The U.S. Global Change Research Program (USGCRP) released the draft Fourth National Climate Assessment (NCA4), Volume II for public comment from 03 November 2017 to 31 January 2018, concurrent with review by a special committee convened by the National Academies of Sciences, Engineering, and Medicine (NASEM, 03 November 2017 - 12 March 2018).

The NASEM panel evaluated the draft NCA4 Vol. II and published a document that captured consensus responses to questions posed within a carefully designed Statement of Task. The final report can be accessed here and an acknowledgment generated by USGCRP leadership here. This memo explains actions taken by the NCA4 Vol. II writing team to accommodate the expert judgment of the committee. In addition to the narrative review provided by the NASEM penal, each chapter writing team considered any chapter-specific line-by-line comments made by the panel, noted edits and rationale, and revise the report. The annotation to these line-by-line comments from the NASEM panel can be accessed here.

A Federal Register Notice publicized the Public Comment Period and a web-based system collected input from the general public and external disciplinary experts. Chapter writing teams considered each comment, noted edits and rationale, and revised the report. The Public Comment Period annotation can be accessed here.

Independent Review Editors (RE) were chosen by the NCA4 Federal Steering Committee from a pool of eternal experts solicited through an open call publicized via Federal Register Notice (20 July 2017 – 08 September 2017). Each chapter was assigned an RE to evaluate author responses to both the NASEM review and public comments, and the revised chapter drafts themselves, to confirm that the chapter writing teams had given due consideration to all review comments prior to submission for final agency review and clearance.

Names and affiliations of participants in the NCA4 Vol. II Public Comment Period were withheld from the authors, Review Editors, Federal Steering Committee, and staff throughout review and revisions. Anonymity helped preserve integrity of the drafting process. During registration, all reviewers consented to have their names associated with relevant comments once the report was published. The full report underwent several additional rounds of review after these responses were generated and, therefore, edits may have been made that are not part of the attributed set of comments included on the following pages.
<table>
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<th>First Name</th>
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<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
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<tr>
<td>Michael</td>
<td>Anderson</td>
<td>241254</td>
<td>Figure</td>
<td>00. Front Matter</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>12</td>
<td>Table 1 in the public comment document does not match the table in the downloaded pdf. The table is in the downloaded pdf of the section &quot;How to read this report.&quot; It is much clearer about the likelihood statements and shows the percentages associated with each choice. Replace Figure 2 in this section with Figure 2 from the pdf for revised clarity.</td>
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<tr>
<td>John</td>
<td>Cherry</td>
<td>245150</td>
<td>Whole</td>
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<td>22</td>
<td>Thank you for your comment. We have added lines to the caption of this figure to explain the differences.</td>
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<td>Allison</td>
<td>Commens</td>
<td>240168</td>
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<td>00. Front Matter</td>
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<td>Missing punctuation? When brown 2015 may also want to consider specifying UXG and USG in the first time the acronym are used. May also want to consider adding EPA’s CIRA report as a technical input, maybe the radiation work too?</td>
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<td>Thank you for your comment. We have revised the text accordingly.</td>
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<td>Allison</td>
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<td>The figure from NCA4 that compares SRES and RCPs is also in the CHA. An example of a sentence based on the RCPs for more extensively than literature based on the SRES (or similar climate change). We have not included this figure. We felt it would introduce more confusion than clarity.</td>
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<td>Janet</td>
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<td>Clarity needed [Do Well perhaps]</td>
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<td>9</td>
<td>Thank you for your comment. We have updated the text to read &quot;particular matters.&quot;</td>
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<td>Him of</td>
<td>Concerned</td>
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<td>Suggestions to include a definition of &quot;radiatively active species&quot; or using a less jargon-based term.</td>
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<td>Thank you for your comment. We have updated the text to read &quot;particular matters.&quot;</td>
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<td>12</td>
<td>Thank you for your comment. We have updated the text to reflect these suggested revisions.</td>
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<td>Michael</td>
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<td>Thank you for your comment. The draft text was not intended to be exhaustive, we have revised the sentence to read, &quot;and the resulting impacts, including temperature change or sea level rise.&quot; to help clarify this.</td>
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<td>Thank you for your comment. The text has been updated.</td>
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<td>Don’t like the characterization of the scenarios by saying “higher,” “lower,” and “very low.” First of all, it is not made clear what these terms apply to—namely emissions, radiative forcing, amount of climate change, what, etc. The terms “higher”, “lower” imply policy judgement—there might be a better way. In your case it might be something like “reducing carbon dioxide emissions” or “reducing greenhouse gas emissions” or “reducing radiative forcing”.</td>
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<td>Thank you for your comment. Authors deliberated extensively on how to best label these scenarios in an accessible manner. Pinning a specific temperature on these would mislead, as that is not what the RCPs capture, that is a model output driven by the RCPs.</td>
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**Response**

Thank you for your comment. In the interest of brevity and clarity, we have limited the number of RCPs considered, but have encouraged authors to use RCP 8.5 where the literature allows and adds sufficient new information to the assessment. The text explains this, so authors have not made any additional revisions.
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<td>140992</td>
<td>Text Region</td>
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<td>I am a bit confused by the ordering here— it makes it seem as if climate and sea level changes are driving the population changes—which seems strange for the demographic aspect. I also wonder if &quot;migration&quot; is the right word here—that makes it seem as if people are moving to some attractive location when actually I would suspect what is meant is forced relocation, so perhaps it would be better to say &quot;dislocation&quot; or &quot;forced immigration&quot; or something. And are the net land use changes also driven in part by the changes in climate? Again, a schematic chart might help me see this as an argument. In any case, this is a pretty complex paragraph for the general reader (even for the technical reader), especially given it is in the front matter.</td>
<td>Thank you for your comment. The ordering is entirely arbitrary, but we have deleted “dislocation” in the final bullet to avoid any internal references.</td>
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<td>Michael</td>
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<td>“There needs to be explored what the basis was for this guesstimate. Is it what is meant that these were analytical outcomes of various scenarios so (as is sequential) or whath?! In any case, I think if we removed the scenarios as I suggested, then saying that one is associating various outcomes with FFFavoree, FFPhaseout, and FFPhaseless scenarios would be much clearer for the reader (as much more sea level rise and deceleration associated with the FFfavoree scenario than the FF_phaseless scenario, etc). Otherwise, I’m getting confused about this at higher levels of abstraction. I really don’t think this whole discussion of scenarios is going to be very clear to anyone without some schematic diagrams and/or tables.</td>
<td>Thank you for your comment. We have moved much of this discussion to the appendices to ensure that the FFFavoree is concise, providing the reader with a high-level overview of the fundamentals needed to contextualize the report. Details are provided in the Data Tools and Scenarios Products Appendix.</td>
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<td>For the whole analysis framework in terms of risk assessment? There are risks associated with all of the situations and costs, and would be with all of the proposed scenarios, both in terms of the impacts that result for the environment and society and also in terms of the impacts and risks associated with choosing a particular policy path or not (sea level rising down if FF favoree is not achieved, high prices for energy or limited supplies, etc.)</td>
<td>Thank you for your comment. We have deleted “where appropriate and feasible”</td>
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Replace whole paragraph. After the mid-20th Century, oceans absorbed 90% of the excess heat from human-caused emissions of carbon dioxide. Each year, oceans absorb more than a quarter (25%) of the carbon dioxide emitted to the atmosphere annually from human activities. Heat from the atmosphere warms the oceans and carbon dioxide absorbed by the oceans makes them more acidic. In many locations, oxygen concentrations, that sea life require to survive, decline over time as the earth's seas ocean systems respond to changes in heat and acidity.

We disagree with this comment. The referenced statement represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapters 2 and 4, for more information on the scientific basis for this statement, including relevant citations.

These statements incorrectly imply all of the experienced warming is due to anthropogenic CO2. The projection that the mid-latitude northern hemispheric mean temperatures grow at a linear rate of future cooling and refer entirely on models that assume a climate sensitivity of 3 which is not warranted by recent peer-reviewed analysis. The final sentence is erroneous in US high temperatures have been declining since the 1960s and the rise in average is due to increased humidity and nighttime temperature.

We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 12, for more information on the scientific basis for this statement, including relevant citations.

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Their overconfidence not only waives away the proper scientific caution in the mainstream literature but it ignores actual counter-evidence. Only this month (i.e. after this report was drafted) there was a new study by Bengtson et al. in Nature reporting that global mean ocean temperatures rose at a faster rate over a 73-year interval during the Younger Dryas event than is observed in the modern era. Quoting that paper: 

The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 12, for more information on the scientific basis for this statement, including relevant citations.

We disagree with this comment. The referenced statement represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 15 and 4, for more information on the scientific basis for this statement, including relevant citations.

The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 12, for more information on the scientific basis for this statement, including relevant citations.

The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 12, for more information on the scientific basis for this statement, including relevant citations.

The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 12, for more information on the scientific basis for this statement, including relevant citations.
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<td>Para 1 lines 13-15: I am surprised that such impressive wording has survived into the 3rd draft. It does speak well for the diligence of previous reviewers.</td>
<td>We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapters 2 and 3, for more information on the scientific basis for these statements, including relevant citations.</td>
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<td>For observational evidence on warming does not provide any explanation one way or the other for attribution of climate change. Attribution is done through modeling studies, principally by using GCM-generated forcing series to decompose observed data into additive components (solar, GHG, etc). Later in the report you show, and entirely on, the results of such an exercise. A line on a graph that shows the purported GHG contribution to temperature increase is not from observational data. It is the output of a statistical model that taken as inputs includes observed climate models. The best you can say at the present time is that this report is %Global average temperature as measured using surface thermometers increased by about 1.7 °C from 1880 to 2016. Climate models typically overestimate this specific intensity assuming a dominant role for greenhouse gases.</td>
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<td>Para 1 lines 11: The whole point of a report like this is to export from the scientific community to journalists the proper language to describe the phenomenon in question, not to import from them the wrong language. If you wish to add an expectation parenthesis for %greenhouse gases (%GHG) you can surely do but to read it as a way to the inaccurate phrase %heat-trapping gases (%GHG) the gases in question absorb and emit infrared radiation, they do not block hot air from circulating. You would be better to omit the parenthesis and simply refer to %greenhouse gases like CO2 and methane (%GHG) and then in a later section explain in the action of the gases using correct concepts rather than journalistic slogans.</td>
<td>We appreciate the suggestion; however, the text in this summary is a direct quotation from NCA4 Volume 1. This document was published in November 2017 and it is not subject to change.</td>
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<td>Findings</td>
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<td>Para 1 lines 13-15: This paragraph notes model projections as established facts and omits any caveats. The authors are obviously trying to write their own headlines but I cannot see any scientific justification for pushing material like this up front. It announces without any qualification that warming rates over the rest of the century conditional on emission paths can be known with great precision, without acknowledging that these are model-based forecasts, let alone that (as even the IPCC acknowledges) GCMs have overstated warming trends over the past 15-20 years. Wording that aims to inform the reader without venturing into fearmongering would go along the following lines: %%Climate models project continued warming over the rest of the century. Known sources of uncertainty include the rates at which greenhouse gases will continue to be emitted and the overall climate sensitivity to their accumulation in the atmosphere. Unknown sources of uncertainty include many terms of natural variability. The central tendency of current climate models under business-as-usual emission scenarios is to project warming of about 0.5°C to 2.0°C by 2100, with a slight reduction if the emission reductions under the Paris Accords are implemented. The range of uncertainty includes lower trends as well as possible acceleration to anomalously high levels (%5°F or more), with probabilities sharply dropping away too.</td>
<td>The referenced statement is a brief summary of the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1, in particular Chapter 6. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 4, for a much longer discussion of the scientific basis for this statement, including relevant citations.</td>
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<td>We disagree with this comment. The referenced information represents the scientific understanding of ocean acidification as presented in the peer-reviewed literature. This document has already been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 15, for more information on the scientific basis for this statement, including a definition and description of ocean acidification, which is a scientific term commonly used in the literature, as well as relevant citations.</td>
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<td>We disagree with this comment. The referenced information represents the scientific understanding of the risks associated with human induced climate change as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 15, for more information on the scientific basis for this statement, including relevant citations.</td>
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<td>We disagree with this comment. The referenced information represents the scientific understanding of the risks associated with human induced climate change as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 15, for more information on the scientific basis for this statement, including relevant citations.</td>
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<td>We disagree with the reviewer’s assertion that information on a sub-set of data, consisting of land-locked storms, is more relevant than a high-level summary such as the one contained in the entire dataset, which includes all basin-wide storms. All citations and references for the information contained in this statement are provided in NCA4 Volume 1, which was published in November 2017. We particularly refer the reviewer to Chapter 11, which discusses both basin-wide and land-locked storms.</td>
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<td>Para 1 lines 11: The whole point of a report like this is to export from the scientific community to journalists the proper language to describe the phenomenon in question, not to import from them the wrong language. If you wish to add an expectation parenthesis for %greenhouse gases (%GHG) you can surely do but to read it as a way to the inaccurate phrase %heat-trapping gases (%GHG) the gases in question absorb and emit infrared radiation, they do not block hot air from circulating. You would be better to omit the parenthesis and simply refer to %greenhouse gases like CO2 and methane (%GHG) and then in a later section explain in the action of the gases using correct concepts rather than journalistic slogans.</td>
<td>We disagree with the reviewer’s assertion that information on a sub-set of data, consisting of land-locked storms, is more relevant than a high-level summary such as the one contained in the entire dataset, which includes all basin-wide storms. All citations and references for the information contained in this statement are provided in NCA4 Volume 1, which was published in November 2017. We particularly refer the reviewer to Chapter 11, which discusses both basin-wide and land-locked storms.</td>
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<td>Ross</td>
<td>McKitter</td>
<td>142027</td>
<td>Red-Text</td>
<td>Dla. Science &amp; Climate</td>
<td>Findings</td>
<td>17</td>
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Paragraph 10. Regarding the “self-reinforcing cycles within the climate system”... it is noteworthy that any change of climate models can only be arborescent. Yet in this paragraph you claim the climate is prone to large, persistent natural changes which can only be anthropogenic. It is particularly interesting to note how these 10 messages have changed over the course of the NCAs (in terms of confidence and likelihood) and how they will change in future reports.

We disagree with the reviewer’s comment as it conflates natural variability over decades/timescales, which is the topic of NCA4 Vol. 1, with the response of the Earth’s climate system to long-term warming over centuries to millennia, which is the topic of NCA4 Vol. 1 Chapter 15. For a comprehensive discussion of natural influences on climate, we refer the reader to these chapters of NCA4 Volume 1, which is available at

We appreciate the reviewer’s comment and will note USGCRP is aware of it.

Please be consistent when showing degrees in both F and C. Sometimes the C is shown parenthetically after the F, but not always (e.g. on line 17 you show the C conversion, but on line 18 for the comparable temperature, you do not. See also lines 6 and 36). This was a major error, by the way. It was particularly interesting to see how these 10 messages have changed over the course of the NCAs (in terms of confidence and likelihood) and how they will change in future reports.

We appreciate this suggestion and will synchronize the references to C/F accordingly. We also appreciate the suggestion to compare messages over the history of NCA4. Although it is beyond the scope of this summary, which pertains to NCA4 Vol. 1 only, we will refer to the USGCRP for future reference.

The text in the high-level climate science summary is a high-level, verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. However, we refer the reviewer to Vol. 1 Chapter 12, which specifically mentions this point.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

We disagree with the reviewer’s comment as it conflates natural variability over decades/timescales, which is the topic of NCA4 Vol. 1, with the response of the Earth’s climate system to long-term warming over centuries to millennia, which is the topic of NCA4 Vol. 1 Chapter 15. For a comprehensive discussion of natural influences on climate, we refer the reader to these chapters of NCA4 Volume 1, which is available at

We appreciate the suggestion and will note USGCRP is aware of it.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. However, we refer the reviewer to Vol. 1 Chapter 14, which discusses cumulative emissions in detail.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. We refer the reviewer to Vol. 1 Chapter 14, which discusses cumulative emissions in detail.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. However, we refer the reviewer to Vol. 1 Chapter 14, which discusses cumulative emissions in detail.

We appreciate the suggestion, but in Paragraph 1 your argument depends on the claim that natural variability is known to be minimal on all time scales because it (anthropogenic) warming will be less than currently expected. In other words, the information in this paragraph can support two opposite conclusions. By emphasizing only one you exhibit bias. It would be expected to be beneficial, but has not yet been comprehensively assessed. Yet in this paragraph you claim the climate is prone to large, persistent natural changes which can only be anthropogenic. It is particularly interesting to see how these 10 messages have changed over the course of the NCAs (in terms of confidence and likelihood) and how they will change in future reports.

We appreciate the suggestion and will incorporate them into the text where appropriate.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
144016 Comment Text Region

MacCracken

144015 Chapter 9

Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. Regarding hurricane activity, we refer the reviewer to Vol. 1 Chapter 9 which describes the state of scientific knowledge on hurricane frequency and intensity in the Western North Atlantic. We also refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this topic.

144009 Chapter 15

We appreciate the reviewer's suggestion; however, we feel the wording is accurate and grammatically correct, and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

144008 Chapter 4

Don't you mean "subtropics" instead of "tropics"? And perhaps, for clarity, say "the dry subtropics". I don't know of any significant discussion of the tropics expanding.

We disagree with the reviewer on this comment. This text refers to the following statement from NCA4 Vol. 1 Chapter 5, which reads: "Evidence continues to mount for an expansion of the tropics over the past several decades, with a poleward expansion of the Hadley cell and an associated poleward shift of the sub-tropical dry zones." We refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this statement.

144007 Chapter 15

The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. Regarding hurricane activity, we refer the reviewer to Vol. 1 Chapter 9 which describes the state of scientific knowledge on hurricane frequency and intensity in the Western North Atlantic. We also refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this topic.

144006 Chapter 4

We appreciate the reviewer's suggestion; however, we feel the wording is accurate and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

144005 Chapter 15

Change "carbon" to "carbon dioxide", and change "but" to "but also". Also perhaps say "global warming" instead of just "warming" - or even better, say "global warming and associated climate-induced impacts".

We appreciate the reviewer's suggestion. However, we feel the wording is accurate and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

144004 Chapter 4

Annual average temperature across the Arctic has increased … Annual average temperature is singular. Average plus extreme temperature is plural.

We appreciate the reviewer's suggestion; however, we feel the wording is accurate and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

144003 Chapter 4

The paragraph discusses changes in both average and extreme temperatures, we believe the plural is acceptable.

As the paragraph addresses changes in both average and extreme temperatures, we believe the plural is acceptable.

144002 Chapter 4

The heading is plural ("Temperatures") but the whole paragraph is given in the singular. Perhaps change heading to "Increasing Temperatures Across the U.S." - and then somehow say that these would contribute to the rise in the average temperature across the US.

We appreciate the reviewer's suggestion; however, we feel the wording is accurate and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

144001 Chapter 4

Don't you mean "subtropics" instead of "tropics"? And perhaps, for clarity, say "the dry subtropics". I don't know of any significant discussion of the tropics expanding.

We disagree with the reviewer on this comment. This text refers to the following statement from NCA4 Vol. 1 Chapter 5, which reads: "Evidence continues to mount for an expansion of the tropics over the past several decades, with a poleward expansion of the Hadley cell and an associated poleward shift of the sub-tropical dry zones." We refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this statement.

144000 Chapter 4

The word "decades" needs to be deleted, or at least changed to "centuries" or even "many centuries." It might be useful to say with respect to mid-20th century conditions.

