, South Africa]	TAKEN INTO ACCOUNT: this has been rephrased to be precise
126811					The Africa section focuses on sub-regions of Africa. It might be useful to also highlight specific eco-regions/ecosystems that may be particularly impacted by the CIDs. [Trigg Talley, United States of America]	REJECTED: This assessment belongs to WGII

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
93533					Also although the specifications in page 15 (L-17-19). We never find in the chapter the Mediterranean term used for Northern Africa or the Middle East (Asia). [Omar Chafki, Morocco]	NOTED: The AR6 assessment is done for AR6 regions. There is no specific subregions of the Mediterranean. However, CID table for Africa includes a line for "North Africa" which is an adaptation of the Mediterranean region to the Northern African region.
126813					Will the other Working Groups address need for additional research on how CIDs stress availability and distribution of resources, and potentially increase violence and migration? AR5 posited an indirect causal connection of poverty, economic shocks amplified by climate change, and violence. Additional research is needed. Further, there is some research on the link between drought, heat waves, and domestic violence that could be explored more. The link between violence and drought in Africa should be mentioned: https://www.mdlinx.com/journal-summaries/violence-intimate-partner-abuse/2020/03/23/7626167/ [Trigg Talley, United States of America]	REJECTED: This information can be found in the WGII report
93535					Climate services and the experience of Met services (WMO members) is not enough assessed. Please remediate to this gap [Omar Chafki, Morocco]	NOTED: however note that the assessment is based on the peer-reviewed literature. In many cases climate services are not reported in the peer-review literature making it difficult to assess. Note however the improved climate services section
28255					I love Chapter 12! The strong linkage between changing climate indices and the associated impacts (WGII) is highly relevant for practitioners. [Sebastian Bathiany, Germany]	NOTED: We thank the reviewer
126815					[ACCESSIBILITY] Terms like Climate Impact Drivers and Essential Climate Variables are not well defined at the start of the chapter, and cross-references to other chapters were not especially helpful. Without these definitions, the reader struggles to understand initially what is being conveyed. The chapter could benefit from an introductory box explaining in broad detail what these terms mean, including some basic examples. In that box, put the seven categories of CID and at least some subcategories, some associated ECVs, and some important indices. A simple diagram linking the three ideas would be really helpful. This could be a watered-down version of Table 12.1, which doesn't appear until fully 15 pages into the text. Without this kind of simple explanation, the current Executive Summary is obtuse and even the framing part of the chapter is hard to understand. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The ES now defines CIDs and other concepts
126817					Much of Chapter 12 relies on RCP8.5 results without mention of other RCPs or SSPs. Over-reliance on this scenario will allow some stakeholders to more easily dismiss important findings. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Now other scenarios are represented in new figures and in the assessments
64865					Having done climate change in practice, I find that climate services can be very beneficial for climate change integration in practical applications. However, this chapter has not touched (to a greater degree) on the key issue that users of climate information continue to grapple with. For example, transition risks and physical climate risks cannot be treated equally when planning for short-term and longterm horizons. Climate model response tends to dominate uncertainty sources in the short-term relative to climate scenarios. Thus, in the short-term focus for physical climate risk assessment should be on understanding key physical climate processes rather than GHG scenarios which are more relevant in the long-term. I think a section which addresses this practical issue would be beneficial for climate services. I am not sure if this is addressed in WGII or not. [ELVIS ZILEFAC ASONG, Canada]	TAKEN INTO ACCOUNT: This is now handled in Section 12.6
126819					Chapter 12 has a clear international focus. Is the United States part of the discussion? There is little to no reference to the many levels of climate services in the United States (NOAA Regional Climate Centers/Regional Integrated Science Assessments, State Climatologists, USDA Climate Hubs, etc.). The landscape is fairly detailed and could dominate the overall discussion, but no mention of U.S. services seems odd. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: A broader coverage now took place in 12.6

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126821					Climate services is too narrowly defined as use of information about climate change only. Use of climate information also works in near-term decisionmaking. There are many U.S. examples to illustrate the use of information in making decisions to adapt to changing conditions and prevent longer term damage. There are a few comments of climate services at various time scales including sub-seasonal. Even in the "examples" they are descriptions of entities/structure or actions. There are no references to use of climate services which have impacted decisionmaking. This chapter would be better if some examples of use of climate services were illustrated in making some specific decision/action change and possible impact. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: A broader coverage now took place in 12.6