We appreciate the reviewer's suggestion; however, we feel the wording is accurate. NCAS Vol. 1 Chapter 4 describes a commitment scenario where equilibrium temperature stabilises over decades (recognising that other impacts continue to play out over centuries to millennia). In addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

143999 Comment Text Region

MacCracken

143998 Comment Text Region

Michael

143997 Comment Text Region

Michael

143996 Comment Text Region

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143993 Comment Text Region

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143992 Comment Text Region

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143991 Comment Text Region

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143989 Comment Text Region

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143988 Comment Text Region

Michael
The report should remove the unsupported major claim in that... emissions of greenhouse gases, are the
dominant cause of the observed warming... The claim that CO2 causes global warming is unsupported and
a method that has been properly published and peer reviewed: if report authors believe that there is a valid
method published anywhere to support this claim, then please put the citation/reference number for that
method at end of the key sentence, so the supporting logic/method can be easily and unambiguously located,
and properly checked. If no proper reference can be located, then the claim that CO2 causes global warming
should be removed from the Executive Summary and throughout the report text. The report's key claim – that
CO2 increases causes global warming – is so important that it should be covered by its own chapter in the report,
which should clearly state the method used to support the claim. What method was used (to show that CO2
causes global warming), who did the research, where is this documented (clear citation), who did the review?
Does this alleged supporting document actually state the conclusion and describe the method and analysis used
to reach the conclusion about CO2? What method was used? To my knowledge, no one (not IPCC, EPA, NSF,
NOAA, NAS, etc) has ever cited the proper reference for this key claim because the proper scientific research
has never been done – no funding agency ever sought to fund research using the scientific method to test (e.
test to falsify) the hypothesis that CO2 causes warming; because that would be political heresy. So, the
correct method for testing the hypothesis has been ignored, and instead an undocumented or unvalidated
method has been used. Despite these multiple federal agencies spending over $7billion/year of the public's
money on research, none of these so-called scientists had the good sense to actually apply the scientific
method or to ever ask: What is the best way to test this hypothesis? https://www.gos.gov/sty/source/climate_change,
funding, management/issue summary. Although the Report is not clear about what method the authors believe justifies their major statement that... emission of greenhouse gases, are the dominant cause of the observed warming... the reader can make a guess. The
text invites two or more possible reasons (both in/valid) for why the authors would believe in their claim: CO2
does cause global warming: (a) “it's just physics” and (b) The models say so. “It’s just physics.” “The
author’s belief is shown by the sentence at end of CSSR Chapter 4: “The first statement regarding
additional warming and its dependence on human emissions and climate sensitivity has high confidence, as
understanding of the radiative properties of greenhouse gases and the existence of both positive and negative
feedbacks on this property... The US Department of Defense (DOD) Natural Resources Program has been proactive on
countering management actions to protect endangered and threatened species on DOI-owned lands and
incorporating climate change into natural resource management. DOD expects national security to be
compromised or threatened by a variety of climate impacts, which also interact with natural resource
management. These impacts include physical impacts on infrastructure on DOI military bases, disrupted
security and, increases in terrorism and domestic and international climate refugees (Citation: U.S.
Department of Defense, Quadrennial Defense Review 2014). The report should remove the unsupported major claim in that... emissions of greenhouse gases, are the dominant cause of the observed warming... the reader can make a guess. The
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<th>Chapter</th>
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<td>Allison</td>
<td>Crimmins</td>
<td>142975</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>9</td>
<td>19</td>
<td>1</td>
<td>5</td>
<td>This sentence says that risks are projected to intensify without adaptation, but it could be argued that the risks will intensify with or without adaptation. In my opinion, mitigation could mitigate these risks. But adaptation is in part about what you do after the risk is imminent. These are, of course, adaptation measures that could be made in preparation for the risks, but I worry that this phrasing makes it sound we can adapt our way out of risks. We can't. We can adapt our way out of damages, but not out of the risk. The existing text reflects the first sentence of the #2 finding. We have revised the first sentence of this paragraph to read: “More frequent and intense extreme events will continue to damage infrastructure, ecosystems, and social systems that provide essential goods and services to communities.” We have replaced the text of the paragraph with “Identifying adaptation options for the most vulnerable populations would contribute to a more equitable future within and across communities, and global action to mitigate greenhouse gas emissions will substantially reduce climate-related risks for these populations.”</td>
<td>The authors appreciate this comment.</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>142376</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>19</td>
<td>24</td>
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<td>7</td>
<td>The text is a bit vague and jargon-ridden (e.g., “interdependent networks”). What even is that? I would recommend using bolder, more concise language. For example: “More intense weather and climate extremes will continue to damage the infrastructure, ecosystems, and social systems that provide essential goods and services to communities.” That is shorter, much easier to understand, and doesn’t sound like you’re pontificating or unsure about whether weather extremes will happen. Note that you mention “new risks” in the unitalicized text, but do not explain where these are in the underlying paragraph. Because #12 is on adaptation and mitigation, suggest not including it. I think the way it is phrased in #2 seems to be contradicted by the #2 finding. We have revised the first sentence of the supporting paragraph to read: “More frequent and intense extreme events will continue to damage infrastructure, ecosystems, and social systems that provide essential goods and services to communities.”</td>
<td>The authors appreciate this comment.</td>
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<td>Ted Region</td>
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<td>19</td>
<td>24</td>
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<td>The text buries “(Weather-related events)”. Change to “something about which we are very concerned.” We have deleted this text, as suggested in this comment.</td>
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<td>Crimmins</td>
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<td>20</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>Suggest: “Changes in temperature and precipitation drive by climate change increase air quality risks from acid, additive level ozone (aqo), and allergens.” “The frequency and severity of allergies, including asthma and hay fever, are expected to increase as a result of a changing climate.” We have revised the text to read: “Changes in temperature and precipitation drive by climate change increase air quality risks from acid, additive level ozone (aqo), and allergens.”</td>
<td>The authors appreciate this comment.</td>
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<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>20</td>
<td>15</td>
<td>16</td>
<td>16</td>
<td>Any reason the other populations of concern were omitted here? People with disabilities, people with pre-existing health conditions, certain occupations, tribal communities, etc.</td>
<td>The authors appreciate this comment.</td>
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<td>Allison</td>
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<td>142082</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>20</td>
<td>19</td>
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<td>There is no mention of mental health in this sector. It was an entire chapter of the health assessment. Consider adding that in. Would also recommend moving the sentence on adaptation to the key finding on adaptation. It is too redundant here for a high level overview of report findings. The authors appreciate this comment.</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>142083</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>21</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>So, my take away from this last sentence is that this problem is already being handled and I don’t need to worry about it. This clashes with the strong, bold sentence above that says transformative impacts cannot be avoided without reductions in carbon (just GHGs). Many of these report findings have vague statements about adaptation options existing, with no real quantifiable substance or evaluation of their impact or reason for their being in a key finding. This section does not seem responsive to NAS suggestions for inclusion of adaptation. Rather it’s confusing to the reader. There seems to be an effort to stick the word “adaptation” in where possible, without scientific research to back it up, and at the expense of talking about mitigation. In this finding, the reader isn’t told what kind of adaptation strategies the literature has found for addressing impacts, emerging ecosystem impacts, or how they do so. Just that there are strategies. Suggest deleting this sentence as it is redundant to #12.</td>
<td>The authors appreciate this comment.</td>
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<td>Allison</td>
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<td>142084</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>21</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>Suggest including wildfire. Also on the 2, you may want to put the word “stop” outside the parentheses. Also, any mention adaptation strategies and not mitigation strategies? What are these adaptation strategies? How do they work? Could I put this exact sentence at the end of every single one of these key findings? So, there, is it really a key finding of adaptation?</td>
<td>The authors appreciate this comment.</td>
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<td>142085</td>
<td>Ted Region</td>
<td>DB: Report Findings</td>
<td>21</td>
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<td>This paragraph is very well-written and, unlike many other findings, has more specifics about mitigation and adaptation that help me understand why these topics are addressed in the oceans and coasts section. This text is a bit vague and jargon-ridden (e.g., “interdependent networks”). What even is that? I would recommend using bolder, more concise language. For example: “More intense weather and climate extremes will continue to damage the infrastructure, ecosystems, and social systems that provide essential goods and services to communities.” That is shorter, much easier to understand, and doesn’t sound like you’re pontificating or unsure about whether weather extremes will happen. Note that you mention “new risks” in the unitalicized text, but do not explain where these are in the underlying paragraph. Because #12 is on adaptation and mitigation, suggest not including it. I think the way it is phrased in #2 seems to be contradicted by the #2 finding. We have revised the first sentence of the supporting paragraph to read: “More frequent and intense extreme events will continue to damage infrastructure, ecosystems, and social systems that provide essential goods and services to communities.”</td>
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<td>16</td>
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<td>This paragraph is very well-written and, unlike many other findings, has more specifics about mitigation and adaptation that help me understand why these topics are addressed in the oceans and coasts section. This text is a bit vague and jargon-ridden (e.g., “interdependent networks”). What even is that? I would recommend using bolder, more concise language. For example: “More intense weather and climate extremes will continue to damage the infrastructure, ecosystems, and social systems that provide essential goods and services to communities.” That is shorter, much easier to understand, and doesn’t sound like you’re pontificating or unsure about whether weather extremes will happen. Note that you mention “new risks” in the unitalicized text, but do not explain where these are in the underlying paragraph. Because #12 is on adaptation and mitigation, suggest not including it. I think the way it is phrased in #2 seems to be contradicted by the #2 finding. We have revised the first sentence of the supporting paragraph to read: “More frequent and intense extreme events will continue to damage infrastructure, ecosystems, and social systems that provide essential goods and services to communities.”</td>
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<td>DB: Report Findings</td>
<td>22</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>Suggest recording “added stressor”. This is a bit jargon-y and begs the question “added to what?”</td>
<td>The authors appreciate this comment.</td>
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<td>22</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>This sentence reads “Events that lead to disruption and damage can result in more frequent and longer-lasting disruptions.” What? This has been removed.</td>
<td>The authors appreciate this comment.</td>
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</table>
This paragraph needs substantial revision. It is very unclear what the message is meant to be—it seems as if the authors are confused themselves. It makes me wonder if this even rises to the level of a report finding. A phrase that is across it’s completion is key finding 41 would cover this. At least, suggest picking “interconnected” and “drop “interdependent”. Suggest dropping the last three-essay sentence about some vague sort of efforts to bolster resilience. Note I am not sure how they address the problem. Suggest making this paragraph about the fact that much of the climate research focuses on impacts on one sector/impact/area at a time, when in the real world that isn’t how it works. AND definitely let me know why I should care about this. I am not sure what efforts to understand the impacts of climate change are undermining the potential impact by missing these connections? While we catalyze the individual impacts of climate change, the true impacts greater than the sum of the parts— and therefore there is even more urgent a need to take action.

This key finding says it is about adaptation and mitigation. But that isn’t only about adaptation in the broadest. And the text only tells me that someone is working on the problem somewhere— not how they are doing it or whether it will be effective. Just that strategies exist. Is that really a finding that I care? Can you take some of the better [less vague] adaptation sentences from the above findings to rebuild this key finding?

The text in this paragraph is a bit hard to follow. Recommend breaking this into two sections.

This key finding has been edited to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

The section in this paragraph is a bit hard to follow. Recommend breaking this into two sections.

This finding has been added to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

This finding has been rewritten/updated to more clearly define the message. It is about the combination of impacts and that the impacts are much greater than the sum of the parts. It also highlights the importance of adaptation and mitigation in reducing these impacts.

The finding has been edited to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

This finding has been added to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

This finding has been added to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

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This finding has been added to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.

The finding has been added to reflect both adaptation and mitigation findings and includes more specifics on mitigation. The text has been broken into two sentences.
Michael MacCracken 144027 Red Region DBL. Report Findings 19 19 15 11 Might be also be helpful here to also mention "agriculture and industries" and not leave those uses implicit in "humans"

Michael MacCracken 144028 Red Region DBL. Report Findings 19 19 12 12 Change "in doing" to "as doing"

Michael MacCracken 144029 Red Region DBL. Report Findings 19 19 12 13 Change "in doing" to "as doing" and "(and costs"

Michael MacCracken 144030 Red Region DBL. Report Findings 19 19 16 16 It is not "just high drought" but "extreme and occurrence of drought"... things are happening now, not just presenting a risk of occurrence.

Michael MacCracken 144031 Red Region DBL. Report Findings 19 19 16 16 It is not "just high drought" but "extreme and occurrence of drought"... things are happening now, not just presenting a risk of occurrence.

Michael MacCracken 144032 Red Region DBL. Report Findings 20 20 28 28 I'd suggest changing "increasingly disrupt" to "are projected to increasingly disrupt" and sometimes here introduce an "as well" phrase indicating what needs to be done to reduce the risks and occurrences. (I'm sure to me that at least some hope has to be given to indicate that taking action can make a difference (and this applies throughout this section).

Michael MacCracken 144033 Red Region DBL. Report Findings 20 20 24 26 Good type of concluding sentence for each of the various points--indicate what can be done, give some hope and reason to act.

Michael MacCracken 144034 Red Region DBL. Report Findings 20 20 16 16 Transformation changes are already occurring--for example, the western pine forests in the West are dying (or already mostly dead) and change is already happening. It would be useful to somehow here indicate that these changes are already underway, not just a prospect for the future, as "will" implies. The first sentence of the supporting paragraph on the next page indicates changes are already underway, so it is truly a question of using the summary statement to match the text.

Michael MacCracken 144035 Red Region DBL. Report Findings 21 21 13 14 I'd suggest changing "in the increasingly changing"... the present text is just sort of a statement of a certainty, not really clearly indicating that it is going on.

Michael MacCracken 144036 Red Region DBL. Report Findings 21 21 14 14 Are crop yields really going down? Is it not happening that various adaptation measures and technological improvements are keeping crop yields up and that what the issue is is going to be whether such efforts can keep up with climate change. When such changes have been occurring on local to variability and regional changes, adaptation has been able to moderate and overcome adverse impacts, but with change going on everywhere, this is going to become increasingly difficult.

Michael MacCracken 144037 Red Region DBL. Report Findings 21 21 15 15 Is not the agricultural economy in this US "really booming"? What is threatened are the small farmers who are weathering conditions as individuals, as individuals, really dealt with. So, the overall economy does well, but individual farmers suffer. I think this is what we came up with in the first national assessment--and it is a real distinction to keep. When individual farmers tend to keep to their practices, they end up becoming too poor (through successive bad years) to have the resources to change to new practices, so they go broke and suffer and some newcomer comes (perhaps for a big company) and takes over and starts up with different resources until they too get overcome by the changes. So, the economy does okay, but the individual farmers suffer. [Given IPCC, sometimes it has said that productivity of US agriculture is projected to increase, one has to explain how climate change can be bad for at least some of those involved and the communities they live in.] Also, climate change modifies competitive relationships among regions, and who can grow each crop most cost efficiently and reliably, and who is not just to the particular situation for a particular farm, but also has to consider the national and international economic and changing costs and other advantages and disadvantages, requiring ongoing evaluation of all sorts of information that can really complicate the situations faced by farmers. It is so hard to see more and more challenges and failures, and if a farmer in a region happen to make the same bad decision, then overall performance can be affected, etc.). Really important to be clear on difference between overall economy and the well-being and success of particular farmers and particular regional agricultural economies.

Michael MacCracken 144038 Red Region DBL. Report Findings 21 21 17 18 Suggest changing "to crop" to "to sustaining and enhancing crop"--more literally correct.

Michael MacCracken 144039 Red Region DBL. Report Findings 21 21 23 23 Need to be taken here from the word the word "yields, which usually refer to production per acre, and often for good reason. But this word or particular regions for particular crops can be affected due to a particular weather situation (that happens all the time to variability, etc.,) but this problem is usually overcome by each farmer planting the crop likely to return the best investment for the particular situation they face. What I understand is less seriously threatened is overall production of the single agriculture industry rather than yield (it will likely be good in some locations and situations and not in others). And the difference between affects any yield versus overall production needs to be clearly made because how one responds to each type of change is different.

Michael MacCracken 144040 Red Region DBL. Report Findings 21 21 26 26 It'd suggest changing "There are to "There potentially are"--the on-the-ground real situation really can matter. I've recently, under extreme conditions events, as individuals, really dealt with. So, the overall economy does well, but individual farmers suffer. I think this is what we came up with in the first national assessment--and it is a real distinction to keep. When individual farmers tend to keep to their practices, they end up becoming too poor (through successive bad years) to have the resources to change to new practices, so they go broke and suffer and some newcomer comes (perhaps for a big company) and takes over and starts up with different resources until they too get overcome by the changes. So, the economy does okay, but the individual farmers suffer. [Given IPCC, sometimes it has said that productivity of US agriculture is projected to increase, one has to explain how climate change can be bad for at least some of those involved and the communities they live in.] Also, climate change modifies competitive relationships among regions, and who can grow each crop most cost efficiently and reliably, and who is not just to the particular situation for a particular farm, but also has to consider the national and international economic and changing costs and other advantages and disadvantages, requiring ongoing evaluation of all sorts of information that can really complicate the situations faced by farmers. It is so hard to see more and more challenges and failures, and if a farmer in a region happen to make the same bad decision, then overall performance can be affected, etc.). Really important to be clear on difference between overall economy and the well-being and success of particular farmers and particular regional agricultural economies.

Michael MacCracken 144041 Red Region DBL. Report Findings 21 21 30 30 I think "certain" here is a reader trigger. How about for the public saying something like "benefits and functions"?

Michael MacCracken 144042 Red Region DBL. Report Findings 21 21 34 34 Why not use "and" instead of "or"?