77671					The regional section of this chapter is clear, and useful. Otherwise, however, it seems rather repetitive and unnecessarily long, with a lot of lists of possible impacts. Sometimes very straightforward concepts are presented in an overly complicated way - in particular in relation to climate impact drivers. [Emer Griffin, Ireland]	TAKEN INTO ACCOUNT: We have tried as much as possible to simplify the descriptions
126823					The end use of information created here seems to be data and maps. These are helpful, but another step is necessary which can occur in a variety of ways: creation of decision tools for specific types of end-users, interpretation of information for users, iterating on specific needs and redevelopment into actionable information. The authors seem to have limited experience in this. There is a large next step necessary in engaging stakeholders that is necessary to provide a service. [Trigg Talley, United States of America]	REJECTED: IPCC WGI cannot engage with stakeholders for the creation of a service: our goal is to review literature and present an assessment. However we have been taking into account many review comments to improve the SOD. Also please note the online Atlas which provides many possibilities
126825					There seems to be a disagreement between what the chapter is titled and what it wants to describe. The chapter title is Climate Change Information in Climate Services. Then it goes on in subsections to try to describe climate services. A clearer breakdown of data/information useful for services and a description of the services, impacts, etc., could improve the chapter. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We assumed the reviewer was referring to Section 12.6 and not the full chapter, which has a different title. This section has now been improved
126827					[SCOPE] This whole chapter seems to be a summary of CIDs with very broad examples of impacts to regions, species, community, etc. It does not comprehensively state what regions will face and doesn't discuss other influences on the CID. Before launching into Section 12.4, the chapter might benefit from some general discussion on the overall goal. In some places it says the goal is to link WGI and WGII. If that is the goal, that should be discussed up front before introducing CID regional information. Otherwise it seems like a summary of information presented earlier. How is this information different from what will be presented in WGII? How will it help those using information in the WGII report? [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: we deepened the 12.4 introduction
126829					[ACCESSIBILITY] The chapter repeats earlier information and can be reduced in length without loss of quality and possibly with greater focus. Much of regional framing of changes in extremes are captured in Chapters 10 and 11, and even repeated within the chapter itself. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The FGD is now harmonized and much overlapping information is now removed
126831					[ACCESSIBILITY] The Executive Summary actually repeats much of the information from earlier chapters and does not add much new information. The vague language, poor writing, and jargon severely detracts from the message in certain sections. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The ES has now been restructured and authors hope this has improved the quality
126833					For the link to WGII to be meaningful, the chapter needs to move beyond synthesis of Chapter 10 and 11 results (into Figure 12.1), and introduce the full spectrum of climate risks across spatial and temporal scales that matter to WGII. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 extends the physical assessment provided by Chapter 10 and 11 and adds impacts and risk perspective and an assessment of tailored climate information that is needed to create hazard information to be combined with vulnerability and exposure for Working Group II risk assessment. Chapter 12 has developed this approach in close collaboration with the other Working Group I chapters and Working Group II leaders in order to ensure coherence and added value without duplication.

Comment ID	From Page	From Line	To Page	To Line	Comment	Response
126835					[CONFIDENCE] Chapter 12 needs to address the fundamental issues of uncertainty in information to support decisionmaking, and to characterize uncertainty and predictability as major contributions to effective decisionmaking. Attempts to draw conclusive statements on the regional manifestation of extremes and changes therein, without the combined modulating factors of ENSO and decadal-scale variability, introduces an incommensurate confidence in the statements. It overstates an ability to both extract useful information from and incrementally improve a class of models that are structurally ill-suited to the challenge. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added discussion on uncertainties across RCP/time and global warming levels, new material on emergence, and continue to show multiple sets of projections to convey relative certainty and confidence in our assessment. Interaction of long-term trends and natural variability (e.g., ENSO) is captured within the future projections and is often the source of the substantial uncertainties we convey. Chapter 12 also draws out patterns of regional CID change that are robust even in some cases where the exact magnitude of those changes is not certain.