Michael MacCracken 144043 Red Region DBL. Report Findings 21 21 34 34 I don't see how the "health" of these people is affected, and that does not seem to be mentioned in the paragraph (well, except of "loss of identity," but given how fast the world is changing, this seems a pretty general problem. It also might be said here (as in then explained later) that such changes can affect the economic well-being of the communities and not just the individuals.
"At least several inches" describes global mean sea level rise between 2000 and 2030, but not "in the next...". These numbers imply an average wage of $80/hour. The phrase "In nearly every region of the United States..." does not seem to be over-romanticizing to suggest that all Native communities in the north use ice cellars...at this... Because Celsius and Fahrenheit are not ratio variables (there is no true "zero," unlike for distance and age) it does not make sense to say that the Arctic is warming twice as fast as the rest of the planet. Suggest deleting...people can and will remain at Isle de Jean Charles and Kivalina until they die. Suggest deleting the word "forced"...environmental threats to some nations, etc. Pretty clearly, the press of advancing society will be seen as the...these interconnected systems are increasingly vulnerable to cascading impacts that are often difficult to predict, threatening essential services within and beyond the..."..."Businesses" has been added to this sentence. The test region has been edited and note reads: "Many Indigenous peoples rely on natural resources for their...and are often uniquely affected by climate change." The impacts of climate change on water, land, coastal areas, and other natural resources, as well as infrastructure and related services, are expected to increasingly disrupt Indigenous peoples' livelihoods and economies, including subsistence and agroforestry, fishing, reindeer, and tourism. The sentence states we may expect 1 to 4 feet of sea level rise but does not provide the corresponding time..."I'd suggest changing "are vulnerable" to "will become increasingly vulnerable"..." I think this would help to more clearly indicate the special problems that such..."...many cultures that don't nearly as closely tie individuals to their natural environment as do Indigenous communities. "..."I think a sentence needs to be added about how at least some adaptation approaches would require a level of disruption to their societies that is greater than for those from the western suburbs that don't nearly as closely identify to their natural environment as do Indigenous communities. This text is consistent with Key Message 4 of Our Changing Climate and the Climate Science Special Report. See https://science2017.globalchange.gov/chapter/11/. No change to the text has been made. We do not believe that the level of coverage of national security in the underlying report warrants its own category. However, it is mentioned in the "Interconnected Impacts" finding. There is also reference to DoD vulnerability assessment and adaptation activities in sections 1.3 and 1.4 of the Overview. National security is mentioned in the "Interconnected Impacts" finding. There is also reference to DoD vulnerability assessment and adaptation activities in sections 1.3 and 1.4 of the Overview. No change.
<table>
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<tbody>
<tr>
<td>Sally</td>
<td>Sims</td>
<td>Whole Page</td>
<td>Use 28: Delete reliably true and replace it with valid, instead of between collected and around. Delete end of and replace with: line 13: After species and then the add timing of periodic or seasonal biological phenomena (e.g., &quot;phenology&quot;) line 32: Add a , after success. Start next sentence with These observations.</td>
<td>We have revised the text to reflect the first and third suggested changes. The remaining text has been deleted or changed so that the comments no longer apply.</td>
</tr>
<tr>
<td>Sally</td>
<td>Sims</td>
<td>Whole Page</td>
<td>Use 31: After environmental risk to all marine habitats and species, including</td>
<td>The relevant text has been removed.</td>
</tr>
<tr>
<td>Louis</td>
<td>Gontis</td>
<td>Whole Page</td>
<td>Use 2 should read: such as invasive aquatic and terrestrial plant species.</td>
<td>This text has been removed.</td>
</tr>
<tr>
<td>Holly</td>
<td>Mullerich</td>
<td>Whole Page</td>
<td>Use 20: Add terrestrial with and species.</td>
<td>The first sentence referenced has been deleted. This text has been added: &quot;Where changes occur too quickly for species to adapt, local extinctions can happen.&quot;</td>
</tr>
<tr>
<td>Jeremy</td>
<td>Munirich</td>
<td>Whole Page</td>
<td>As a private citizen and a retired science teacher who dialogues in climate activism I find this report captivating! Some of the more technical information in this document eludes me but the absolute importance of it does not. This report is extremely comprehensive and fact filled. With so many of the points made regarding the symptoms of a changing climate the report includes a confidence level. So many of these potential problems are stated with the utmost confidence making them terrifying. The data for this report have been collected from far and wide. Many government agencies have worked very hard to produce this invaluable report. The inclusion of the financial assessment for so many of these outcomes of climate change are an important feat. For so many individuals this figure is the bottom line that may get their attention. I am so thankful to all of the individuals involved with this document. They have done a wonderful job of wording both accurately and thoroughly. My only suggestion is that a very readable or watered down version of this report be &quot;pushed&quot; onto the American people by governments, media, teachers, pulpits and the general public. All Americans need to be knowledgeable about this most important concern.</td>
<td>We appreciate this feedback and continue to explore what derivative products may be most valuable and feasible to ensure the messages are able to be delivered to and digested by as wide an audience as possible.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Text Region</td>
<td>The extreme events listed here have appeared previously given the intense hurricanes, fires, and winters of late 2017 (and early 2018). It would be more timely, and impactful to discuss impacts of Hurricane Maria upon the infrastructure of Puerto Rico (US territory), of Hurricane Harvey upon Houston, of extreme winter temperatures and cold snaps experienced in the northern and southeastern United States, and the wildfires of Western United States.</td>
<td>We made a conscious decision not to include the elaborated uncertainty and confidence language in the overview as it is intended for a very wide, general audience - not those necessarily versed in reading scientific assessments where such lexicon is commonplace. We include a description of the uncertainty and confidence language in the front matter and each chapter contains &quot;Uncertainty Accounts&quot; that include this calibrated language for those &quot;specialists&quot; who are versed in digesting such language. Moreover, we have made a concerted effort to ensure that appropriate coins and context are included wherever necessary to minimize the opportunity for a mischaracterization or misinterpretation of a given finding - even without the confidence/uncertainty language given explicitly.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Text Region</td>
<td>Use 29: We do not have confidence estimates for this important event. Line 30: The chapter Focus Group section includes a description of the uncertainty with respect to the concentration of CO2 in the atmosphere.</td>
<td>The text has been added to the projections section in the overview 1.2.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Text Region</td>
<td>The phrase &quot;climate models have proven remarkably accurate&quot; is a strong, confident statement and should be moved to earlier in the report, such as the first or second paragraph of the entire chapter, to set the stage for confidence in models and climate science.</td>
<td>Text clarifying the relationships between CO2 emissions, CO2 atmospheric residence time, and natural CO2 removal processes has been added.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Text Region</td>
<td>The ‘long-term value of carbon dioxide is not common knowledge and “long lifetime” is a subjective number that could range from 6-months to centuries. Narrowing in on the range of time of carbon dioxide would be helpful for people of different backgrounds.</td>
<td>This text has been removed.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Figure</td>
<td>This figure is very busy and difficult to understand. The scale of the figure does not mesh well with the nature of the information presented. Particularly the graph, it would be better if this figure could be broken up by an applicable section (e.g. weather and climate), and the information moved to the area in which the topic is broken down in more detail.</td>
<td>This figure has been redeveloped into a full 2-page spread for greater accessibility, and the text sections that follow have been reorganized around the report findings (rather than indicators). Discussion of these &quot;indicators of change&quot; are now more integrated throughout the rest of the Overview.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Table</td>
<td>Thelisten with this chapter and provide us with a draft brief for us to review. We are not a &quot;bylaws&quot; organization, and the draft is appropriate. However, due to the nature of technological advancement, other analyses may be more relevant.</td>
<td>We have removed this example and have added the example of a GPS-based phone application that estimates travel time.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Table</td>
<td>Here is a double-decker at the end of the sentence.</td>
<td>This has been corrected.</td>
</tr>
<tr>
<td>Neha</td>
<td>Gupta</td>
<td>Table</td>
<td>The sentences in this section feel awkwardly worded, and there appears to be an overuse of the semi-colon. Simply breaking up the long sentences into shorter, complete sentences would increase the overall strength and readability of this section.</td>
<td>The text has been shortened and edited for readability.</td>
</tr>
<tr>
<td>Jennifer</td>
<td>Jones</td>
<td>Whole Page</td>
<td>The call-out box would be better towards the end of the chapter for people who have moved further into the text, as the methodology of the assessment is not as important as the messages of the assessment for the larger public.</td>
<td>This content has been removed.</td>
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**Note:**

- **doi:** 10.1038/NGEO3031.
- **Executive Summary:** Chapter 01. Overview / Executive Summary
- **Figure/Table Number:** 40 48 14 25
- **Start Page:** 35 35 20 29
- **Start Line:** 35 35 20 29
- **End Line:** 35 35 20 29
- **Comment:** Add reference to 2017 events (Hurricane Harvey, Irma, Maria) and consider adding a reference to the estimated cost, for example $500 billion for billion-dollar extreme weather events in 2017 estimated at https://www.ncdc.noaa.gov/billions/. (Note a cost estimate for a 2012 draught is provided in the next paragraph of the draft.) Text on the 2017 hurricane season has been added in the rewritten section 1.3.
- **Figure/Table Number:** 40 40 16 21
- **Start Page:** 40 40 16 21
- **Start Line:** 40 40 16 21
- **End Line:** 40 40 16 21
- **Comment:** Consider including the projected time of the peak in carbon emissions for IPCC 6.6 as done for all other RCPs in this paragraph. It is important to make clear to decision-makers that best available information suggests that this scenario “narrower” likely requires emissions to peak within the next decade. For example see Figure 2.2 of this draft report (p. 42). Figure SPM 5 and Figure 11 in the IPCCs 2014 synthesis report, and Miller et al. (2017) doi:10.1088/00005162350315 We have cured back the caption text to the figure to keep it at a higher level, accessible to non-technical readers. For additional detail about particular emissions pathways and their implications, the reader is directed to Chapter 16 of NCA4 Vol I (https://climatechange2017.globalchange.gov/chapter/16/) and the IPCC Working Group III report from its 5th Assessment Report cycle (http://www.ipcc.ch/report/ar5wg3/).
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<th>Start Line</th>
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<td>Brown</td>
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<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
<td>2</td>
<td>11</td>
<td>1</td>
<td>11</td>
<td>This is an error from the figure. See page 32 for the explanation for the figure; in the final it should be a checkbox to select an outcome. The detailed explanation is very helpful.</td>
<td>We appreciate this feedback and have created a new Fig. 1.3 that illustrates a key, illustrative climate-related impact for each region alongside an existing ongoing response action to address the risks posed by that impact.</td>
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<tr>
<td>Lisa</td>
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<td>Table</td>
<td>01. Overview / Executive Summary</td>
<td>3</td>
<td>13</td>
<td>3</td>
<td>13</td>
<td>This will be a useful table for the ES.</td>
<td>We appreciate this feedback and have created a new Fig. 1.3 that illustrates a key, illustrative climate-related impact for each region alongside an existing ongoing response action to address the risks posed by that impact.</td>
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<tr>
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<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
<td>15</td>
<td>26</td>
<td>15</td>
<td>26</td>
<td>The NCA is an important document as an evolving, sustained assessment. The new chapters are appropriate and important, particularly those on multiple stressors and complex systems. Improvements in how the document can be more useful in decision making are also welcomed. It should be clarified whether NCA4 is a stand-alone document that is replacing NCA3, or if it complements and adds to NCA3.</td>
<td>We clarify this has been added, including a stand-alone box on “Evaluating Risks to Inform Decisions.”</td>
<td></td>
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<tr>
<td>Lisa</td>
<td>Brown</td>
<td>142034</td>
<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
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<td>25</td>
<td>15</td>
<td>25</td>
<td>The paragraph has been added, including a stand-alone box on “Evaluating Risks to Inform Decisions.”</td>
<td>We have deleted this sentence as the content is covered elsewhere and other comments urged us to cut content that is redundant.</td>
<td></td>
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<tr>
<td>Allie</td>
<td>Crimmins</td>
<td>141953</td>
<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>This is a nice paragraph, though it is a bit esoteric. Should everyone be getting by and living well, adapting along to these changes? Nothing to worry about here. As the last sentence says “Sure there are risks, but Americans are doing swell.” If that is the message this report finds from the literature it assessed? There is no mention of mitigation anywhere—just adaptation. Why? There is no mention of Hawaii or Caribbean or other islands. While I appreciate the sea-to-shining-sea text, I strongly urge the authors to consider what the general reading public should take away from this, and whether you want that message to be “everything is swell.” This is a scientific assessment, so to make this statement, there better be scientific data that show everything is a hunky do.</td>
<td>We have revised the sentence to incorporate these aspects: “It concludes that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans’ physical, social, and economic well-being are rising.”</td>
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<td>01. Overview / Executive Summary</td>
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<td>We have revised the sentence to incorporate these aspects: “It concludes that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans’ physical, social, and economic well-being are rising.”</td>
<td>We have revised the sentence to incorporate these aspects: “It concludes that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans’ physical, social, and economic well-being are rising.”</td>
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<td>Allie</td>
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<td>01. Overview / Executive Summary</td>
<td>27</td>
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<td>27</td>
<td>Chapter 1.1: In a whole, very well written. I would suggest completely reworking the first paragraph (see earlier comment on the appropriateness of saying anything is swell) and deleting the last paragraph of 1.1 (it is not needed and the last sentence of the previous paragraph on mitigation and adaptation is much stronger). But everything in between is golden. I particularly appreciated the paragraph on social inequities. Well done.</td>
<td>We appreciate the feedback, have revised the first paragraph, and deleted the last paragraph (moving some of its content to the Front Matter).</td>
<td></td>
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<tr>
<td>Allie</td>
<td>Crimmins</td>
<td>142006</td>
<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>We appreciate the feedback, have revised the first paragraph, and deleted the last paragraph (moving some of its content to the Front Matter).</td>
<td>We have revised this section as appropriate.</td>
<td></td>
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<td>Allie</td>
<td>Crimmins</td>
<td>142008</td>
<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
<td>28</td>
<td>30</td>
<td>28</td>
<td>30</td>
<td>Section 1.2: Not really a biggie. This would be more effective if it conveyed fewer points. For example, drop the mention of NCA4 and all the temperature records in the first paragraph (see earlier comment on the appropriateness of saying anything is swell) and deleting the last paragraph of 1.1 (it is not needed and the last sentence of the previous paragraph on mitigation and adaptation is much stronger). But everything in between is golden. I particularly appreciated the paragraph on social inequities. Well done.</td>
<td>We have revised this section as appropriate.</td>
<td></td>
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<tr>
<td>Allie</td>
<td>Crimmins</td>
<td>142009</td>
<td>Text Region</td>
<td>01. Overview / Executive Summary</td>
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<td>While I appreciate the sea-to-shining-sea text, I strongly urge the authors to consider what the general reading public should take away from this, and whether you want that message to be “everything is swell.”</td>
<td>We have revised this section as appropriate.</td>
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<td>Allie</td>
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<td>While I appreciate the sea-to-shining-sea text, I strongly urge the authors to consider what the general reading public should take away from this, and whether you want that message to be “everything is swell.”</td>
<td>We have revised this section as appropriate.</td>
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</table>

Please add a reference to economic growth since 2014, e.g. “...annual growth in global emissions has slowed while the global economy has grown by X...” to support the statement that “economic growth has been largely decoupled from greenhouse gas emissions.”

Erica Brown

This text has been removed.

Please add a reference to economic growth since 2014, e.g. “...annual growth in global emissions has slowed while the global economy has grown by X...” to support the statement that “economic growth has been largely decoupled from greenhouse gas emissions.”
<table>
<thead>
<tr>
<th>First Name</th>
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<tr>
<td>Allison</td>
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<td>142208</td>
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<td>Chapter</td>
<td>01. Overview / Executive Summary</td>
<td>134</td>
<td>140</td>
<td>140</td>
<td>All section 1 was good. I am overall pleased with this entire chapter. It is extremely redundant to chapter 2. It is literally 31 pages long!!! I think it could be 5 pages easily. Section 1.2 could be deleted almost completely. Maybe save the presentation figure for box 2.1. The page number of how this assessment was conducted is redundant to the front matter and would make a better appendix than here in the overview. Section 1.3 can be deleted because it is literal, page 37 box 21 should be deleted as it is completely redundant. I have serious concerns over the first uncertainty section (see separate comment) and probably most of this should be in an appendix or FAQ. Page 30 line 17 through page 40 box 24 should be deleted as it is redundant. Now, finally, page 45, go to the overview of the findings of this report and not the CSSR (though there are still a few repetitions of the CSSR findings in here, at least if you delete the above sections I’ve noted, you’ll only be saying twice – once in this chapter and then once again in the next chapter – instead of three times). Section 1.3 starting on page 46 line 28 should be reduced from two pages to two paragraphs (one saying “It’s complicated and one on social/cultural/impacts). The second call out box explains uncertainty much better, and more accurately than the first call out box. You certainly don’t need both in the same chapter. Keep the first paragraph of this call out box (page 48 lines 6-16) and delete or move lines 11-21 as an appendix or technical process. No reader cares about this and no one understands what “risk-based framework” means, nor do they need to. Only the authors of this report would care about this jargon, not the intended audience. Text on page 48 Box 22 through page 49 lines 8 is redundant to the earlier section on “it’s complicated” interdependencies. Delete. Section 1.5 seems redundant to text you already said in this chapter about how impacts differ under different mitigation scenarios. For example, the text on page 50 lines 10-18 is completely redundant to text on page 41 lines 7-13. Put one place to say it in the chapter and delete the other. Delete text from page 52 lines 14-23: these stages are silly (not academic) and this paragraph is very much about the NCA and very little about the scientific literature. The following paragraphs do a better job explaining adaptation limitations. Then cut down to just two paragraphs in this section: why is it is so long? The list of “business operations, resource management, and investments” is repeated several times in this section. Delete paragraph on page 53 lines 28-35. It is vague and says little that isn’t said multiple times elsewhere, including in the paragraph directly above and below it. In summary, keep most of section 1.1, some of 1.4, make section 1.5 two paragraphs long, make the mitigation and adaptation sections of 1.6 each two paragraphs long and cut redundancies, and keep the distraction. Also note that much of the information on page 54 lines 10-29 is redundant to the front matter. We appreciate the feedback and have made significant revisions to the Overview to reduce redundancy and focus on the main conclusions from this volume of the assessment, resulting in a more targeted summary with the intent to ease the reader. As the underlying climate science is essential to understand what is driving the observed and projected changes, we have retained the climate science section to provide a summary of what it is (volume 1) of the 4th National Climate Assessment - the Climate Science Special Report. That said, we have pared back the section and provided balance between observations, attributions, and future projections. Section 1.4 (future projections) has been combined with section 1.3 (observations and attribution), and some climate science content represents Chapter 2 has been removed. We have removed the text on how the assessment was conducted. We have completely reworded the middle part of the Overview to pivot away from the “current risk” and “future risk” construct from the public comment draft to something that more closely mirrors the Report Findings. Section 1.5 has been eliminated and content on sectoral interdependencies, multiple stressors, complex systems, and vulnerable populations has been integrated throughout the revised Section 1.3. A short box on “interconnectors’ impacts” has been added. Based on comments from the National Academies of Sciences, Engineering, and Medicine as well, the risk- framing box has been rewritten in more accessible language, and some of the more technical content referring to risk framing has been moved to the Front Matter. Text referring to extreme heat and labor impacts that is redundant to text in the revised section 1.3 has been removed from the Response section. The mitigation and adaptation sections have been rewritten to reduce redundancies. We have removed this example and have added the example of a GPS-based phone application that estimates confidence in climate models, please see Chapter 4.3 of NCA4 Vol. I - the Climate Science Special Report (<a href="https://science2017.globalchange.gov/chapter/4/">https://science2017.globalchange.gov/chapter/4/</a>)</td>
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<td>This is no longer the overall finding (example of uncertainty). It implies that we just need to treat the worst, or adjust it, or make it better and then we’ll have the “right” answer. This is not an appropriate analogy, but a dangerous one. Please use another example: we make decisions in our life under uncertainty all the time- deciding who to be friends with or marry, deciding what school to go to or what job to take, even who to vote for this watch is a representation of impression, not uncertainty.</td>
<td>We have removed this example and have added the example of a GPS-based phone application that estimates</td>
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<td>Allison</td>
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<td>19</td>
<td>This text would be greatly strengthened by deleting everything from page 37 line 32 through page 38 line 35. In fact, as is, the best sentences on computer modeling don’t convey the reader with a lot of redundant information on uncertainty (and definitely not an appropriate analogy of uncertainty). This information on uncertainty is repeated in a later text box in this same chapter. But the computer model paragraphs are well-written and stand on their own. And they are actually the last text box.</td>
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<td>This sentence says that frequency and severity of ALLERGIC illnesses will increase. The authors may want to be more careful with their wording. It may not be that more people who never had allergies before now have allergies. Maybe, but not that is still emerging science. It is more likely that people who already have allergies (and other respiratory issues) will experience symptoms. I’d also like to see the literature that the severity of those illnesses increases. I can see more people needing medication, or more people needing to go to the hospital, especially as allergen seasons lengthen or higher concentrations push someone over a tipping point. But I’m wondering if there is any scientific literature that measures how the severity of a person’s allergic response has changed because of climate change.</td>
<td>Much of the climate modeling information has been moved into the rewritten section on climate projections in the main chapter text. This box has been shortened. For readers interested in learning more about our confidence in climate models, please see Chapter 4.3 of NCA4 Vol. I - the Climate Science Special Report (<a href="https://science2017.globalchange.gov/chapter/4/">https://science2017.globalchange.gov/chapter/4/</a>)</td>
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<td>14</td>
<td>Why are these quantified values and economic dollar signs in the weather and climate section, but not in these two sections?</td>
<td>We have removed this text.</td>
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<td>Allison</td>
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<td>Don’t understand this call out box. It says it’s about why this framing is a useful tool for decision-makers, but then it doesn’t explain that in the actual text. I don’t know what this framing is, or how it is used, or how it is relevant to the text or the text is mostly an update for the NGA. The first paragraph to get the best just talk about the NGA process. I’m not sure why that is in here. The paragraph on page 48 Box 22 is completely inconsistent- now we’re suddenly talking about complex systems- how is that relevant at all? Telling me what “NEA indicators” is not helpful. Telling me what you found when you considered this would be, but that is missing. Why would telling me there are case studies in this report help me understand the usefulness of risk-based frameworks? At what end? This just seems like a lot of back-patting this author who are familiar with this jargon, but not a text box that actually describes something for the intended audience. Suggest deleting this text box. The paragraph on page 53 Box 21-25 does a good job explaining this than this entire text box, and it would be better to say it in just one of this chapter, rather than both places.</td>
<td>We have retained this box based on other comments and input from review of the National Academies of Science, Science, Engineering, and Medicine. However, the text that was in this box has been greatly simplified and streamlined as the reader seeks the information from the NCA4 process have been removed. We have moved some of the text as reminders. The new paragraph gives information from this box to the Front Matter, while other elements have been re-written and included in a new Box 1.2 - Evaluating Risks to Infirm Decisions.</td>
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<td>15</td>
<td>15</td>
<td>Please do not use these “upstream” and “downstream” terms. They may mean something to the NCA4/CRIP people who designed these two reports, but they mean nothing to the reader, and they are a jargon-y distraction. Also note that much of the information on page 54 lines 10-20 is redundant to the front matter.</td>
<td>This language has been removed.</td>
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<td>Overview/Executive Summary</td>
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<td>Overview</td>
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<td>31</td>
<td>This is guessing this is intentional, since this chapter is meant to summarize other chapters, but there were almost zero citations in all 31 pages of this chapter. I think I counted two, though there was no reference section at the end of the chapter. I'm not sure having zero citations in this chapter is a good idea. I do think the chapter needs to be chopped down considerably, and put together so it becomes an actual overview chapter. I may agree that citations aren't needed. But as is, this chapter is long, argon filled, redundant, etc., and focuses too much on the NCA process and not enough on the NCA findings, for which there should be citations (you do have citations to the chapters, which is good). I strongly suggest the authors of this chapter read the front matter, chapter 2, and maybe some appendices, give some careful thought about the key messages they want to convey in this chapter, and then get themselves a brief copyeditor to cut out the pages and pages of redundancies. This overview could be much more like the NCA overview, but right now we're getting too many kitchen sinks in them gumming it up.</td>
<td>We have undertaken a substantial rewrite of the Overview to reduce redundancies and focus on the main findings of the assessment. To far as the aspect of this comment relating to references, it was, indeed, our conscious decision not to include them throughout the text. Rather, we decided to add appropriate references at the end of sections to the underlying chapters. Including direct references to the literature in the Overview would detract from its readability and is in keeping with common practice for such &quot;Executive Summaries&quot; for major assessment reports.</td>
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<td>David</td>
<td>Peterson</td>
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<td>Whole Chapter</td>
<td>Overview/Executive Summary</td>
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<td>Overview</td>
<td>24</td>
<td>26</td>
<td>This chapter was an overall great depiction of the consequences climate change has had in the U.S. and the human society. The indication of economic impacts of different regions was very informative.</td>
<td>We appreciate this feedback.</td>
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<td>Overview/Executive Summary</td>
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<td>Recommend adding the word &quot;modern&quot; to the comparison with human history. Human history dates back about 10,000 years, but the finding in the CSRs about the rate of warming only compares to the last 2,000 years. From page 53 of the CSR: &quot;For context, global annual averaged temperatures for 1986–2015 are likely much higher, and appear to have risen at more rapid rate during the last 3 decades, than any similar period over the past 2,000 years of records.&quot;</td>
<td>This suggestion has been implemented.</td>
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<td>Overview/Executive Summary</td>
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<td>This paragraph presents a rather rosy view of the state of adaptation in the U.S., particularly in light of the recent hurricanes and wildfire seasons of 2017. For example, the statement about NE fisheries (&quot;Fishing...in the Northeast are adjusting to more frequent ocean heat waves that harm cod fisheries&quot;) seems to be contradicted by the first paragraph on page 37 (lines 2-6). Further, by failing to even mention limits on greenhouse gases, the paragraph gives the impression that we can adapt our way out of the worse effects of climate change. Recommend making the tone more closely reflect the peril laid out on page 37.</td>
<td>Our point in going these regional examples is to illustrate to the reader that adaptation action is being taken and should be emulated. We do not imply that &quot;all&quot; fishermen or &quot;all&quot; farmers, we have taken sufficient adaptation action to eliminate all climate-related risks. However, we have added some context to the end of this paragraph to acknowledge that response actions, including mitigation, are not yet adequate to substantially reduce risks from climate change.</td>
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<td>Luerio</td>
<td>Constible</td>
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<td>Whole Page</td>
<td>Overview/Executive Summary</td>
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<td>27</td>
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<td>This is helpful background, and should be retained in the final report.</td>
<td>We appreciate the feedback, but in light of other comments on this box - as well as the consistent feedback to trim down to call the Overview’s length, we have moved some of this content to the Front Matter and Process Appendices.</td>
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<td>We have improved the readability of thefigure significantly, including through more clear labels on axes, data ranges, etc.</td>
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<td>1</td>
<td>Recommend choosing different colors to help improve the visibility of the different drivers, particularly in panel (a). The red hatchings used to show the uncertainty bands makes it difficult to see the non-bolded lines.</td>
<td>Due to Federal regulations, certain color palettes must be used to assist those with visual impairments.</td>
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<td>Luerio</td>
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<td>Figure</td>
<td>Overview/Executive Summary</td>
<td>32</td>
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<td>The sentence stating &quot;In all three panels...&quot; is a little hard to understand. Recommend editing: In all three panels of this figure, the black line shows the difference in observed annual average global surface temperature between 1980–2015 and 1961–1990, etc.</td>
<td>This suggestion has been implemented.</td>
</tr>
<tr>
<td>Luerio</td>
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<td>Overview/Executive Summary</td>
<td>34</td>
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<td>34</td>
<td>17</td>
<td>Recommend adding a sentence about hurricanes Harvey, Irma, and Maria, with a focus on the infrastructure failures in Puerto Rico.</td>
<td>This text has been added in the rewritten section 3.1.</td>
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<tr>
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<td>Constible</td>
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<td>Figure</td>
<td>Overview/Executive Summary</td>
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<td>12</td>
<td>This comment extends to the end of the call out box on line 13, page 39. This call out box is good, but a little on the long side. Recommend including a statement somewhere near the top about how the uncertainty inherent in climate science doesn't change the fundamental understanding of the greenhouse effect. Human activity is changing the climate. Also, please consider moving up the statement on pg 39 about the accuracy of climate models.</td>
<td>We have shortened this box and added a statement to the effect that the uncertainty inherent in climate science doesn't change the fundamental understanding of the greenhouse effect and that human activity is changing the climate. The statement on the accuracy of climate models has been moved into the main section of 1.2 on projections.</td>
</tr>
<tr>
<td>Ross</td>
<td>McKirdy</td>
<td>141018</td>
<td>Whole Page</td>
<td>Overview/Executive Summary</td>
<td>24</td>
<td>24</td>
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<td>3</td>
<td>How do you know that the climate is changing faster than it was at any point in human history? Ocean temperature data goes back a couple of decades and only measures the top layers. Thermospheric temperature records go back to 1958. Land surface records go back to the late 1800s, but quality is poor in most regions especially prior to WWII. Human history goes back 10,000 years or more. You are making statements you cannot possibly know to be true.</td>
<td>The statement is based on the extensive assessment of the peer-reviewed literature presented in NCA4 Volume 1 (Climate Science Special Report) and summarized here in NCA4 Vol II in Chapter 2.</td>
</tr>
<tr>
<td>Ross</td>
<td>McKirdy</td>
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<td>Overview/Executive Summary</td>
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<td>You say: &quot;While the American economy has continued to grow and some measures of human well-being have improved over the past several decades, many communities, ecosystems, and economic sectors have already experienced negative impacts and they remain at great risk as warming trends continue. &quot; Same? Have improved? Can you name any important measures that haven't, especially in the UST? In this section you are asking people to believe that the extraordinary technological, scientific and economic advances of the past several decades are at best moderate and debatable, whereas the damages from climate change have already swamped them and will make everything worse in the future. What I take away from it is that the authors are not very good at measuring economic and social welfare, and they have little insight into the things that matter to people when they assess their standard of living.</td>
<td>We deleted the entire paragraph as the first part was reiterating with other parts of the Overview. And, upon further review, the second part of this comment is not actually derived from the underlying assessment content and what is asked to be addressed here is beyond the scope of this report.</td>
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<tr>
<td>Ross</td>
<td>McKirdy</td>
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<td>Overview/Executive Summary</td>
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<td>30</td>
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<td>You say that natural factors could explain the observed rapid changes. Yet a few pages earlier (p. 17) you said that models underestimate natural variability. If you cannot explain the mechanisms and dimensions of natural variability, how can you conclude that it doesn't account for recent changes? I'm not asserting that it does, I'm just reiterating the point that you keep making unfounded assertions about things you don't actually know to be true. Your language needs to reflect the actual state of knowledge and a realistic assessment of your own uncertainty.</td>
<td>The uncertainty in the climate’s multisectoral response to past externally imposed changes does not invalidate the conclusion that no known natural forcing factors could be responsible for the observed warming. In order for the climate to make projections, you need to understand that no known natural factor has caused recent changes. In some cases, you are using the same points that you keep making about natural variability. We are not asserting that natural variability accounts for recent changes; we are just stating that our climate projections are based on multiple factors that are well understood.</td>
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<td>Ross</td>
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<td>Overview/Executive Summary</td>
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<td>We have undertaken a substantial rewrite of this entire chapter to better reflect the conclusions of the assessment. As far as the aspect of this comment relating to references, it was, indeed, our conscious decision not to include them throughout the text. Rather, we decided to add appropriate references to the underlying chapters. Including direct references to the literature in the Overview would detract from its readability and is in keeping with common practice for such &quot;Executive Summaries&quot; for major assessment reports. This conclusion is at odds with paleoclimate evidence. While this section has been significantly re-written, the fundamental conclusions have not changed.</td>
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**Executive Summary**

01. Overview / Executive Summary
It is misleading to say “no combination of natural factors is found in the observational record that would account for the current warming trend.” You are referring to Figure 1.2 which does show observations (except for the trend line). It shows model-generated solutions. You can claim that the model decomposes observed changes in such-and-such a way based on the way forcings are represented in the model and the way natural variability is represented. This does not mean that the decompositions reflect what greenhouse gases play such-and-such a role. But if you should acknowledge that the colored lines are “observational” because they are not. Are you so confident observational validation?

Climate models have been extensively tested and evaluated (the reader is directed to Chapter 2 of the report, as well as NCA4 Volume I – Climate Science Special Report) as well as NCA4 Volume I - Climate Science Special Report, particularly Chapter 4.3), and while they are not perfect, they are the best research tools currently available. There is no unique metric of model performance, and the binary “good/bad” distinction fails to evaluate whether models are fit for a particular purpose. A vast literature on model evaluation and diagnosis, the coordinated framework provided by the Coupled Model Intercomparison Project, and a large body of observations can guide decision-making and model selection. It is simply not true that the research literature has shown that models are not “good.” Biases and errors in many variables have been identified by multiple studies, and model improvement is an ongoing process. Climate models will never be exact reproductions of reality, but they incorporate the basic physics and chemistry that dictate climate behavior. There is high confidence that models predict credible realities of future change. IPCC WGII AR5 Ch 10 Fig 10SM.1 (see http://ipcc.ch/pdf/assessment-report/wg2/2014/report/en/AR5_WG2_FINAL.pdf) shows the same sort of decomposition is shown as in Figure 1.2, except in more detail by showing vertical layers by latitude band. In most cases the decomposition key notes the overlap with key metrics of surface temperature trends and temperature extremes, and to the extent they yield improved fit with some metrics (e.g., Arctic temperatures) they are likely getting that metric right for the wrong reasons.

It is misleading to say “No combination of natural factors is found in the observational record that would account for the current warming trend.” You are referring to Figure 1.2 which is a very weak form of argumentation. While it is a superficially persuasive picture, there are at least three problems with the argument.

First, you have assumed that the models are accurate representations of climate processes, which is an untenable assumption. There is a large literature on climate model testing which you have completely ignored. A recent example is Steenbrook, Reinecke and Pidd (2016) “Testing the historical tracking of climate models.” Interdisciplinary Journal of Global Change Forecasting (www.sciencedirect.com/science/article/pii/S221113991630029X).

This paper points out that if a model’s match to target observations is genuine rather than spurious, hindcast errors must be statistically and exhibit a mean-reversion property. But the difference between climate model predictions of the climate of temperature and the observed GMST values (which is in fair non-stochastic and non-mean-reverting. That paper also reviews related literature on this question from a variety of authors applying a variety of methods, with the recurring result that climate models fail to reproduce key statistical features of target observations, which means they are not suitable for forecasting tools. The implication is that you cannot boast about how good your models are when they have systematic problems reproducing essential properties of the target variables.

Another important study in this regard is Swann, E.L., 2013. Emerging selection bias in large-scale climate change simulations. Geophysical Research Letters, 40, DOI: 10.1002/glu.5522, which shows that between CMIP5 and CMIPS, GISS became more like each other but less like the observations. That they no longer overlap with key metrics of surface temperature trends and temperature extremes, and to the extent they yield improved fit with some metrics (e.g., Arctic temperatures) they are likely getting that metric right for the wrong reasons.


This statement about model accuracy is based on an extensive assessment of the literature, most recently summarized in Chapter 4.3 of NCA4 Volume I – Climate Science Special Report, as well as in the entire Volume I of NCA4 (Climate Science Special Report). In particular, Chapter 4.3 of NCA4 Vol I notes: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamentals of the physical processes they represent, such as radiation transfer or geophysical fluid dynamics, which can be tested independently against measurements or theoretical calculations to demonstrate that model approximations are valid (e.g., IPCC 1990). They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large-scale modes of natural variability, and an expectation that new evidence to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013). There is no better framework for degrading our understanding of the physical processes in a complex coupled system than the earth's climate." See https://science2017.globalchange.gov/chapter/4/ for more detail.

Extreme weather events expose vulnerabilities and present similar hazards to those we can expect in a warmer world.
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<tbody>
<tr>
<td>Karin</td>
<td>First Name</td>
<td>14315</td>
<td>O1. Overview / Executive Summary</td>
<td>3</td>
<td>50</td>
<td>7</td>
<td>18</td>
<td>01. Overview / Executive Summary</td>
<td>The reviewer did not provide supporting information or evidence to support their comments regarding the adequacy of domestic or global mitigation efforts in affecting long-term changes in warming or atmospheric concentrations of GHGs. We therefore are unable to substantiate their comment and note that the mitigation chapters of the CS5 and NCA4 assess and review peer-reviewed studies on these topics. No changes have been made to the text in response to this comment. Regarding the comment on discounting, the results described in the Overview text are presented in nominal terms, as they are annual values. Discounted values may be important when presenting a timetables of values, which is not the case here.</td>
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<tr>
<td>Social Science Coordinating Committee</td>
<td>14375</td>
<td>O1. Overview / Executive Summary</td>
<td>30</td>
<td>10</td>
<td>8</td>
<td>The discussion of drivers of climate change in this section reflects contributions from natural science research (such as observations, modeling). The discussion can also consider incorporating a discussion of anthropogenic drivers of climate change from the social science perspective. For example, the IPCC AR5 WGII has a chapter on drivers of climate change (Bonacci et al. 2014). More recently, the USGCRP Social Science Coordinating Committee has coordinated three White Papers: Social Science Perspectives on Climate Change which includes one paper on “Drivers of and Responses to Climate Change” (USGCRP 2018 — upcoming). The paper discusses the underlying drivers of climate change, including demography, economics, politics, social stratification and inequality, technology, infrastructure, and land use, and how these factors interact dynamically over space and time. The intent of this section of the Overview is to describe the more physical (vs societal) drivers of climate change. The human-component sought in this comment is captured later on in the Overview in much greater detail.</td>
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<tr>
<td>Alastair</td>
<td>Oldfield</td>
<td>143006</td>
<td>O1. Overview / Executive Summary</td>
<td>24</td>
<td>03</td>
<td>5</td>
<td>The opening paragraph of the Introduction fails to appropriately convey the magnitude of current and proposed damage caused by climate change, and fails to convey an appropriate sense of urgency and seriousness about the need for action. The sentence “Earth’s climate is now changing faster than at any point in human history” uses the neutral word “change” and fails to attribute this change to its primary cause: greenhouse gas pollution from the burning of fossil fuels. The opening sentence must make clear that the primary cause of climate change is human activities, primarily burning oil, gas, and coal, rather than a vague statement. Similarly, the second sentence uses the neutral words “impact” and “affect” rather than “damage” or “harm” or “negative impacts.” It is also unclear what “Americans are responding” means. Many Americans are limited in their ability to “respond” or cope with climate change — especially the elderly, young, sick, poor, and some communities of color. The final sentence of the opening paragraph implies that Americans are handling climate change and that everything will be okay at current response levels: “Americans are responding to change in ways that can reduce climate-related risks, bolster resilience to change, and improve livelihoods.” Nothing could be further from the truth. Although some states and local communities are undertaking mitigation and adaptation actions, current US climate policy is completely inadequate to avoid dangerous levels of atmospheric GHG concentrations and associated dangerous impacts from warming, extreme weather events, sea level rise, ocean acidification, species extinction, glacier/ice sheet loss and the like. The US must take much stronger, bold, and urgent action to reduce GHG gas pollution to avoid unacceptable damage, and this message should be clear from the very first paragraph onward. We strongly recommend that you change the opening paragraph so that it accurately represents the current state of the literature on climate change and risks. For example, “Earth’s climate is now changing faster than at any point in human history, and the primary cause is greenhouse gas pollution created by burning oil, coal, and natural gas. Negative impacts of global climate change are underway across the United States and are disrupting people’s lives, their communities, natural systems, and the economy…” We reviewed the first sentence to reflect the fact that the observed changes are being driven primarily by human activities. We did not revise the second sentence because - as the assessment shows - not all impacts in the U.S. are negative. We have also revised the final sentence to reflect the conclusion that while Americans are responding, much of what we care about is still at serious risk without additional action.</td>
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<td>Union of Concerned Scientists</td>
<td>143972</td>
<td>O1. Overview / Executive Summary</td>
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<td>03</td>
<td>5</td>
<td>Presumably, when the authors say, “responding to rapid changes” they are referring to changes in climate – it would be helpful to say this more clearly. We have revised this sentence so it now reads: “Americans increasingly recognize the risks climate change poses to their everyday lives and livelihoods and are beginning to respond.”</td>
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<td>Union of Concerned Scientists</td>
<td>143973</td>
<td>O1. Overview / Executive Summary</td>
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<td>03</td>
<td>12</td>
<td>It would be helpful in the “Cut Out Box” to further emphasize that through the public comment process, the NCA provides a platform for diverse perspectives to engage in the assessment, and in light of the evidence base and the points raised by the diverse reviewers, provides the scientific consensus on the topics explored in the report. The NCA provides an opportunity for the entire American public to weigh in. We have moved much of the content from this box to the Front Matter and Process Appendix. The specific suggestion made in this comment has been incorporated into the Process Appendix.</td>
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<tr>
<td>Union of Concerned Scientists</td>
<td>143975</td>
<td>O1. Overview / Executive Summary</td>
<td>48</td>
<td>09</td>
<td>12</td>
<td>The authors plan to update this with the latest report on 2018 temperatures from NOAA and NAAQ? Otherwise, it should be made very clear at the outside of this Executive Summary which period the report covers, as well as the baselines that are used for the assessments. Otherwise, the public could be confused by what has been said recently about 2018 (e.g. that 17 of the last 18 years have been the warmest on record). We have undertaken a large rewrite of the section, which has resulted in this specific text being deleted. However, we have made great efforts to present the most up-to-date data in Fig 1.1.</td>
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<tr>
<td>Union of Concerned Scientists</td>
<td>143976</td>
<td>O1. Overview / Executive Summary</td>
<td>48</td>
<td>09</td>
<td>16</td>
<td>The arrows could be a little bit confusing, especially the one for drought that has two arrow heads. It would be helpful to explain the arrows briefly in the figure text. We have re-worked this figure, drawing inspiration from NOAA’s 20 signs of a Warming World (<a href="https://cpo.noaa.gov/warmingworld/index.html">https://cpo.noaa.gov/warmingworld/index.html</a>), which should help make the content more accessible.</td>
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<tr>
<td>Union of Concerned Scientists</td>
<td>143978</td>
<td>O1. Overview / Executive Summary</td>
<td>40</td>
<td>03</td>
<td>5</td>
<td>It would be helpful to state this key finding in the body of the text from figure 1.2 that, “the long-term global warming trend observed over the past century can only be explained by the effect that human activities have had on the climate.” We have included the following text in the revised Section 1.2 “Greenhouse gas emissions from human activities are the only factors that can account for the observed warming over the last century; there are no viable alternative human or natural explanations supported by the observational evidence. Without human activities, the influence of natural factors alone would actually have had a slight cooling effect on global climate over the last fifty years.”</td>
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<td>Union of Concerned Scientists</td>
<td>143980</td>
<td>O1. Overview / Executive Summary</td>
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<td>05</td>
<td>11</td>
<td>This point could be a bit confusing when paired with the point about the Dust Bowl being the period of peak heat since records have been kept a few pages back. The authors should clarify or distinguish this point. The text has been removed.</td>
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<td>Union of Concerned Scientists</td>
<td>143981</td>
<td>O1. Overview / Executive Summary</td>
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<td>Any links to benefits to MIP should also be mentioned here as well.</td>
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</tbody>
</table>