57461					All the citations to Atlas figures should be revised by the authors of Chapter 12 for correct numbering. [Daniel Martinez Castro, Cuba]	TAKEN INTO ACCOUNT: We are now careful of numbering
126837					[RISK] Anticipating potential surprises, quantifying probabilistic risks, and addressing systemic risks are the very real challenges that climate change poses for science and for practice. Noting the importance of micro and local climates in impact and adaptation is important from a climate services perspective. [Trigg Talley, United States of America]	NOTED: We have improved the text and provided more precise statements. The climate services section is now improved
34167					Missing references in the text: Altieri, A.H., Gedan, K.B., 2015. Climate change and dead zones. <i>Global change biology</i> . 21, 1395-1406. [Guiomar Rotllant, Spain]	REJECTED: We do not see where this reference would fit in CH12.
126839					The case studies help and more should be used. The broader statements on regional risks do not reflect the complexity within the cases and the importance of understanding specific extremes in addition to trends and sequences of events. The prescriptive nature of the chapter actually minimizes the uncertainty inherent in models from which these estimates are derived. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added discussion on uncertainties across RCP/time and global warming levels, new material on emergence, and continue to show multiple sets of projections to convey relative certainty and confidence in our assessment.
27513					We suggest to also consider 'environmental externalities'. [Eric Brun, France]	REJECTED: we do not clearly see what the reviewer is referring to. However in Section 12.1, the other factors inducing impacts are clearly mentioned
126841					If the bridge is to WGII and especially to inform planning, risk management, and adaptation, then the lack of characterization of uncertainty (both technical and epistemic) and indeterminacy as these affect potential surprises and thresholds is a major flaw, and is and can be a major source of maladaptation. Thus, the use and usability of such information if intended for risk reduction and resilience planning is at best inadequate and at worst misleading. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have added more information on scenario and other forms of uncertainty, as well as discussions of the emergence of CID change signals. Together this provides climate information necessarily inclusive of an uncertainty framing that is needed for adaptation and mitigation investment and risk management.
126843					While a case or two may help, the larger problem is that the chapter fails to acknowledge and recognize the longstanding capabilities that have been developed and that are in need of assessment. See, for example, SREX (numerous chapters) and the U.S. Fourth National Climate Assessment for activities: RISAs, Hubs, etc.; WMO Regional Climate Centers; formal and informal climate services arrangements. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have updated this executive summary statement to better focus on the novel aspects of the climate services section. This includes better recognition of approaches that have been successful.
126845					Sections 12.6 and 12.7 need reframing and updating. The section on Climate Services is disconnected from the rest of the chapter. More needs to be assessed on characterizing and communicating both reliable knowledge and uncertainty in the services arena where decisions are actually made, and the supporting infrastructure needed to do this on an ongoing iterative basis (see U.S. National Climate Assessment). [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have updated this executive summary statement to better focus on the novel aspects of the climate services section. This includes better recognition of approaches that have been successful. The revised cross-chapter box on climate services brings together material from Chapter 1, Chapter 10, the Atlas, and Chapter 12 to illustrate how communication, engagement, and distillation lead to better climate information and resulting climate services.
126847					The Box on the Copernicus Climate Change Services is very much needed. However, if this assessment is to move beyond earlier IPCC reports (i.e. what actually is new here?) then the chapter should recognize the limitation of developing and disseminating climate change projections information independent of addressing modes of variability and the changing teleconnections of those on the atmospheric circulation system (as was raised in AR4, AR5, SREX, SRCCL, and elsewhere). [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: This is now a cross-chapter box incorporating material on the risk framework from Chapter 1, distillation in Chapter 10, climate services in Chapter 12, and communication from the Atlas. This provides new perspective on how the Copernicus Climate Change Services is seeking to provide useful climate services. Internal variability is included in the uncertainty assessments

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114817					This section has a lot of useful content on impact drivers relevant to risk assessment. A challenge for the whole chapter is how to present these kinds of results in a way that the reader can digest and take away the key messages. One suggestion (and only that, might not be a good one), and using this section as an example, is to consider organizing the discussion around types of metrics that are particularly relevant to global analyses. This would follow from the intro to the section that sets up what global-scale analyses are and why global metrics are of interest. For example, heat indices that are expressed as a fraction of land area affected could be explained as a way to inform how widespread particular outcomes are (note this is one of the criteria for judging severity of risks in WG2 Ch 16 on key risks). Similarly, a global average probability of occurrence can be introduced and explained (including any drawbacks to what it reflects), and then results reported (likelihood of risks is also a criterion for severity; different from likelihood of the hazard but related). Same thing would apply to how indices scale relative to global average temperature (which ones increase more or less rapidly, or have larger differences between scenarios). These topics are already in the text, but you could consider organizing around them and explaining their relevance/strengths/weaknesses. [Brian O'Neill, United States of America]	TAKEN INTO ACCOUNT: Chapter 12 focus is on regional assessment as other chapters (e.g. CH11) have a rather global focus. We have adopted from the beginning the point of view of a regional readership. Thus we believe that global metrics are not what will be the most relevant information for regional stakeholders. However Section 12.5 covers a global synthesis of regional metrics. 12.5 is restructured, with 12.5.1 becoming the main section, adding more elements in the global synthesis. Section 12.5.2 is now transformed into a cross-chapter box on WGI indices for RFCs. This may partially address the suggestions made here.