References:

- Bumbaco, G. (2016). "Drug Reconciliation In " The intent of this section of the Overview is to describe the more physical (vs societal) drivers of climate change. The human-component sought in this comment is captured later on in the Overview in much greater detail.
<table>
<thead>
<tr>
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<td>Michael</td>
<td>MacCracken</td>
<td>144058</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>27</td>
<td>27</td>
<td>It would be good to find some example of how the “contribution” is more specific and also hopefully informative.</td>
<td>The authors agree with this suggestion; “sophisticated” has been removed. In addition, this figure has been moved to Chapter 2.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144059</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>11</td>
<td>It’s good to change “heightened” to “more impactful.”</td>
<td>This text has been removed.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144060</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>If “risk” changes more frequently to “frequent and prolonged” and it is not just fishery that are affected (they tend to move), but also other resources, changes to the ocean and coastal habitats, it would be clearer if changed “in” to “across” and “has increased” to “has, on average, increased”—there are two impacts that are not being captured by this statement.</td>
<td>We have included “and prolonged” and added “related ecosystems” to the end of the sentence to address this concern.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144061</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>It would be good to change “periodic” to “cyclical” or “cyclic” or “oscillatory.”</td>
<td>We have undertaken a large rewrite of this section, which has resulted in this specific text being deleted.</td>
<td></td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144062</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>19</td>
<td>It would be good to say that it is important to have a footnote to list what is meant by “fairly stable global climate” (and note that a “global” should be added). The footnote could indicate that over the past several thousand years, global average temperature, reconstructed from a number of proxy variables, has likely not changed by more than plus or minus half a degree Celsius. Yes, apparently, somewhat more, but then mostly as relatively gradual excursions that have then returned over decades/centuries to the longer term average for that latitude. It also important to add that “sea level” has also been quite stable—indeed, this stability has likely been more important than temperature stability.</td>
<td>We have not used footnotes in the Overview to allow for easier reading. However, the text referred to here has beenremoved as an effort to shorten and simplify this section.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144063</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>It’s important to make it clear that this is a primary message conceded from the SBS VII meeting, so something first occurred 30 years ago.</td>
<td>We appreciate the context provided by this comment.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144064</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>This text has been removed.</td>
<td>We have revised the text so it now reads: “...tend that exceeds the range of natural...”</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144065</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
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<td>It’s good to say that the world is now in a situation of “has pushed” and this has been removed.</td>
<td>We have revised the text so it now reads: “...tend that exceeds the range of natural...”</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144066</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>24</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>Change “effect” to “effects”—the verb in the sentence as well as logic seems place here.</td>
<td>This text has been removed.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144067</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>25</td>
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<td>11</td>
<td>We have deleted “these” altogether and made no replacement, so the sentence now reads: “...threatens to exacerbate existing inequalities...”</td>
<td>We are not using footnotes in the Overview to allow for easier reading. However, the text referred to here has been removed as an effort to shorten and simplify this section.</td>
<td></td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144068</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>25</td>
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<td>It’s important to make it clear that this is a primary message conceded from the SBS VII meeting, so something first occurred 30 years ago.</td>
<td>We have deleted “these” altogether and made no replacement, so the sentence now reads: “...threatens to exacerbate existing inequalities...”</td>
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<tr>
<td>Michael</td>
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<td>144069</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
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<td>We have undertaken a large rewrite of this section, which has resulted in this specific text being deleted.</td>
<td>We have undertaken a large rewrite of this section, which has resulted in this specific text being deleted.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144070</td>
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<td>01. Overview / Executive Summary</td>
<td>28</td>
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<td>End 2017 can be added as joining this group, making the past four nations the warmest.</td>
<td>We appreciate the context provided by this comment.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144071</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>28</td>
<td>21</td>
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<td>We wonder if the paragraph might be made even more convincing by adding a phrase/sentence to the effect that if the effect of the natural greenhouse effect, calculations indicate that the global average temperature would be 0.5°C below that at present—basically, so cold that life would not be likely/possible.</td>
<td>We have revised the text to reflect this suggestion.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144072</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>30</td>
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<td>2</td>
<td>I’d suggest adding a phrase to the end of the sentence saying “since the mid 20th century.”</td>
<td>The sentence has been removed, but “over the last century” has been added to a similar sentence.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144073</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>30</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>It would be good to change “periods” to “cyclical” or “cycle.”</td>
<td>We have deleted “periods” and replaced it with “natural climate cycles”</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144074</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>32</td>
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<td>It turns out that “sophisticated” is a bit of a euphemism for “extensively tested”–the real point is that the models have been tested and evaluated, not that they are “inhabit...”</td>
<td>The authors agree with this suggestion; “sophisticated” has been removed. In addition, this figure has been moved to Chapter 2.</td>
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</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144075</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
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<td>It’s good to change “at the start of the study saying” “As a result of the inherent chaotic nature of nature and internal climate processes...”</td>
<td>We have added a sentence that reads: “On short time scales, movements of air in the atmosphere and water in oceans are inherently chaotic...” However, this figure and caption have been moved to chapter 2.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144076</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
<td>34</td>
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<td>17</td>
<td>17</td>
<td>It’s good to change “has declined” to “has, on average, declined”</td>
<td>We have revised the text so it now reads: “...tend that exceeds the range of natural...”</td>
<td></td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144077</td>
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<td>We have revised the text so it now reads: “...tend that exceeds the range of natural...”</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144078</td>
<td>01. Overview / Executive Summary</td>
<td>01. Overview / Executive Summary</td>
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<td>21</td>
<td>21</td>
<td>It’s good to change “animal” to “marine mammals”–which is more specific and also hopefully informative.</td>
<td>The suggestion has been implemented.</td>
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</table>
...A phrase very much like "no detectable change", which really means we don't have evidence yet that gives us 95% confidence that a change has occurred, was at the root of the extensive controversy over the statement in the IPCC Second Assessment Report regarding detection of a discernible human influence. Basically, the phrase is obscuring how there has been a choice (traditional in the statistical and physical science community, but not generally in the public or government decision making arena). This "choice" is really a value-based decision (indicating that there is a predilection of scientists in making decisions not to being wrong) that needs to be made apparent to the public/mover. To really convey what is understood, I'd suggest re-wording the sentence to say: "Because the observational record is limited to only 150 years or so because the occurrence of drought is irregular, high confidence that droughts are becoming more likely has not yet been possible to achieve, but there is strong evidence that the higher temperatures resulting from human influences are leading to deeper surface moisture deficits, which is a closely related indicator of drought-like conditions." While the intent behind this comment has merit, the proposed revision to the text is quite lengthy and provides a level of technical detail that is not consistent with the rest of the Overview. We have retained the text as it was and directed readers interested in more detail to see Chapter 8 of NCA4, Vol 1: The Climate Science Special Report (https://science2017.globalchange.gov/chapter/4/), which covers "Droughts, Floods, and Wildfires." While the intent behind this comment has merit, the proposed revision to the text is quite lengthy and provides a level of technical detail that is not consistent with the rest of the Overview. We have retained the text as it was, and directed readers interested in more detail to see Chapter 8 of NCA4, Vol 1: The Climate Science Special Report (https://science2017.globalchange.gov/chapter/4/), which covers "Droughts, Floods, and Wildfires." It might be useful in this paragraph to make the point that net-spherical distribution changes (so sea level rise) (IPCC) is defined to a disproportionate increase in the likelihood of flooding even if the increase in sea level is not that large if you expect to be flooded). We have removed this example and have added the example of a GPS-based phone application that estimates travel time.

I think this example of wrist watches is a poor one--watches are generally better, even mechanical ones, if those under $100 even know what such a watch is. In many cases, the example really indicates a bias, not really uncertainty. How about using a GPS travel-time estimate, where can be more or less, depending on conditions, or $100 and not accounting separately for the radiative forcing of methane and other short-lived species that tend not to persist more than a decade or two. It is important to mention that this result is due to over-simplification of the analyses. We have removed the text to acknowledge the role that short-lived burdens such as methane, can play in driving near-term temperature reductions through heavy mitigation of these substances. However, it remains fundamentally true that we are locked in to decades of additional warming even if all GHG (short-lived and otherwise) were to go to zero tomorrow given the long-lifetime of CO2. I think this example of wrist watches is a poor one--watches are generally better, even mechanical ones, if those under $100 even know what such a watch is. In many cases, the example really indicates a bias, not really uncertainty. How about using a GPS travel-time estimate, where can be more or less, depending on conditions, or $100 and not accounting separately for the radiative forcing of methane and other short-lived species that tend not to persist more than a decade or two. It is important to mention that this result is due to over-simplification of the analyses. We have removed the text to acknowledge the role that short-lived burdens such as methane, can play in driving near-term temperature reductions through heavy mitigation of these substances. However, it remains fundamentally true that we are locked in to decades of additional warming even if all GHG (short-lived and otherwise) were to go to zero tomorrow given the long-lifetime of CO2.
At the time of publication of the public comment draft, we did not have information to include the US Caribbean region; this was mentioned in the caption of the figure. We continue to try obtaining this information and hope to be able to obtain that data in time for inclusion in the final version of the report.

I've commented on the earlier presentation of this list, which I think is not of commensurate points, etc. I would defer the point that response will occur, and it can be either proactive or reactive. Where did the Caribbean/Gulf of Mexico islands go?

We have completely re-worked the middle sections of the Overview based on this and other comments — and included a number of new graphs, as well. The Overview now provides an introduction, a summary of climate science (as presented in NCA Vol. I - Climate Science Special Report) as observations, attribution, and impacts before pivoting to a more society-focused middle section that now mirrors the human-focused Report Findings before concluding with the sections of Responses (i.e., Adaptation and Mitigation). This structure more clearly mirrors the assessment as a whole and responds to this comment's call for greater clarity in purpose and redundancies.

We agree with this comment and are exploring how we can most efficiently do this as a Program. We've added a reference to Bakker et al. (2016) and to add the Bakker et al. (2016) reference.

The text has been removed.

We've added a reference to Bakker et al. (2016) in the earlier presentation of this list, which there is not of commensurate points, etc. I would defer the point that response will occur, and it can be either proactive or reactive.

Until the organization of this chapter is more structured and effectively linking the audience at the interest of the overview, the majority of the audience is looking for the strongest points in beginning section. This paper appears to garner this interest by pointing to the issue of climate change as a threat to economic stability and a risk to human health and safety. The tone of the overview gives the impression that this is one of the primary reasons for national and international concern and action. However, the beginning section begins with a synopsis of the status and extent of climate change. These facts are not irrelevant and should not be left out of the definitive version in the overview. However, because of the primary argument being risk assessment based, this should be placed at the forefront of the overview. The structuring of the review of the key titles of "Weather and Climate," "Snow and Ice," "Land and Water," and "Oceans and Coasts" is very helpful to the reader. The overview should instead include major headings that indicate the argument and not the region of interest. Much of the information in the first and second version of these chapters feels repetitive because of the structure. It also gives the impression to the reader that there is less evidence therein actually. If the same information and statement of presentation are repetitive in this manner, overall, the language is strong and the information is well passed together. The real issue in this overview is structure and organization. In the overview, it is critical that the language, arguments, and factual information be well constructed and contain minimal tangents. Breaking up the wall of text with more visuals would be extremely beneficial to extending the reach of this paper to the wider audience.

The text has been removed.

The reference has been added and the text revised as suggested.

The box on short-term natural variability is not the appropriate place to comment on long-term change; this aspect is already made earlier, on page 77 line 28. A reference to Bakker is shown in the earlier presentation.

We've added a reference to Bakker et al. (2016) and note that this is only a study.

The reference has been added and the text revised as suggested.

The reference has been added and the text revised as suggested.
This Key Message probably violates the Information Quality Act requirement that federal agencies ensure that science information be noted that these gases do not trap heat.)

occurred early in the 20th century, when greenhouse gasses were thought to have little impact. (It should also be noted that the gases do not trap heat.)

these changes are well within the range of natural variability. In fact at least half of the temperature increase possible natural causes for the observed changes. Moreover, there are numerous studies that suggest that the increase in radiative forcing due to these activities has far exceeded the relatively small net increase due to natural factors, which include changes in energy from the sun and the cooling effect of volcanic eruptions." (Chapter 1)

It additionally finds that: "In the industrial era, human activities have been, and are increasingly, the dominant cause of climate warming. The increase in radiative forcing due to these activities has far exceeded the relatively small net increase due to natural factors, which include changes in energy from the sun and the cooling effect of volcanic eruptions." (Chapter 2)

The text has been revised to incorporate more of this specific wording.

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Key Message 3: The world’s oceans have absorbed 93% of the excess heat from human-induced warming since the mid-20th century and are currently absorbing more than a quarter of the warming since the mid-20th century and are currently absorbing more than a quarter of the present warming. These wild claims exhibit neither quality, objectivity, utility, nor integrity. To begin with, there is neither a scientific rationale for expecting that the oceans will absorb most of the warming, nor a scientific basis for expecting that the warming will be absorbed unevenly. The text falsely asserts that the oceans are absorbing most of the warming, which they are not. The text also falsely states that the warming is being absorbed in a common belief. That there is any human-induced warming or that the oceans are absorbing most of it has yet to be determined and appears increasingly unlikely. Connecting ocean warming to human emissions is pure speculation at this point.

Key Message 2: Earth’s climate will continue to change over this century and beyond. Past mid-20th century warming is likely to continue and appears increasingly unlikely. Connecting ocean warming to human emissions is pure speculation at this point.

Key Message 1: The earth’s oceans have absorbed 93% of the excess heat from human-induced warming since the mid-20th century and are currently absorbing more than a quarter of the present warming. These wild claims exhibit neither quality, objectivity, utility, nor integrity. To begin with, there is neither a scientific rationale for expecting that the oceans will absorb most of the warming, nor a scientific basis for expecting that the warming will be absorbed unevenly. The text falsely asserts that the oceans are absorbing most of the warming, which they are not. The text also falsely states that the warming is being absorbed in a common belief. That there is any human-induced warming or that the oceans are absorbing most of it has yet to be determined and appears increasingly unlikely. Connecting ocean warming to human emissions is pure speculation at this point.
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| David      | Wojick    | 141524     | Text Region  | 02      | Our Changing Climate | 54         | 56      | 12         | 16      | The present text says this: 12 Additional increases in annual average temperature of about 2.5å¡F (1.4å¡C) are expected 13 over the next few decades regardless of future emissions, and increases ranging from 3.0å¡F to 14 3.2å¡F (1.6å¡C to 1.8å¡C) are expected by the end of century, depending on whether the world 15 follows a higher or lower future scenario, with proportionally greater changes in high 16 temperature extremes. Comment: These supposed “expectations” likely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely. Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1, NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe 4 weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: “Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability, and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Farnel et al. 2013).” (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: “The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with observed physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation).” (Chapter 5) And over longer time scales, Vol. 1 concludes that: “While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the
| Christian   | Armstrong | 141625     | Text Region  | 02      | Our Changing Climate | 47         | 50      | 2          | 9       | Here is the present text: 2 Key Message 6: Annual precipitation has increased across most of the northern and eastern 3 United States and decreased across much of the southern and western United States; these 4 regional trends are expected to continue over the coming century. Observed increases in the 5 frequency and intensity of heavy precipitation events in most parts of the United States are 6 projected to continue. Surface soil moisture over most of the United States is likely to 7 decrease, accompanied by large decreases in snowpack in the western United States and shifts 8 to more winter precipitation falling as rain rather than snow in many parts of the central and 9 eastern United States. Comment: These supposed “expectations” and “projections” falsely assert speculative computer projections as though they were established physical facts, which they are not. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely. Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1, NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: “Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability, and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Farnel et al. 2013).” (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: “The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation).” (Chapter 5) And over longer time scales, Vol. 1 concludes that: “While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the
Christen Armstrong 214209 Test Region 02: Our Changing Climate 13 15 8 12 Present text:

8 Arctic-wide glacial and sea ice loss is expected to continue, by mid-century, it is very likely that the Arctic will nearly lose all sea ice in winter. Permafrost is expected to continue to thaw over the coming century as well, and the carbon and methane released from thawing permafrost has the potential to amplify human-induced warming, possibly by 12 significantly. Comment: These supposed “expectations” likely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.

Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections.

Assertions that climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections.

Christen Armstrong 214303 Test Region 02: Our Changing Climate 14 16 13 18 Present text:

41 Key Message B: Human-induced change is affecting atmospheric dynamics and contributing to 3 the poleward expansion of the tropics and the northwest drift in Northern Hemisphere 16 winter storm tracks since 1950. Increases in greenhouse gases and decreases in air pollution 13 have contributed to increases in Atlantic hurricane activity since 1970. In the future, Atlantic 14 and eastern North Pacific hurricane frequency and intensity are projected to increase, as are 11 the frequency and severity of landfalling "atmospheric rivers" on the West Coast. Comment: This entire message falsely states well-known controversial claims as though they were established 10 physical facts, which they are not. That these extreme claims are highly controversial stands out in the present 9 the text probably violates the information Quality Act requirement that federal agencies ensure and 8 guarantee the "quality, objectivity, utility, and integrity of information disseminated by the agency.” Thus 7 these controversial claims exhibit neither quality, objectivity, utility or integrity. To begin with there is neither 6 objectivity nor integrity. As a result there is no quality or utility.

Assertions that climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections.

David Koplik 214333 Test Region 02: Our Changing Climate 15 17 13 18 Present text:

26 Key Message B: Regional changes in sea level rise and coastal flooding are not evenly 24 distributed across the United States; changes in ocean circulation, land elevation, and 22 Antarctic ice melt will result in greater-than-average sea level rise for the Northeast and 20 western Gulf of Mexico under lower scenarios and most of the U.S. coastline other than 18 Alaska under higher scenarios. Since the 1960s, sea level rise has already increased the 16 frequency of high tide flooding by a factor of 5 to 10 for several U.S. coastal communities. 14 The frequency, depth, and extent of tidal flooding is expected to continue to increase in the 12 future, as is the more severe flooding associated with coastal storms, such as hurricanes and 10 nor’easters. Comment: These supposed “expectations” likely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.

Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections.

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And over longer time scales, Vol. 1 concludes that “White climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the...
Here is the present text:

4 Key Message 10: The climate change resulting from human emissions of carbon dioxide will affect all around the world. The impacts will vary depending on different factors, including temperature, precipitation, sea level rise, and more. These changes will have significant economic and social implications for various regions.  

Both NCA4 Vol. 1 and 2 represent a summary of the state of the science including, where appropriate, an accurate and representative range of uncertainty in both historical observations and future projections. All future projections correspond to a higher and lower future scenario. The Front Matter of Vol. 2 states that, "For the sake of brevity and clarity, the Principals of the Subcommittee on Global Change Research (SCR) decided that NCA4 would focus on RCP 6.0 as a "historical" scenario, and RCP 5.3 as a "lower" scenario." Other RCP scenarios outside the range projected by climate models cannot be ruled out, and due to their systematic tendency to underestimate temperature change during past warm periods, models may be more reliable in predicting future climate change than models that have been used to generate the projections in the IPCC AR4.  

Comment: This text falsely asserts that climate change will be beneficial. It is more likely that climate change will be harmful.  

Analysis of projected changes in past assessments have demonstrated that, if anything, such assessments tend to err on the side of under- rather than over-estimating observed change. A number of such analyses have been conducted by independent researchers as well as by organizations such as the National Research Council.  

These assessments are summarized in Byrnie et al. (2012), who concluded that, "The available evidence suggests that scientists have in fact been conservative in their projections of the impacts of climate change. In particular, we discuss recent studies showing that at least some of the key attributes of global warming from increased greenhouse gases have been under-estimated, particularly in IPCC assessments of the physical climate, by Working Group 1. We note the less frequent manifestation of over-prediction of key characteristics of climate in such assessments. We suggest, therefore, that scientists should not be complacent but rather the reverse: toward cautious estimates, where we define caution as erring on the side of less rather than more alarming predictions."  


The referenced Key Message represents the scientific understanding of climate as summarized it, and presented on the peer-reviewed literature found in NCA Volume 1, which requires the permissions of the Information Quality Act. The text in this Key Message is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 15, for more information.

Response

Thank you; this has been corrected.
Chapter 02. Our Changing Climate

Chapter 02. Our Changing Climate

The chapter begins with a discussion of the effects of past sea ice loss and its consequences for the environment. It notes that the melting of sea ice is an important factor in determining the current state of the climate. The chapter then discusses the role of climate change in influencing sea ice, and how this can impact the Arctic and other parts of the world. It also highlights the importance of understanding the factors that are contributing to the loss of sea ice.

The chapter continues by discussing the effects of increased CO2 on ocean organisms. It notes that the increased CO2 levels in the ocean are likely to have significant impacts on marine ecosystems. The chapter highlights the need for more research to understand how these changes are likely to affect the health of the ocean.

The chapter also addresses the issue of Arctic Amplification and the Jet Stream. It notes that these phenomena are likely to be affected by climate change, and that more research is needed to understand how these changes are likely to impact the climate.

The chapter concludes by discussing the importance of understanding the effects of climate change on the environment. It notes that more research is needed to better understand these effects, and that action must be taken to address the challenges posed by climate change.

I found the chapter to be very interesting, as it describes how much humans are really contributing to climate change. Furthermore, the paragraph in lines 18-24 is wrong or misleading. Emissions from the USA, and North America, not into (i.e. emissions) alone. Increased sequestration, by whatever means, for a given emission level, will also lead to a reduction in the amount of CO2 in the atmosphere.

I appreciate the reviewer's opinion but the title of the chapter cannot be changed at this time. I also appreciate the comments on sea ice changes (which is within the purview of this chapter), the below Key Message 7 has been expanded to explain that the "no-free" threshold would be crossed in late summer; that the metric is a measurement of predictability of the threshold being crossed for the first time in approx. 2 million years; and that sea ice will continue to form each winter. Clarification was also added regarding how loss of sea ice affects heat uptake and distribution in the ocean.

I was interested in reading the additional content provided in the comments, which were helpful in understanding the key messages of the chapter.

Thank you for the kind comment.

I appreciate the reviewer's opinion but the title of the chapter cannot be changed at this time.
Detailed Review Comments of Chapter 2

There is voluminous research discussing the global warming % of total warming % of total warming % of total warming during the 16-years since the previous report. If this 16-years is correct, then it would place the warming trend over the last 16-years over 16-years. From the historical climate record, satellite, and reanalysis data, the warming trend consistent with the 16-years trend was over the 16-years. The 16-years is similar to long but smaller than the 16-years. 20-years ago.

Key Message 1: Lines 16-22 are not entirely representative of the ongoing research into the 16-years. The inclusion of the Lewandowsky et al. (2016) reference suggests this document is hedging toward 16-years. We recommend a more precise statement using short-term warming variability. Additionally, the Karl et al. (2015) paper includes arguably questionable data methodology choices and a better reference exists using the ERSST5 (Huang et al. 2017).

These definitions are needlessly imprecise: % from a few years to a decade or so and should replace with exact information about the length of previous % of total warming % of total warming % of total warming. The recent publication of Yin et al. (2016) in Geophysical Research Letters on the % of total warming % of total warming % of total warming is a useful reference as it provides an explanation for the observed warming. The statement % of total warming % of total warming % of total warming is not a good look and will not end up treating future predictions of warming especially when leading climate scientists like James Hansen are predicting another decade-long % of total warming % of total warming % of total warming.

We suggest that the authors remove this sentence from the Key Message, or use existing literature to present a more consensus view on the extreme projections for 2100. In Chapter 8, page 304, line 11-13, for example, the authors state that the readers should see NCA4 Volume 1 for more extensive discussion on the topics discussed in this chapter. We state that the readers should see NCA4 Volume 1 for more extensive discussion on the topics discussed in this chapter.

The next major comment relates to Key Message 8. This section is by necessity quite short, but the extensive discussion reviewer wants to see on the Arctic can be found in Chapter 11 of NCA4 Volume I. Early in the chapter we state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter. We state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter.

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This comment should have been broken into separate comments about various sections of Chapter 2 rather than being a Whole Chapter comment. Nonetheless, we will deal with each of the comments one by one.

The first comment is that there is need to further discuss the so-called hiatus. The sentence relating to the term % of total warming % of total warming % of total warming should not be this, however, they now also clearly reference the extensive discussion on the hiatus found in Chapter 1 of NCA Volume I, including the connections to changes in heat uptake during the period of the hiatus. A number of studies are referenced here, and others are also discussed in Volume I. The next major comment relates to Key Message 8. This section is by necessity quite short, but the extensive discussion reviewer wants to see on the Arctic can be found in Chapter 11 of NCA4 Volume I. Early in the chapter we state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter. We state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter.

This reference has been added.

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This reference has been added.

This comment should have been broken into separate comments about various sections of Chapter 2 rather than being a Whole Chapter comment. Nonetheless, we will deal with each of the comments one by one.

The first comment is that there is need to further discuss the so-called hiatus. The sentence relating to the term % of total warming % of total warming % of total warming should not be this, however, they now also clearly reference the extensive discussion on the hiatus found in Chapter 1 of NCA Volume I, including the connections to changes in heat uptake during the period of the hiatus. A number of studies are referenced here, and others are also discussed in Volume I. The next major comment relates to Key Message 8. This section is by necessity quite short, but the extensive discussion reviewer wants to see on the Arctic can be found in Chapter 11 of NCA4 Volume I. Early in the chapter we state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter. We state that the readers should see NCA4 Volume I for more extensive discussion on the topics discussed in this chapter.

This reference has been added.
<table>
<thead>
<tr>
<th>First Name</th>
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<th>Comment ID</th>
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<th>Chapter</th>
<th>Figure/Table Number</th>
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<tbody>
<tr>
<td>Michelle</td>
<td>Tigchelaar</td>
<td>143909</td>
<td>Test Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>10</td>
<td>16</td>
<td>23</td>
<td>28</td>
<td>This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were present: Dr. Mary Fisher, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Tannenbaum. This text recognizes a variety of definitions of feedback in the climate literature. For example, the highly cited Soden et al. (2008) considers the Planck feedback to be one of the radiation feedbacks, so that the net feedback is damping to be clearer what is meant, we suggest writing “The net effect of these feedbacks (excluding the Planck response) over the industrial era has been to amplify...” Soden, R.J., J.M. Held, R. Colman, C.M. M. Shef, J.F. Kiehl, and C.A. Shively, 2008: Quantifying Climate Feedbacks for Long-Range Forecasts. J. Climate, 21, 3094-3102. Suppl. doi:10.1175/2007JCLI2130.1. We disagree with the suggestion that the &quot;net radiative feedback is damping&quot;. As was stated in NCA4 Volume 1: &quot;When the temperatures of Earth’s surface and atmosphere increase in response to RF, more infrared radiation is emitted into the lower atmosphere; this serves to restore radiative balance at the tropopause. The radiation feedback, defined as the Planck feedback, only partially offsets the positive RF while triggering other feedbacks that affect radiative balance. The Planck feedback magnitude $\sim 0.12$ W/m$^2$°C (0.2°F) of cooling and is the strongest and primary stabilizing feedback in the climate system (Vial et al. 2015).&quot; NCA4 Volume 1, on which this chapter is based, does account for the Planck function. So the statement in the chapter that &quot;net effect of these feedbacks over the industrial era has been to amplify human-induced warming&quot; is correct as it stands.</td>
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<tr>
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<td>143915</td>
<td>Test Region</td>
<td>02</td>
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<td>7</td>
<td>9</td>
<td>7</td>
<td>20</td>
<td>This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were present: Dr. Mary Fisher, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Tannenbaum. This comment regards the statement of the past decade, such a slowdown led to numerous assertions that global warming had stopped. No temperature records, however, show that long-term global warming has ceased or even substantially slowed over the past decade. It is not clear what is meant by this statement. Consider instead the following: &quot;The slowdown from about 1998 to 2008 led to some speculation that 20th century warming was not due to anthropogenic climate forcing, whereas global warming resumed in the last decade, and global warming is clear in long-term temperature records despite occasional 5 to 10 year periods of slowdowns.&quot;</td>
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<tr>
<td>Michelle</td>
<td>Tigchelaar</td>
<td>143930</td>
<td>Test Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>75</td>
<td>76</td>
<td>18</td>
<td>30</td>
<td>This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were present: Mary Fisher, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Tannenbaum. This text has three issues. (1) There is little sinking in the Arctic Ocean; (2) the freshwater budget of the Arctic is not described correctly; and (3) ocean heat loss is by far the largest contribution to the sinking rate, not freshwater. Melting sea ice causes no significant annual source of freshwater to the Arctic Ocean. Instead, owing to a large export of sea ice out the Fram Strait, there is actually a loss of freshwater from net annual growth in the Arctic Ocean. The major sources of freshwater to the Arctic Ocean are direct precipitation, land runoff, and export of fresh water from the Atlantic Ocean. Presumably this text should be altered to describe the sinking in the North Atlantic and its freshwater budget. Consider replacing the text with, &quot;The role of sinking in the northern North Atlantic depends on heat loss from the ocean to the atmosphere as well as freshwater input to the surface. Freshwater sources include runoff from melting land ice, direct precipitation, and export of sea ice and relative freshwater from the Arctic ocean into the Atlantic Ocean. For decades scientists have been concerned that the role of sinking could slow as atmospheric warming impairs ocean heat loss and raises direct precipitation and melting rates (land-ice %).&quot;</td>
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<tr>
<td>Mary</td>
<td>Fisher</td>
<td>143796</td>
<td>Whole Page</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>42</td>
<td></td>
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<td></td>
<td>We have now better articulated that the current rate of rise responsible for 'almost half' the rise since 1900 is very likely to continue through year 2100 to 1-4.3 feet.</td>
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<tr>
<td>Mary</td>
<td>Fisher</td>
<td>143797</td>
<td>Test Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>43</td>
<td>63</td>
<td>14</td>
<td>15</td>
<td>It’s worth highlighting (1) why and (2) the implications of a higher rate for decision making and adaptation, since we have a lot of this SLR baked in for the first half of this century. Arctic sea ice was left out of this sentence (uncertainties associated with modeling). It may be helpful to have all the key messages up front, followed by a breakdown of each one, to better follow the format of the other chapters and have the main points in one place.</td>
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</tr>
<tr>
<td>Mary</td>
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<td>02</td>
<td>Our Changing Climate</td>
<td>83</td>
<td>63</td>
<td>14</td>
<td>16</td>
<td>The higher rate is since early 1980’s, not in the last decade only - the way it is written a bit misleading. From CSR: Title: gauge analyses indicate that GMSL rose at a considerably faster rate of about 3 mm/year (0.12 inches/year) since 1993, a rate supported by satellite data indicating a trend of $3.4 \pm 0.4$ mm/year (0.13 to 0.16 inches/year) over 1993–2015. We have now better articulated that the current rate of rise responsible for ‘almost half’ the rise since 1900 is very likely to continue through year 2100 to 1-4.3 feet.</td>
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</tr>
<tr>
<td>Margaret</td>
<td>Mutter</td>
<td>143900</td>
<td>Figure</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>The Figure 2.7 title on line 10 “Observed and Projected Change in Heavy Precipitation does not correspond to the titles above the bars of maps of the U.S. The title on the left appears to make it heavy precipitation events, whereas the titles of the two pairs of maps refer to the 99th percentile of annual precipitation. The tile for the top pair of maps is “Observed Change in Total Annual Precipitation Above the 99th Percentile” and the tile accompanying the lower pair of maps is “Projected Change in Total Annual Precipitation Above the 99th Percentile by Late 21st Century.”</td>
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<tr>
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<td>Our Changing Climate</td>
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<td>21</td>
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<td></td>
<td>This text has been revised to make this point more clear.</td>
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<tr>
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<td>The text has been revised to make this point more clear.</td>
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<tr>
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<td>02</td>
<td>Our Changing Climate</td>
<td>17</td>
<td>21</td>
<td>23</td>
<td></td>
<td>We appreciate this comment and considered it carefully, but concluded in the end that we do not feel that the original text is unclear, and moreover the suggested text does not say the same thing as the text is intended to convey, which is in turn based on a very similar statement in NCA4 Volume 1.</td>
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<tr>
<td>Rebecca</td>
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<td>The chapter follows the pre-determined format of the NCA4 chapters.</td>
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<td>The text has been revised to make this point more clear.</td>
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<td>The text has been revised to make this point more clear.</td>
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</table>

Note: The table above contains a summary of comments and responses regarding the first page of the document. Each row represents a comment made by a reviewer, along with the corresponding response from the author(s). The table includes information on the reviewer, the type of comment (e.g., comment ID, comment type), the chapter reference, and the specific lines in the document where the comment was made. The comments and responses are organized to reflect the feedback process, allowing for a clear understanding of the iterative revision process.
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<th>Comment</th>
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<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>17</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>Please capitalize “Earth” when talking about the planet. Are you talking about warming of the land areas of the globe by using “earth” Families of all other planets are capitalized (even the former planet Pluto). Earth deserves the respect of having its name capitalized. This will also make text consistent with page 58, lines 4 and 6, and hopefully in the rest of the document. Revised as suggested.</td>
</tr>
<tr>
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<td>02</td>
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<td>8</td>
<td>58</td>
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<td>2</td>
<td>would also urge capitalizing “Earth” when referring to our sun. Also, see page 55, line 6 and then further on. Revised as suggested.</td>
</tr>
<tr>
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<td>144501</td>
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<td>Our Changing Climate</td>
<td>10</td>
<td>6</td>
<td>11</td>
<td>11</td>
<td>This is a pretty optimistic statement - given how slow the response has been to the need to cut emissions. It's a FDDO of 1.5. Chad all emissions pathways having large offsets. I think it's needed to make clearer here that the emissions cutbacks need to do this the much more much more that nation's have committed to do, much less are not so actually so do, per the Paris Accord. Revised as suggested.</td>
</tr>
<tr>
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<td>144502</td>
<td>Core Region</td>
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<td>Our Changing Climate</td>
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<td>I urge adjusting the wording to say &quot;by the end of this century and beyond compared to preindustrial&quot; to indicate warming would last, and also that a warming this large may take until a bit after 2100 to do some impact. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144503</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>60</td>
<td>60</td>
<td>24</td>
<td>24</td>
<td>Worsening a word, need to say &quot;associated with modeling&quot; Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144504</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>60</td>
<td>60</td>
<td>26</td>
<td>26</td>
<td>It seems to me the philosophical phrase is located in the到位 location -- if it is a reference, that style needs to be used; otherwise, the assessment itself is not going to be in that box (findings of it may be in that box, and if that is what is meant, a bit of clarification is needed). Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144505</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>60</td>
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<td>31</td>
<td>31</td>
<td>Change &quot;what's in the amount to be clearer and a bit more formal. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144506</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>61</td>
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<td>22</td>
<td>22</td>
<td>As I have suggested elsewhere, I think it would be much more informative for readers to have the scenarios named based on what the scenario means with respect to ongoing CO2 emissions - FF forever, FF phasedown, or FF phasing out, etc. Scenarios are described as per the standardized wording that is used across all chapters in NGA Vol. 3 and 2. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144507</td>
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<td>Our Changing Climate</td>
<td>61</td>
<td>61</td>
<td>23</td>
<td>23</td>
<td>As noted elsewhere, I would urge changing &quot;about 95%&quot; to &quot;over 95%&quot; to better recognize that there are uncertainties that really, don't justify going to two figure precision. Revisions as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144508</td>
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<td>02</td>
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<td>Revised as suggested.</td>
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<td>Our Changing Climate</td>
<td>62</td>
<td>62</td>
<td>11</td>
<td>11</td>
<td>Need to say &quot;negligibly&quot; as a quarter of a bit from here on. Also, this sort of implies it's taking up those particular molecules, and that is not the case. It's also important to say that the uptake is the net effect as there is no short-term removal of any of these natural and background gas and net amounts. Thus, it might be said that the &quot;seasonal net uptake each year has been about a quarter of each year's emissions.&quot; I would also note that this has been the case the CO2 emissions are rising. As emissions eventually start going down gradually and reach zero, the relationship will change, so it might be said that the situation is now -- as it won't be forever. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144512</td>
<td>Core Region</td>
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<td>Our Changing Climate</td>
<td>62</td>
<td>62</td>
<td>13</td>
<td>13</td>
<td>Repeatedly, change &quot;near&quot; to &quot;roughly a quarter -- actually, the compensation depth that yrs seems already too low enough to be disturbing shells, etc. Revised as suggested.</td>
</tr>
<tr>
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<td>02</td>
<td>Our Changing Climate</td>
<td>62</td>
<td>62</td>
<td>30</td>
<td>31</td>
<td>To justify numbers being so precise, it would be good to somehow align here indicate that these numbers are developed from the results of a number of models, each separately preparing an ensemble of simulations. But, would note, this is really not a true measure of anxiety as an opposed to a true measure of the spread among the set of simulations of a set of models, each of which is being run in its presumably optimal configuration. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144514</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>62</td>
<td>62</td>
<td>31</td>
<td>31</td>
<td>In referencing the change to the 20th century values, the extent of disturbance to date is left off and this must be used for future projections. In addition to presenting F and C, I'd urge presenting the results to both preindustrial and late 20th century, so perhaps saying something like 'with an increase of 4.9 +/- 1.3 F (2.7 +/- 0.7 C) by 2100 as compared to the late 20th century relative to the last few decades. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>Our Changing Climate</td>
<td>62</td>
<td>62</td>
<td>36</td>
<td>38</td>
<td>May be to page 63, line 1, but entry system prevents inputting that. What I am wondering is why be including increase of 4.9 +/- 1.3 F (2.7 +/- 0.7 C) for temperature if not also including metric along with metric units for sea level rise. I would also urge adjusting the wording to say &quot;by the end of this century and beyond compared to preindustrial&quot; to indicate warming would last, and also that a warming this large may take until a bit after 2100 to do some impact. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>02</td>
<td>Our Changing Climate</td>
<td>63</td>
<td>63</td>
<td>4</td>
<td>4</td>
<td>For formal report writing, change &quot;it's in &quot;Global sea level&quot;. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144517</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>63</td>
<td>63</td>
<td>5</td>
<td>5</td>
<td>I'd urge change &quot;it's in &quot;seawater&quot; and then later in the sentence change &quot;seawater&quot; to &quot;the seawater&quot; Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>63</td>
<td>63</td>
<td>7</td>
<td>7</td>
<td>Change &quot;water&quot; to &quot;seawater&quot; for consistency of expression (even though the added water is freshwater). No need for comma or line 7. Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144519</td>
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<td>02</td>
<td>Our Changing Climate</td>
<td>63</td>
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<td>10</td>
<td>10</td>
<td>Needs to be said that the reason one is stopping at 2800 years is that is how far back adequate proxy records extend, and that the actual period likely goes back to over 8000 years ago, the time when major melting from the last glacial period ended. Revised as suggested.</td>
</tr>
<tr>
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<td>144520</td>
<td>Core Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>63</td>
<td>63</td>
<td>24</td>
<td>24</td>
<td>The right side better say &quot;While the rate of sea level rise will be little affected by the near-term emission trajectory, sea level rise beyond 2050 will be significantly affected.&quot; I wish note that &quot;future scenario&quot; is repetitive and not what matters. Future emissions are what matters. Revised as suggested.</td>
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</table>