126849					More examples of CS-focused organizations and how they have actually functioned should be outlined. Assess where such constructs have been attempted and what has worked and what has not -- including assessing the costs of impacts and of inaction, and co-benefits. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: The Cross-Chapter Box on climate services now mentions more examples without developing them
40579					Nonuniform assessment of CID categories across regions. For instance, compound events are assessed only for Europe. I don't think compound events are not relevant or documented for all the rest regions. [TSU WGI, France]	TAKEN INTO ACCOUNT: Compound event is an emerging topic and peer-reviewed literature is uneven, but the sections now assesses more articles
126851					A communications framing alone is insufficient for a climate service, which requires decentralized but robust regional and local networks (beyond website and training workshops). The subsection on Challenges in climate service raises more longstanding issues. The references therein support a plethora of earlier studies saying the same thing. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have updated this executive summary statement to better focus on the novel aspects of the climate services section.
126853					Are the challenges restated because of persistence and difficulty, or are they actually new? If the former then an assessment of services would be better served by assessing the literature on where and why these changes have been difficult to overcome and where they have led to improved decisions or at least decisionmaking process, and what some of the equity issues are (see SREX 2012; Allis et al., 2019; Hewitt et al., 2020). Without this, co-production is weakly engaged. [Trigg Talley, United States of America]	TAKEN INTO ACCOUNT: We have updated this executive summary statement to better focus on the novel aspects of the climate services section. This includes better recognition of approaches that have been successful.
126855					Chapter 12 should include discussion of economic and environmental justice impacts, including those imposed on/by infrastructure degradation, losses in tourism, coral reef degradation, healthcare costs, food insecurity, and more. [Trigg Talley, United States of America]	REJECTED: this is not in the mandate of WGI
117137					Congratulations for the state of maturation of the chapter, with the choice of a clear framing. [Valerie Masson-Delmotte, France]	NOTED - thanks for encouragements, this is needed!
52625					Figure 12.4 to 12.13 show information from CMIP5/CMIP6/CORDEX. One of the stated motivations for this is to consider inter-generational uncertainties. Whilst I think this is a good thing, the figures are certainly pretty complex and can be quite hard to interpret. Also they do not always seem to be so well integrated into the text. It would help to be more consistent in referring to them in the text. These figures could also provide the basis for more discussion about uncertainty and confidence. How does intergenerational uncertainty compare with other sources of uncertainty? Where is CMIP6/CORDEX helping to increase confidence compared with CMIP5? There are a few examples of where this is done in the Europe section for example, e.g., page 71, lines 11-16 and page 73 lines 15-17. [Clare Goodess, United Kingdom (of Great Britain and Northern Ireland)]	TAKEN INTO ACCOUNT: We have changed the figures to make them less complex to read and to include more scenario differentiation. Now Figure 12.4 includes only a selection of indices and the intergenerational/inter-ensemble uncertainty is left to regional figures and to a Supplementary material. The text now refers more to the text, including comments on intermodel uncertainty. Section 12.5 also assesses globally messages from intergenerational uncertainties.