The chapter follows the same naming conventions that apply to the entire NCA4.
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<td>3</td>
<td>35</td>
<td>1</td>
<td>1</td>
<td>The flattening of this graph does not really seem a good way to convey how much sea level rise is being projected. By my calculation, the vertical scale is reduced by something like a factor of 128 compared to reality. It suggests reducing this to something more like a factor of 3, and then perhaps indicate this in the caption.</td>
<td>We agree, this figure has been revised and updated.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144122</td>
<td>Text Region</td>
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<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>something happened in the caption says the units are inches whereas the figure shows feet and meters. Agree; this graph is just too flat.</td>
<td>The figure has been revised and updated to address both of these issues.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144123</td>
<td>Text Region</td>
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<td>3</td>
<td>3</td>
<td>I would not use the word &quot;bound&quot;—get a West Antarctic ice sheet collapse and the rise could be greater. Fine to say the various curves cover a range of what present understanding suggests is plausible, but given the limits of knowledge (and arbitrary assumption by DeConto and Pollard) limit of how rapidly could occur, I'd avoid using the word &quot;bound.&quot; I would also urge adding a sentence to the caption indicating that real sea rise would be likely to keep rising at a high rate after 2100 because once the melting process is begun, it will become more and more difficult to stop.</td>
<td>We have re-worded accordingly.</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144124</td>
<td>Text Region</td>
<td>02. Our Changing Climate</td>
<td>4</td>
<td>6</td>
<td>23</td>
<td>23</td>
<td>Others time is running backwords, you have the periods in the wrong order.</td>
<td>Revised as suggested.</td>
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<td>4</td>
<td>6</td>
<td>13</td>
<td>15</td>
<td>I wonder if it might be useful here to indicate that at least some of the extra warmth was the result of poor land use practices that tended to strip the land of vegetation, which in turn reduced evaporative cooling. The present warming, it might be noted, is occurring even in the presence of much more responsible land use practices, greater vegetation cover and soil moisture, and higher humidities (an indication of evaporative cooling).</td>
<td>The text has been revised to incorporate this suggestion.</td>
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<tr>
<td>Michael</td>
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<td>144126</td>
<td>Text Region</td>
<td>02. Our Changing Climate</td>
<td>4</td>
<td>6</td>
<td>18</td>
<td>18</td>
<td>Seven variability, might be better to say “much more common” instead of “common” —I’d also be a bit cautious in using the word common. Given current NOAA practice of updating the “normal” every decade to the most recent three decades, weather forecasters will tend not to be saying that the warm periods are as unusual as is implied here. While the wording here is actually comparing the years instead of the decade, what is really being missed is that if one considers the changing likelihood since the mid 20th century when a lot of infrastructure was put in place following World War II, the extremely warm conditions becoming typical are 5 to 6 or more standard deviations above the 1951-80 normal—so roughly 1 in a few million type of occurrences for infrastructure built in the mid 20th century (and forests that were growing then). This updating of normals that NOAA does is fine if the underlying climate is not changing and for aspects of the economy that are continually adapting to the then current climate, but for anything that was built tied to some previous climate, the degree of change is way beyond design factors used for a large portion of the infrastructure that we depend on.</td>
<td>We believe the word “common” is sufficiently descriptive, so the text remains the same.</td>
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<td>MacCracken</td>
<td>144127</td>
<td>Figure</td>
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<td>4</td>
<td>35</td>
<td>6</td>
<td>5</td>
<td>What about for the Caribbean island component of the US?</td>
<td>We believe the word “common” is sufficiently descriptive, so the text remains the same.</td>
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<td>144128</td>
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<td>02. Our Changing Climate</td>
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<td>6</td>
<td>6</td>
<td>In talking about the increase in heat waves, it also needs to be mentioned that the absolute humidity will also be higher, and that the discomfort index will be increasing even more than the temperature. Basically, the situation is going to become intolerable for working and exercising outdoors during much of the year.</td>
<td>The purpose of this paragraph is to summarize Chapter 6, which focused on changes in temperature (vs. humidity).</td>
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<td>2</td>
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<td>During what period of time have these changes occurred?</td>
<td>The text has been revised to say “Since the beginning of the last century.”</td>
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<td>10</td>
<td>12</td>
<td>It might be noted that this is consistent with the expansion of the subpolar, which is a feature associated with increased climate change.</td>
<td>A comment to this effect has been added.</td>
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<td>16</td>
<td>16</td>
<td>Change “increases” to “precipitation increases.” Well, actually, it is quite surprising that in the sentence that goes from line 12 to line 18 the word “precipitation” does not get mentioned until line 17—it needs to be mentioned earlier.</td>
<td>Two mentions of precipitation have been added to this paragraph.</td>
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<td>22</td>
<td>I’d prefer “stronger” to “greater”</td>
<td>Revised as suggested.</td>
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<td>144133</td>
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<td>4</td>
<td>6</td>
<td>24</td>
<td>26</td>
<td>Delete “future” —“projected” means future.</td>
<td>Revised as suggested.</td>
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<td>144134</td>
<td>Text Region</td>
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<td>24</td>
<td>28</td>
<td>Change “average” to “projected average” as changes have not yet occurred—and the precision is likely overreaching—how about saying “about 40%.”</td>
<td>The reviewer is mistaken; the numbers they reference are clearly indicated to be observed, not projected.</td>
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<td>20</td>
<td>31</td>
<td>What the basic story says is models are doing what the theory inherent in them indicates is likely—and would suggest that might suggest they are too connected to be relevant. What is perhaps more important is that they continue observed trends.</td>
<td>The reviewer is mistaken; the numbers they reference are clearly indicated to be observed, not projected.</td>
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<td>The text is this case could be explained by mentioning the greater variability makes it difficult to identify trends this point.</td>
<td>The existing sentence fully explains the lack of clear trends from floods, and additional information is provided in NCA4 Volume I, Chapter 6.</td>
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<td>Delete the word “future” —these are present projections. The word projection includes saying that one is talking about the future.</td>
<td>We reworded the relevant text and did not feel any changes were necessary.</td>
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<td>Again, delete the word “future” —these are scenarios that we have now and that are scenarios includes meaning they are about the future.</td>
<td>Comments can be past or future; the word “future” makes it clear that these are the latter.</td>
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<td>By eliminating the potential for evaporative cooling, drought itself leads to warming and so the simultaneity mentioned here. What happened in those years was that changes in the atmospheric circulation led to less precipitation and thence drying and thence warming while also bringing warmer air to start with into the region.</td>
<td>Thank you for this comment. Chapter 6 of NCA4 Vol 1 expands on this point in some detail.</td>
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Climate intervention is begun very soon. There is no basis at all for including the words "decades" here—the time scale at a minimum is centuries unless just seems to me far from what is most likely, especially if one also includes the reduction in net aerosol
It seems to me there is a good chance that the increase in global average temperature relative to preindustrial
each of the RCP numbers mean, doing so having no real understanding of what radiative forcing is. then call RCP6.0 by FFdelayed phasedown, and create an RCP1.0 or something like that and call it something like: replace RCP8.5 by FFforever, RCP4.5 by FFphasedown, and RCP2.6 by FFphasedown. Perhaps it would be much more informative to given an indication of what each scenario includes with respect to fossil
The parenthetical terms being used are based on a policy perspective of what might be reasonably done in the future—they are not scientific judgments, and so should not be used here. As I have suggested elsewhere, I think it would be much more informative to given an indication of what each scenario includes with respect to fossil fuel emissions, and in doing this one might well add a more rapid phasing out option. My suggestions were thus for something like: replace RCP8.5 by FFforever, RCP4.5 by FFphasedown, and RCP2.6 by FFphasedown. Perhaps then call RCP6.0 by FFphasedown/reduced and create an RCP4.5 or something like that and call it "FlatFossil". Doing this would theoretically I think be much more informative than having to remember what each of the RCP numbers mean, doing so having no real understanding of what radiative forcing is. This is WRONG—even with perfect observations, the chaotic behavior of nonlinear systems makes prediction of climate variations over the period of seasons to perhaps two decades mostly not possible (not to mention one or two unexpected forcings like volcanic eruptions). Saying the problem is observations leads to officials
This is amplified in the remainder of this paragraph as well as the paragraph that follows. This point has been added to the sea level rise section above, and the interested reader is referred to NCA4 Volume 1 Chapters 4 and 15 for more detail. This sentence is amplified in the remainder of this paragraph as well as the paragraph that follows. The parenthetical terms being used are based on a policy perspective of what might be reasonably done in the future—they are not scientific judgments, and so should not be used here. As I have suggested elsewhere, I think it would be much more informative to given an indication of what each scenario includes with respect to fossil fuel emissions, and in doing this one might well add a more rapid phasing out option. My suggestions were thus for something like: replace RCP8.5 by FFforever, RCP4.5 by FFphasedown, and RCP2.6 by FFphasedown. Perhaps then call RCP6.0 by FFphasedown/reduced and create an RCP4.5 or something like that and call it "FlatFossil". Doing this would theoretically I think be much more informative than having to remember what each of the RCP numbers mean, doing so having no real understanding of what radiative forcing is. while we do not agree that this is a good idea for other reasons as well. It was more of a question of expressing a concern about the potential for creating confusion by using such terms. This sentence follows the same naming conventions that apply to the entire NCA4. This point is already implicit, and REM does not address the question of stabilization. this is more a question of wording than content. We reviewed the relevant text and did not find the proposed change made the sentence clearer. We reviewed the relevant text and did not find the proposed change made the title clearer. We reviewed the relevant text and did not find the proposed change made the title clearer. This sentence has been modified to say "substantial reductions", which is in line with the wording in Chapter 14 of the NCA4 Volume 1. The sentence here is simply intended to be an introduction to the issue; we have included references to relevant chapters (4 and 14) from Volume 1 and the interested reader is referred to those chapters for more detail. This point is already implicit, and REM does not address the question of stabilization.
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<td>Our Changing Climate</td>
<td>30</td>
<td>81</td>
<td>34</td>
<td>34</td>
<td>This text needs to say &quot;about 1800-GC since pesticides/hormones.&quot; And I would note, even assuming this number is right, this means 23 years at current emissions rates and then zero thereafter. How is this consistent with the statements in the 26-year emission reductions before 2045? By then one has to be at zero. And if one set the objective to be 1.5°C, then one has to be at zero much sooner. I would also note that 1.5 and 2°C stabilization points would have tremendous impacts. The objective needs to be to peak at lower than the 1.5 or 2°C and get back to 1.5°C as soon as possible.</td>
<td>In response to the first part of the comment, we have revised the text as suggested. The new text is &quot;Stabilizing global average temperature at or below long-term warming targets would require significant reductions in net global carbon emissions relative to present-day values well before 2045, and Burdi would require net emissions to become zero or possibly negative later in the century. The warming and associated climate effects from carbon emissions will persist for decades to millennia (Cai et al. 2012, Isaac et al. 2015). Accounting for emissions of carbon as well as other greenhouse gases and particles with lifetimes from weeks to centuries, cumulative anthropogenic carbon emissions would likely need to stay below about 403 GtC since the preindustrial era in order to provide a two-thirds likelihood of preventing 2.4°C of warming, implying that approximately, only 230 GtC more could be emitted globally in order to meet that target.&quot; In response to the second part of the comment, it is not our role to recommend or advocate for specific policy choices or targets.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144185</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>1</td>
<td>1</td>
<td>This text needs to say &quot;reduce the increase in global average temperature.&quot;</td>
<td>Revised to read: &quot;limit the increase&quot;</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144186</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>4</td>
<td>4</td>
<td>This is beyond the scope of this chapter, which addresses only the physical changes in the climate system. Other NCA chapters address human response.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144187</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>22</td>
<td>22</td>
<td>Wordings need to be simplified, replacing &quot;have been observed to increase&quot; to &quot;have increased&quot; and then on line 22 delete &quot;now.&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144188</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>24</td>
<td>24</td>
<td>Change &quot;exceeds&quot; to &quot;exceeded that of&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144189</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>24</td>
<td>25</td>
<td>Thinner's, revised accordingly.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144190</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>31</td>
<td>81</td>
<td>18</td>
<td>18</td>
<td>I would suggest saying &quot;human-influenced contribution&quot;, and in that the subject is singular, change &quot;were greater&quot; to &quot;was greater.&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144191</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>32</td>
<td>82</td>
<td>10</td>
<td>10</td>
<td>Again, change &quot;future projections&quot; to &quot;projections of future changes&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144192</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>32</td>
<td>82</td>
<td>14</td>
<td>14</td>
<td>I'd suggest changing &quot;Other types to Characteristic&quot;</td>
<td>Reviewed the relevant text and did not feel the proposed change made the text clearer.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144193</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>32</td>
<td>82</td>
<td>16</td>
<td>16</td>
<td>Should &quot;change&quot; predict to &quot;project&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144194</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>33</td>
<td>83</td>
<td>16</td>
<td>16</td>
<td>Again, change &quot;future projections&quot; to &quot;projections of future changes&quot;</td>
<td>Revised as suggested.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144195</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>33</td>
<td>83</td>
<td>17</td>
<td>17</td>
<td>Suggest changing &quot;local&quot; to &quot;regional&quot; or &quot;national&quot;</td>
<td>Reviewed the relevant text and did not feel the proposed change made the text clearer.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144196</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>33</td>
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<td>14</td>
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<td>Revised as suggested.</td>
</tr>
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<td>Michael</td>
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<td>144197</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>33</td>
<td>83</td>
<td>19</td>
<td>19</td>
<td>Capable &quot;Earth&quot;</td>
<td>The chapter text will be reviewed to conform with the grammatical standards of the entire NCA document.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144198</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>33</td>
<td>83</td>
<td>32</td>
<td>32</td>
<td>I've by now forgotten what &quot;NCA4&quot; stand for</td>
<td>The Fourth National Climate Assessment.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144199</td>
<td>Text Region</td>
<td>02</td>
<td>Our Changing Climate</td>
<td>35</td>
<td>109</td>
<td>1</td>
<td>19</td>
<td>In order to spend some time on reviewing other chapters, I will assume comments made on the main text will be carried over to the Traceable Accounts</td>
<td>Yes.</td>
</tr>
<tr>
<td>David</td>
<td>Koplitz</td>
<td>144003</td>
<td>Text Region</td>
<td>03</td>
<td>Water</td>
<td>35</td>
<td>135</td>
<td>0</td>
<td>0</td>
<td>Some precipitation events are expected to increase in a warming climate and may lead to more severe floods and greater risk of infrastructure failure in some regions. Infrastructure design, operation, financing principles, and regulatory standards typically do not account for a changing climate, presenting a risk to existing infrastructure systems. Comment: The text falsely asserts speculative computer projections as though they were established physical facts, which they are not. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the &quot;quality, objectivity, utility, and integrity of information disseminated by the agency.&quot; The text exhibits neither quality, objectivity, utility, or integrity. To begin with there is neither impartiality nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.</td>
<td>The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA Volume 1: [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the statements about future climate change included in the Water chapter. The report does acknowledge uncertainties in climate model projections. The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA Volume 4.</td>
</tr>
<tr>
<td>Sarah</td>
<td>Davidson</td>
<td>144096</td>
<td>Table</td>
<td>03</td>
<td>Water</td>
<td>34</td>
<td>130</td>
<td>7</td>
<td>129</td>
<td>Consider including just one key to avoid redundancy and make clear that the scale and coloring are the same in both the 1990-2000 and 2001-2008 maps.</td>
<td>We have updated the figure to keep the legend uniform.</td>
</tr>
<tr>
<td>Sarah</td>
<td>Davidson</td>
<td>144097</td>
<td>Text Region</td>
<td>03</td>
<td>Water</td>
<td>33</td>
<td>133</td>
<td>15</td>
<td>15</td>
<td>Given the state of scientific understanding described in Chapter 2, consider changing &quot;if temperature continues...&quot; to &quot;if temperatures continue...&quot;</td>
<td>The text has been revised as suggested.</td>
</tr>
</tbody>
</table>
| Sarah     | Davidson  | 144098     | Text Region  | 03      | Water                | 33         | 133        | 11       | 11       | Consider pointing out that the High Plains Aquifer is the largest freshwater aquifer in the US and it is used to sustain one of the nation's primary agricultural regions, e.g., see Branson et al. (2017), doi:10.1111/j.1947-1073.2017.00021.x; McGurk et al. (2017), doi:10.1029/2015WR011668. | We added the Branson 2017 reference and the following text: "The largest freshwater aquifer in the continuous United States that supports an important agricultural region (McGuirk, 2017)"