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71315					In descriptions about "Low confidence" issues, it is unclear whether the mentioned issue is "uncertainty, but important", or "it will hardly occur". It may be difficult (and not appropriate) to evaluate future projection, but some guidance is helpful to utilize report for decision making or regional planning or so. [Kenji Taniguchi, Japan]	TAKEN INTO ACCOUNT: We do distinguish CIDs that are not broadly relevant in a region, this is explained in Introduction of 12.4
29331					I refer both to FAQ 6.2 (chapter 6, page 82) and to paragraph 12.3.7.1 (chapter 12, page 28). Regarding the link between air quality and climate change (See page 82, chapter 6 and page 28 of chapter 12), in Italy we are studying the correlation between air quality/pollution and the COVID-19 pandemic, because since the end of February 2020 we noticed that the new coronavirus SARS-CoV-2 has spread with greater virulence in the regions of Northern Italy such as Lombardy, which are the most polluted, as in China and in the USA. We have also a methodological question concerning the modeling of the new coronavirus as a thermodynamic object. I realized that the current biological models of SARS-CoV-2 present therefore a methodological defect that is expressed in a bad definition (sometimes omission) of the thermodynamics of the system. I therefore redefined the viral particle system in its micro-environment. Studying the coronavirus + environment system, I therefore had to take into account the possible presence of nano-particles and I have drawn up a conformal theory of the energy landscape of the SARS-CoV-2 complex with particulate matter. This complex represents a compact and stabilized structure of minimal entropy, through which the virus greatly enhances its lethal force, from which the reason why the most polluted areas are those most affected by the pandemic. My research merged into a report for the Accademia Nazionale dei Lincei about the Pandemic COVID-19 and the environment. The title of my report is "Energy landscape theory of SARS-CoV-2 complexes with Particulate Matter". The abstract is: "The pandemic COVID-19 caused by the new coronavirus SARS-CoV-2 has rightly mobilized world scientific research, looking for a cure or a way to stop this terrible catastrophe, which is causing thousands of deaths. Italy was the second country hit by the pandemic, after China. However, the virus has not been correctly characterized as a physical system that obeys the laws of thermodynamics and much is still unknown. In particular, SARS-CoV-2 models lack the characterization of the virus system within its environment. This is a serious systematic error. In the present work, we thus consider the system SARS-CoV-2 with its environment, through analysis and simulations, from air transport to cell entry through respiration. In the study of the aerosol environment, we must obviously take into account the presence of nano-particles or dust inside the environment. Therefore, analyzing and comparing the air environments in China and in Italy, we note that the	REJECTED: we thank the reviewer for the information but the topic of impact of air quality on Covid19 is not relevant to this chapter and is not in CH12 mandate for assessment
117141					I would suggest chapter 12 to also explore the option of (1) making a cross chapter synthesis on the potential effect of major volcanic eruptions on CIDs, and communicate it synthetically (as it is not included in SSPs and can cause surprises to consider in risk management); (2) consider how to communicate from the perspective of CIDs, emergence; and (3) effects of effects of emission changes on CIDs (ex, ozone recovery; reduction in aerosol emissions; ambitious mitigation). [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: We now include emergence. However we do not detail the separate effects of different drivers which belongs to the physical mechanisms (in other chapters).
117143					The current chapter approach is that confidence is higher when trends are observed, attributed, and continue in projections. However this is not consistent with issues of emergence, nor with responses to changes in forcing (eg changes in regional aerosol forcing affecting precipitation trends). The chapter approach could be complemented by an Annex describing regional trends (building across multiple chapters) (to support ch 3, 4, 8, 9, 10, 11, 12 building on the atlas). [Valerie Masson-Delmotte, France]	This question is tackled now by the cross-chapter approach described in the Cross-Chapter Box on traceback table, and we follow the methodology defined there. Please also note the effort on emergence of CIDs
6809					There are references to "future projections" in quite a few places in this chapter. Most can probably be changed simply to "projections". See comment 9 on the entire report. [Adrian Simmons, United Kingdom (of Great Britain and Northern Ireland)]	NOTED: this applies to the full report, but quite difficult to homogenize globally as sometimes it is important to repeat
117145					In the caption of figures, I read "both extreme scenarios SSP1-26 and SSP5-85); please use the wording agreed (scenario box). The difference is not easy to see on figures, is this the take home message? [Valerie Masson-Delmotte, France]	ACCEPTED: we use now agreed vocabulary

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117147					An alternative approach could be to depict changes to CIDs as a function of the level of warming as done in ch 11 (not for 2050 only and for 1 or 2 scenarios). [Valerie Masson-Delmotte, France]	REJECTED: stakeholders do want information with time horizons for adaptation; and the 2050 timeline is common to many stakeholders expectations for adaptation and regional information. Removing scenario information leads to an extreme uncertainty in the timing which hinders usability of information for adaptation. This is why we think this presentation should be kept as a central orientation for our assessment as it is stakeholder oriented; however we have added in regional panels information as a function of GWL. This will also complete information from CH11, and help address scenario differentiation effects from mitigation.
117149					There seems to be some redundancy between ch 10 and ch 12, on climate services / climate messages. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: The climate service information has been harmonized with a cross-chapter group
117151					Links to SROCC and SRCLL could be inserted, where relevant. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: more references to SROCC and SRCLL added
79521					Observations unequivocally show that Iran has been rapidly warming over recent decades, which in sequence has triggered a wide range of climatic impacts. Consequently, an increase in the frequency of heat extremes and a decrease in the frequency of cold extremes have been observed. (Choozari et al., 2018). (comment by: f_ansari44@yahoo.com) [Hanieh Zargarlollahi, Iran]	TAKEN INTO ACCOUNT: CH12 does an assessment for the entire West Asia region, which is summarized in section 12.4.2
117153					cross chapter coordination on fire is needed to sharpen the assessment, building on what was done in SRCLL. Same remark for dust and sand storms. For aspects related to the cryosphere (in high mountains and polar regions) please also refer to SROCC. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: CH12 has collected more information on fire weather from other chapters and SRCLL
79523					The annual precipitation has decreased by 8 mm per decade, causing an expansion of Iran's dry zones (Choozari et al., 2018). Compared to the period of 1980–2004, in the period of 2025–2049, Iran is likely to experience more extended periods of extreme maximum temperatures in the southern part of the country, more extended periods of dry (for ≥ 120 days: precipitation < 2 mm, $T_{max} \geq 30$ °C) as well as wet (for ≤ 3 days: total precipitation ≥ 110 mm) conditions, and higher frequency of floods. Overall, the combination of these results projects a climate of extended dry periods interrupted by intermittent heavy rainfalls, which is a recipe for increasing the chances of floods. Without thoughtful adaptability measures, some parts of the country may face limited habitability in the future (Ashraf Vaghefi et al., 2019).(comment by: f_ansari44@yahoo.com) [Hanieh Zargarlollahi, Iran]	TAKEN INTO ACCOUNT: CH12 does an assessment for the entire West Asia region, which is summarized in section 12.4.2. However for mean precipitation, the assessment is done in the Atlas, and CH12 does not give details.
117155					The references to abrupt change need to build on the assessment in the other chapters, I have sometimes the impression that there is short re-assessment provided here. How to cover storylines and deep uncertainty here? (building on other chapters)? [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: We ensure that we are not duplicating or undermining deeper assessments from previous chapters.
79525					This condition (extream rainfalls,higher ferequency of floods together with human interference) have been also leed to higher risk of soil erossion and landslids.(GSI National Map for Landslide Potential ,2020. GSI National Map of Geological Units,2020. National Map for Erodibility of Geological and Old Rock Units,2020.)(comment by: r_sh78@yahoo.com) [Hanieh Zargarlollahi, Iran]	REJECTED: we do not find the reference in peer-reviewed literature. However the landslide hazard has been assessed for West Asia.
112823					Nice chapter -- really valuable to have the tables with regional direction of trends with levels of confidence, and the detailed context well described per region. [Maarten van Aalst, Netherlands]	NOTED: we thank the reviewer

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79545					<p>The outbreak of the corona virus and its spread around the world have significantly reduced the production of carbon and greenhouse gases, which can be found in the form of climate change, before and after corona, in the kidneys. Scientific research on climate change should be considered.</p> <p>The global COVID-19 quarantine has meant less air pollution in cities and clearer skies. Animals are strolling through public spaces, and sound pollution has diminished, allowing us to hear the birds sing. (Larissa Basso, Postdoctoral Fellow, Environmental Research in the Human Sciences, Stockholm University, May, 2020).</p> <p>It would be a way to identify the factors reducing greenhouse gas emissions and their effects on the economy and the environment from the perspective of climate change for human society to be more precise subject matter.</p> <p>The amount of carbon dioxide humans are responsible for generating worldwide each day fell by 17 percent this April compared to the daily average for 2019 (Justine Calma, May 19, 2020, The COVID-19 pandemic cut carbon emissions down to 2006 levels) (comment by: haniehzargar62@yahoo.com) [Hanieh Zargarlellahi, Iran]</p>	<p>NOTED: however climate changes cannot be assessed over such a short period, and emissions have not decreased by a large factor over the year; this is unlikely to have any signature on the climate itself, beyond air pollution</p>
86205					<p>Overall this chapter would benefit from a detailed discussion with WGII to ensure that any overlap is minimised and that the differences between a CID vs risks/hazards approach are worked through. [Debra Roberts and the Durban WGII TSU, South Africa]</p>	<p>TAKEN INTO ACCOUNT: A coordination has taken place between both WGs to ensure consistency in definitions</p>
83903					<p>Several references to "gray literature" (i.e. Ministry documents, ...), it would be good if reviewed literature is included in stead of. [Fatima Driouech, Morocco]</p>	<p>TAKEN INTO ACCOUNT: We have kept the national/regional assessments that were peer-reviewed. A paragraph is explained in the 12.4 introduction to explain this</p>
83905					<p>It is really not very understandable why floods are included among climate events. Floods results from climate events. It would be more appropriate to say for example "floods linked events/extremes". Flood assessment is for WGII and not WGI. [Fatima Driouech, Morocco]</p>	<p>NOTED: WGI assessment is on physical science of climate and floods are physical phenomena, hence they can be assessed in WGI. However floods are also "physical" impacts and have a strong link to land management, hence an assessment is also interesting in WGII.</p>

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90561					<p>This main comment is for this chapter(12) and the entire report and reports as well. This present chapter, as the title indicates, is devoted to the regional scale for climate change impacts. And the regional scale of the climatic study, as usually known and used, is concerned with a limited region with almost homogeneous conditions whether climatic, topographical, ecological, and almost occupied by one ecosystem. This homogeneity makes it easy to recognize the occurrence of both climate change and its impacts by getting extraordinary phenomena in reference to this homogeneous conditions. Therefore, regional-scale should be limited to a small region (cities, towns, hills, valleys) where ecosystems and climate are homogeneous and unique in the studied zone, not a continent like what the present chapter treats. Indeed, a continent is more than much enough to encompass heterogeneous conditions with several climates and ecosystems. Therefore, it would be hard to reveal and recognize climate change and its subsequent impacts in this broad area. although, the chapter treats by continent-scale which would not reflect the regional scale as the main scope of it. Climate change impacts which this chapter generalizes for an entire continent (Africa, Australia, Asia, or others) are not the same for all countries, regions, and even cities, mountains, and valleys within this very continent. In fact, even the same climate change (warming, drought, and other) would have different impacts depending on the region and its ecosystem (adaptation, degradation, and desertification as it is the case for the Algerian steppe (the subject of my researches); or on the contrary, beneficial impacts like the increase of the agricultural crop due to for example the favorable new climatic condition or the eventual double harvesting in the same year (as one of my projects for the region of Djelfa by updating of the agricultural calendar according to the recent climate change to get benefit by having two vegetative cycle per year). Besides, in this chapter, climate change impacts are also generalized over time scale. However, they are not the same for all seasons, months, and also years and decades for example. therefore this should be taken into account to be more accurate and fitting the reality of regions and periods of time.</p> <p>This chapter, as well as the whole report, ignores some climatic factors like insolation which affects by its light quality and color, intensity, and period and which is very important and with a direct impact mainly in the health and agriculture sectors. Also humidity (moisture), atmospheric</p>	<p>NOTED: However, CH12 does the assessment by smaller regions than continents. Regions are defined in CH1, and follow the Atlas classification</p>
83907					<p>It is really not very understandable why floods are included among climate events. Floods results from climate events But involves several other non-climate factors. It would be more appropriate to say for example "floods linked events/extremes". Flood assessment is for WGII and not WGI. [Fatima Driouech, Morocco]</p>	<p>NOTED: WGI assessment is on physical science of climate and floods are physical phenomena, hence they can be assessed in WGI. However floods are also "physical" impacts and have a strong link to land management, hence an assessment is also interesting in WGII.</p>
132037					<p>Figure 12.1: Is the focus of the reader intended to be on the impact driver section (yellow box) or on the risk changing profile risk box? At first, one might see the WGII section, trying to understand the link between risk/vulnerability/exposure and then go to WGI contribution on the right (at least this happened when I looked at the figure). If the objective of the figure is to understand the handshake from a chapter 12 perspective, the visualisation of the information should be slightly changed. Contact the TSU for more guidance. // providing an example of risk as done in this figure is very useful. [TSU WGI, France]</p>	<p>TAKEN INTO ACCOUNT: this figure was proposed for help from designers</p>
89797					<p>This is a general comment: although the report is assessing the physical aspects of impact and risk (which I am not so familiar with), a synopsis on human social context should not be separated from the physical system, as well as relatability to social scientist community. [Bonita Sharma, United States of America]</p>	<p>NOTED: This is the purpose of Section 12.3</p>
132039					<p>Figure 12.2: This is a good start for the visual abstract of your chapter. It can be improved in collaboration with the TSU towards FGD. Chapter 7's visual abstract can provide some inspiration. [TSU WGI, France]</p>	<p>NOTED</p>

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132041					In general, the chapter calls out the figure very well in the main text, providing a proper but short explanation of what should be understood from the figure. In some cases however, the visual does not communicate exactly the explanation as provided in the text - which is an excellent opportunity to improve the figure towards the right intended message. Comments have been provided in such cases. [TSU WGI, France]	NOTED We are looking forward to working with graphical designers
132045					Figure 12.4 to 12.13: although the model agreement methodology is consistent among the 4 figures, it is not consistent with the other chapters/atlas. This should be made consistent and a common model agreement methodology should be ideally apply. [TSU WGI, France]	TAKEN INTO ACCOUNT: CH12 has followed the general guidelines decided (in particular for hatching)
132047					Figure 12.4 to 12.7: It is not clear that the plots are grouped in region by coloured rectangles (lines are thin). Providing a title of the region could help. It could be useful to have the same coloured rectangles in the central map to match the plots and the region on the central map - but this should be tested to see if it does not clutter the figure too much and impede from visualising the data on the map. [TSU WGI, France]	REJECTED: Although this is a good idea, given the other comments on figures, we preferred to simplify them drastically
132049					Figure 12.8 to 12.13: It is not clear at first sight what impact driver each panel is representing. A bigger title for the CDI (daily precipitation, wind, etc) or having them in bold in the current title would help [TSU WGI, France]	NOT APPLICABLE: these figures have been changed completely but we made sure that titles are explicit
112083					Although strong coordination between the Atlas and Ch12 is seen in the SOD, further coordination is needed for a consistent cross-reference of different Atlas indices in the final draft. That will require organizing intermediate deadlines for coordination and making some agreement on datasets and methods (e.g. bias adjustment) to be used. [Jose manuel gutierrez, Spain]	ACCEPTED: collaboration on indices has been kept and increased
115931					FAQ12.1 Too strong focus on agriculture (here and in FAQ12.3.) I would rather suggest an FAQ on what is a climate impact driver, how it is defined etc. [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: We are adjusting FAQ12.1 to reduce focus on agriculture. We are also including an FAQ on climatic impact drivers.
115933					FAQ12.2 Check complementarity with FAQs from chapter 11. Coordination is needed. Frequency is related to recurrence. What about trends and thresholds here as well? Horizontal axis labelled "time" unclear (years, months in a year...). [Valerie Masson-Delmotte, France]	TAKEN INTO ACCOUNT: We have ensured that we do not duplicate or form any inconsistencies with Chapter 11. This demonstrating of climatic impact driver signals of change is not currently presented elsewhere in Working Group I, and we will continue to work with the TSU to add clarity to the figure. The time axis here is not meant to be specific but rather to illustrate the signal that scientists look for in determining CID changes.
115935					FAQ12.3 Nice topic but answers would need to build x chapters (diversity of sectors / examples needed in FAQs from ch 12). Other examples could include ecosystems (eg milder winters, effect on pests etc. Effect on heating demand) [Valerie Masson-Delmotte, France]	NOT APPLICABLE: We have removed the previous FAQ12.3 as this was considered too close to Working Group II's mandate. We have replaced this with an FAQ that better describes the Climatic Impact-driver framework which is oriented around providing climate information without pre-judging its positive or negative impact.
83687					This chapter goes way beyond describing the CID, but also connects these in many instances to the impacts and, occasionally, to vulnerabilities. Much of this is also discussed in WG2. Redundancy is to some extent acceptable, but it also runs the risk that not all messages are similar between WG1-WG2, particularly when it comes to regional impacts. [Robbert Biesbroek, Netherlands]	TAKEN INTO ACCOUNT: All overlaps and conflicts with WG2 have been dealt with via Thematic and Regional cross chapter groups established during the Pre-LAM period
83691					The chapter is way too long and thereby almost impossible to read (138 pages of content - this is a report in itself). [Robbert Biesbroek, Netherlands]	ACCEPTED: Chapter length is drastically reduced