<p>| Sarah     | Davidson  | 144099     | Text Region  | 03      | Water                | 34         | 134        | 14       | 14       | In discussing sea level rise and coastal erosion, consider mentioning that groundwater depletion can itself cause land subsidence, thus increasing relative sea-level rise. See e.g., Epps et al. (2016, doi:10.1130/G37500.1) and Egbert et al. (2013). | Revised as suggested. |
| Sarah     | Davidson  | 144100     | Text Region  | 03      | Water                | 35         | 135        | 9        | 9        | Consider referencing Harvey et al. (2013, doi:10.1007/s00603-013-0704-7) | The suggested reference has been included. |
| Nila      | Brown     | 144241     | Text Region  | 03      | Water                | 30         | 130        | 8        | 8        | Severe storms should be mentioned with droughts and floods. | The text has been added that climate change affects the frequency and magnitude of severe storms. The link between severe storms and floods is discussed in the regional roll-up section. |
| Nila      | Brown     | 144245     | Text Region  | 03      | Water                | 35         | 135        | 20       | 21       | Useful life should be defined. | We have replaced it with &quot;design life&quot;, which is a more commonly used term in engineering design and operation. |
| Nila      | Brown     | 144246     | Text Region  | 03      | Water                | 35         | 135        | 11       | 11       | The statement &quot;Much of the aging US water infrastructure poses a risk to society&quot; is a blanket statement that must be supported with a quantitative description, rather than a general qualifier. What constitutes &quot;water infrastructure&quot; should also be defined. | The text has been revised. The phrase &quot;risk to society&quot; has been revised to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to. |</p>
<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>Brown</td>
<td>142149</td>
<td>Footnote</td>
<td>03. Water</td>
<td></td>
<td>159</td>
<td>159</td>
<td>15</td>
<td>15</td>
<td>The references cited do not support the estimate of four trillion dollars. This sentence appears to be an AWWA report on a one trillion dollar cost. Furthermore, the other citations for this sentence reference addictions about dams, and not other types of water infrastructure.</td>
<td>The text has been revised to clarify. The phrase “risk to society” has been changed to say risk of failure. The text has also been added listing the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrastructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the “billions of dollars”. Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information.</td>
</tr>
<tr>
<td>Allison</td>
<td>Brown</td>
<td>142148</td>
<td>Footnote</td>
<td>03. Water</td>
<td></td>
<td>155</td>
<td>155</td>
<td>15</td>
<td>15</td>
<td>The &quot;McDonald, 2015&quot; citation should read &quot;McDonald, 2015.&quot;</td>
<td>The paragraph has been corrected.</td>
</tr>
<tr>
<td>Erica</td>
<td>Crimmins</td>
<td>142150</td>
<td>Footnote</td>
<td>03. Water</td>
<td></td>
<td>159</td>
<td>159</td>
<td>16</td>
<td>16</td>
<td>The &quot;Medina, 2003&quot; citation should read &quot;Medina, 2013.&quot;</td>
<td>The paragraph has been corrected.</td>
</tr>
<tr>
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<td>Crimmins</td>
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<td>Footnote</td>
<td>03. Water</td>
<td></td>
<td>159</td>
<td>159</td>
<td>15</td>
<td>15</td>
<td>The &quot;Stern, 2006&quot; citation should read &quot;Stern, 2007.&quot;</td>
<td>The paragraph has been corrected.</td>
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<tr>
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<td>15</td>
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<td>The &quot;Schmitt, 2010&quot; citation should read &quot;Schmitt, 2010.&quot;</td>
<td>The paragraph has been corrected.</td>
</tr>
<tr>
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</tr>
<tr>
<td>Brown</td>
<td>Brown</td>
<td>142154</td>
<td>Note</td>
<td>03. Water</td>
<td></td>
<td>136</td>
<td>136</td>
<td>24</td>
<td>24</td>
<td>The paragraph contains a method for determining adaptation costs. The text should state that: &quot;We have included one example: water-energy infrastructure including dams used for storage and flood control and also energy generation.&quot;</td>
<td>The paragraph has been revised for clarity.</td>
</tr>
<tr>
<td>Brown</td>
<td>Brown</td>
<td>142151</td>
<td>Page footnote</td>
<td>03. Water</td>
<td></td>
<td>137</td>
<td>137</td>
<td>10</td>
<td>10</td>
<td>The text was revised to emphasize that the argument presented is not about the definition of &quot;risk to society&quot;.</td>
<td>The paragraph has been revised for clarity.</td>
</tr>
<tr>
<td>Brown</td>
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<td>142152</td>
<td>Page footnote</td>
<td>03. Water</td>
<td></td>
<td>137</td>
<td>137</td>
<td>10</td>
<td>10</td>
<td>Water providers will manage the risk of water quality impacts as required by the Safe Drinking Water Act, but it may cost more. A follow-up sentence should address the fact that utilities will continually need to adapt to new conditions while there may be higher costs due to climate change adaptation and mitigation.</td>
<td>The paragraph has been revised for clarity.</td>
</tr>
<tr>
<td>Brown</td>
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<td>Page footnote</td>
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<td>The paragraph has been revised for clarity.</td>
</tr>
</tbody>
</table>

**Response:**

- **First Name:** Allison
- **Last Name:** Brown
- **Comment ID:** 142149
- **Comment Type:** Footnote
- **Chapter:** 03. Water
- **Figure/Table Number:**
- **Start Page:** 155
- **End Page:** 156
- **Start Line:** 16
- **End Line:** 16
- **Comment:** The "Medina, 2015" citation should read "Medina, 2013." The paragraph contains a method for determining adaptation costs. The text should state that: "We have included one example: water-energy infrastructure including dams used for storage and flood control and also energy generation." The text was revised to emphasize that the argument presented is not about the definition of "risk to society". A follow-up sentence should address the fact that utilities will continually need to adapt to new conditions while there may be higher costs due to climate change adaptation and mitigation. The paragraph has been revised for clarity.
- **Response:** The paragraph has been revised for clarity. The phrase “risk to society” has been changed to say risk of failure. The text has also been added listing the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrastructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the “billions of dollars”. Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information.

---

**Note:** The text has been revised to clarify and correct references. The phrases “risk to society” have been changed to say risk of failure. The text has also been revised to list the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrastructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the “billions of dollars”. Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information.
This is a nice figure, but I do have some questions. First, the dotted "today" line looks like it starts around maybe 1970. I'm not sure if the hurricane in Puerto Rico happened after 1970, but this looks impossible. Also, is this figure shown elsewhere in the CSREES? It seems a good figure to have somewhere in the report, maybe in chapter 1, but I'm not sure if the best use for space is water. I have preferred a more water-specific figure. Also, the gray line is really boring and I think it is confusing that sometimes drought is on the bottom (green) and flooding is stacked above it (blue) and other times the order is switched. If you decide to keep, suggest putting help from TCU to make this more reader friendly. A more useful figure could come from the NOAA state fact sheets that show the increase in nuisance flooding or maybe from the CPIA indicator report on droughts.

We thank the reviewer for the comment. Our intent was to make clear that although forecasts are desirable, this sections has been revised. We have provided more information on the impact and included additional references.

We thank the reviewer for the comment. The text has been revised to eliminate possible confusion regarding suggested use of historical record.

If you are talking about climate projections, then use of the word "forecasts" in this context is fine. But I thought this was a nice way of saying climate models don’t provide local-scale outputs. I would suggest not using the word "forecasts" as we do not "forecast" anything at all with climate models. They are projections, not forecasts.

We thank the reviewer for the comment. The text has been revised for clarity.

There is a text box on the food distribution impacts in the health assessment food chapter (Ziska et al. 2016) that you could cite here.

This section has been revised. We have provided more information on the impact and included additional references.

This is a precise way to state what happened. Period. Especially when you are saying something like increased nutrient loads. The event happened in 2014 but all your citations are from 2013 and earlier.

This is a good paragraph with a lot of meat in it. I would suggest to the authors a more restrained use of the word "forecasts". Is this a weather thing (like a few years) then maybe forecasts is fine. But I thought this is a pretty old data set and a little complicated. If you decide to keep, suggest getting help from TSU to make this more reader friendly. A more useful figure could come from the NOAA state fact sheets that show the increase in nuisance flooding or maybe from the CPIA indicator report on droughts.

Some important studies were included in NHEA, and are also included in this report. We feel these citations are relevant for the report and critical for our summary statements.

We thank the reviewer for the comment. The point is that predictions that are accurate are desired. The sections has been revised to eliminate possible confusion regarding suggested use of historical record.

This is a bit confusing why you switched between local and urban areas. What areas are not included in this list? If efficiencies everywhere are needed, maybe switch this unnecessary text.

We have revised the sentence. "Mis specified" was replaced with "remains unquantified".

If you are talking about climate projections, then use of the word "forecasted" is fine. Is this a new term for engineers? I suggest wording.

We have revised the sentence. No suggestions were replaced with "remains unquantified".

We have revised the sentence. "Mis specified" was replaced with "remains unquantified".

We thank the reviewer for the comment. We intent was to make clear that although forecasts are desirable, only projections are available. This sentence has been entirely revised to be clearer.

We thank the reviewer for the comment. We intent was to make clear that although forecasts are desirable, only projections are available. This sentence has been entirely revised to be clearer.

This is a bit confusing why you switched between local and urban areas. What areas are not included in this list? If efficiencies everywhere are needed, maybe switch this unnecessary text.

We thank the reviewer for the comment. The text has been revised for clarity.

Is this a long way of saying climate models don’t provide local-scale outputs? I would suggest not using the word "forecasts" as we do not "forecast" anything at all with climate models. They are projections, not forecasts.

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The text has been revised to eliminate possible confusion regarding suggested use of historical record.

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This is a good run-down of all the findings and solutions. Well done. I would have liked a little more “description of the evidence basis” though: are these findings well known, been around for decades, well-established? Are they emerging, contentious, uncertain? Are any thing known for sure, others are still working on? It’s not a strong consensus, or do things vary wildly depending on location?

Again, this uncertainty nothing doesn’t match the CSSR. You say there is high uncertainty in precipitation, but the 2015 was medium uncertainty. I don’t know what you mean by saying there is high uncertainty in emissions scenarios. There is no certainty in emissions scenarios, because they are scenarios, not predictions. Also, it seems very inappropriate in a section on confidence and likelihood of water quality/quantity impacts to have a sentence about investment in water infrastructure [lines 10-15], unless you are strictly telling the reader this would alter the confidence/likelihood. Saying “could be better addressed” sounds policy prescriptive, not an assessment of confidence for KM3 based on the literature.

I am very confused about what the confidence rankings are for this key message. In the key message itself on lines 27-33 there are 5 “highs” and 1 “medium”. But the table below in theMajor Uncertainties and Description of the Evidence Base is not clear about what you mean by saying there is high uncertainty in emissions scenarios. There is no certainty in emissions scenarios, because they are scenarios, not predictions. Also, it seems very inappropriate in a section on confidence and likelihood of water quality/quantity impacts to have a sentence about investment in water infrastructure [lines 10-15], unless you are strictly telling the reader this would alter the confidence/likelihood. Saying “could be better addressed” sounds policy prescriptive, not an assessment of confidence for KM3 based on the literature.

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<td>The text has been revised to suggest removing the word water before the word risk.</td>
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<td>The figure has been revised to show updated data for the full calendar year 2017, to delete hazards not directly water-related (e.g., wildfire), and to improve the legibility of gray and black lines shown on the graphic.</td>
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<td>The text has been revised to include &quot;limiting increased evapotranspiration&quot;.</td>
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<td>To address this point we have revised the text to include &quot;promoting water conservation and reducing distribution losses&quot;.</td>
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<td>This chapter focuses water quantity and quality issues due to climate under natural systems as opposed to policy issues arising locally in engineered systems. Hence, we would like to leave it as such.</td>
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<td>We appreciate the suggestion. However, the space is very limited and we have tried to be as concise as possible. Also, this chapter and other chapters include different dollar values and for consistency across the document, we have decided not to add examples similar to what is suggested here.</td>
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<td>We agree with the reviewer. The chapters that focus on change in precipitation, temperature and other variables do add nuance to this issue.</td>
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<td>Thank you for this comment. We have deleted this section of text.</td>
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**Key message 2 Aging water infrastructure.** This section is very focused on structural redundancy, design and planning of water and wastewater infrastructure (fixed risk, capital improvements, planning and design methods). However, operation and maintenance and in particular that optimization is not mentioned in the report. It can be a very useful short-term adaptation option. For example, computer simulation models can be used to improve water allocation and distribution efficiency. Similarly, an example for wastewater systems is combined sewer overflow cleaning which could optimize sewer performance in the short term. Test should acknowledge importance of water distribution optimization and associated costs with it. According to a EPA 2015 document (https://www.epa.gov/sites/production/files/2015-14/documents/epa831f150302.pdf), the United States will need to spend up to $200 billion on water systems over the next 20 years to improve transmission and distribution systems. Of this amount, $70 billion is estimated to be needed for water transmission systems to control over distribution. We thank the reviewer for this comment. This entire message falsely assumes that there are increasing climate risks that need to be prepared for. |
The discussion lays out the need for dynamic planning techniques. However, it does not mention that some water utilities are already beginning to learn the way in planning for uncertain future conditions. The Water Utility Climate Alliance (WUCA), working with AWWA and other organizations has outlined practices for water utilities to use when planning for multiple possible futures (see https://www.wucco.org/site-work/index.htm) as well as examples of how some utilities are addressing these issues. The US EPA has also created the Climate Resilience Evaluation and Awareness (CREAT) tool to help water utilities adapt to long-term extreme weather conditions and analyze the costs and benefits of risk reduction strategies. These issues should be mentioned as the current discussion makes it appear that this issue exists, but does not mention the progress that has been made in finding strategies to address it. Although some of these resources are mentioned later in the chapter, it is important to know how the efforts are underway in this summary.

Adam Carpenter
Figure 3.1 Page 135, Lines 9-10:

The statement on these lines suggests that a changing climate plus high vulnerability of water infrastructure is a critical challenge. Although it is true that both factors are of serious concern, as worded the implication is a negative one that makes it appear that little to no action is being taken, and possibly, that few options exist to address these concerns. We recommend a revised phrasing such as "High vulnerability of water infrastructure presents an opportunity for reinvestment to develop more adaptive and resilient water systems designed to meet plausible climate-related challenges." This is an overly broad statement, implying that little to no information is available for addressing climate-related issues. We recommend changing the statement to recognize that there are tools and resources, although they may not cover all types of infrastructure in all situations.

Adam Carpenter
Page 130, Lines 6-9:

We appreciate this suggestion, but we feel that the statement while appropriate, is too mild. Yes, it presents such an opportunity, but we are ignoring the risk of catastrophic failure. The New Orleans-Katrina event was largely about the failure of a levee that did not support prior to failure, i.e., the climate event was not the significant aspect. It was the lack of the maintenance. The same is the case for the Oroville spillway failure in 2017. Yet in both cases these were spun out as climate stories that detract from the exogenous danger from aging infrastructure.

Adam Carpenter
Page 130, Lines 16-21:

This section states that 50 regulated dams and other flood management infrastructure failed during extreme precipitation in South Carolina in 2015. We recommend elaborating on the nature of these dam and levee failures and what the consequences of these failures were. Were these spillways? Was the dam or levee itself damaged or destroyed, and/or was other property destroyed or lives lost resulting from the failure (as opposed to from other effects of the event)? What were the factors that caused their inability to operate properly beyond the extreme precipitation? This is important to recognize as many failures could be unrelated or tangentially related to climate issues, which is vital contextual information when discussing this topic.

Adam Carpenter
Page 130, Lines 11-12:

The text has been revised to clarify. The phrase "risk to society" has been changed to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrastructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the "trillions of dollars". Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information. About the second comment: this report is synthesis of the existing publications and does not include new data analysis. We were not able to identify a published report comparing the required funding for maintenance with the recent historical expenditures. Hence, we cannot comment on the gap based on the past expenditures.

Adam Carpenter
Page 130, Lines 17-19:

The statement in the chapter text argues that we do not have design standards and criteria for integrating climate change information in design and operational processes. We agree that there are such tools available. The revised text now mentions that there are existing tools, case studies, and other information available that can be adopted into design standards and operation guidelines to account for future climate, and includes a reference for EPA’s CREAT tool.
The statement that "statistical methods have been developed for climate risk and frequency analysis" (Chapter 3, Page 131, Lines 5-8) is overly broad and not reflective of our principal argument: that water systems and services are already experiencing impacts from climate change, and efforts to respond to these impacts are necessary. The statement is not in line with the scientific consensus and the evidence presented in the report.

The methods developed for accounting the observed changes have not been well-integrated into infrastructure design codes and operational guidelines. We agree that this issue is mentioned in several publications including the American Water Works Association’s (AWWA) report among others. However, AWWA’s report is not an official design code for infrastructure.

Our main point is that, in many regions, historical observations indicate change in statistics of extremes. However, the methods developed for accounting the observed changes have not been well-integrated into infrastructure design codes and operational guidelines.
We thank the reviewer for the comments. The text has been revised to clarify that it refers to simultaneous flooding across a large area.

There is no clear way to frame the 200 events were the IA case were [i.e., what were the compounding effects].

No clear way to frame the two or more events were the IA case were [i.e., what were the compounding effects].

Again, scrub “may” and say “is likely to” or some other word from the lexicon. If the sign is really unknown, one could replace by “will” or “very likely” or something similar.

The word “may” is really useless and is not part of the official lexicon. In the first national assessment, we now, the sentence is really a quite meaningless hypothetical and not a projection.

Overdone (and ten billion a year does not really seem like all that much money--equal to a dime a day per multiple of the current rate of expenditure on such efforts? Similarly, on line 26, even 3-figure precision seems really a bit long, and the opening phrase “Emerging risk management strategies” also a bit long--at least my thought process felt complete after the second and then the third word, then had to go on. It might help to try something like “the change in something like “Reconstructions of variations in precipitation, runoff, and drought over the last 500 years indicate that North America...”

The test was revised as suggested.

The text has been revised as suggested.

The text has been revised as suggested.

We appreciate this suggestion, but due to the size of the water tower and the page limit for the chapter, we limit the Regional Randolph section to higher level statements of impacts and do not include details about underlying causes. The mechanics of drought is beyond the scope of this chapter, but are discussed in the NCA4 Climate Sciences Special Report.

The text has been revised as suggested.

The text has been revised as suggested.

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The text has been revised as suggested.

We agree and we have implemented this suggestion.

The text has been revised as suggested.

The text has been revised as suggested.

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The text has been revised as suggested.

The text has been revised as suggested.

The text has been reviewed as suggested.

The text has been revised as suggested.

The text has been reviewed as suggested.

We thank the reviewer for the comment. However, in this case, we cannot use the term “likely” as we cannot assign probability/confidence (e.g. precipitation or downstream reconstructions over the past several hundred years).

The text has been reviewed as suggested.

The text has been reviewed as suggested.

Thank you for this suggestion. We now defined “paleoclimate” (e.g. precipitation or streamflow reconstructions over the past several hundred years).

There is no clear way to frame the two or more events were the IA case were [i.e., what were the compounding effects].

Very likely or “almost certain” if one wants to indicate there is some chance this will not occur. Right now, the sentence is really a quite meaningless hypothetical and not a projection.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

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The text has been reviewed as suggested.

The text has been reviewed as suggested.

The text has been reviewed as suggested.

We thank the reviewer for the comment. However, in this case, we cannot use the term “likely” as we cannot assign probability/confidence (e.g. precipitation or downstream reconstructions over the past several hundred years).
This section has been revised to better address how planning is moving forward despite the uncertainty, while acknowledging the uncertainty.

Regarding "There is no accurate fit"—well, this is the way life is, but we still make decisions. It seems to me that this type of statement needs to be taken on by saying that it is why society and individuals always have and need to continue to make decisions based on assessment. So, the lack of what is wanted is not just a challenge for water planning and management—but it is a challenge for everyone all the time. The question is if the scenarios provide a plausible range of possible future conditions for planning purposes. So, it seems to me that the text needs to take this statement on and give some context, etc. The next sentences get to emerging approaches, but don’t point out the impossibility of the indicated desire for perfect information (and even if it had the indicated accurate forecast, there would be so many other factors to consider that there would be no guarantee of a perfectly safe design and outcome.

The text has been revised as suggested.

The text has been revised as suggested.

The text has been revised as suggested.

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The text has been revised as suggested.

The text has been revised as suggested.

In Chapter 4, at page 172 line 23 and in the caption of Fig. 4.3, "Projected Water Supply and Demand" text has been changed so as not to distinguish between alternative cooling systems. In the caption to Fig. 4.3 and explanation of the different types of systems was given. The following text was added: "Additionally, power plants utilized once-through systems requiring large volumes of water to be diverted through a condenser where the heat was conducted to the water. More recently, recirculating system have been adopted that typically withdraw a fraction of the water so is heated through evaporation. Dry-cooling systems are gaining interest which use air rather than water for cooling."...
<table>
<thead>
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<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
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<th>Response</th>
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<tr>
<td>Juanita</td>
<td>Gupta</td>
<td>241707</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>199 170 30 2</td>
<td>I really like the points made here. It is important to highlight that renewable energy is a growing sector which is becoming more innovative and competitive. especially liked the connection that air increased use in natural gas has led to an increase of grid flexibility which in turn, lowers the use of using solar and wind in keeping growth.</td>
<td>We thank the reviewer for these comments.</td>
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<tr>
<td>Rebecca</td>
<td>Archibish</td>
<td>241708</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>197 171 4 10</td>
<td>Many of the pages are being taken to encourage other areas who are also susceptible to hurricanes, floods and other natural disasters to invest in similar upgrades like New York and New Jersey do.</td>
<td>Please add additional text tracked in revised draft.</td>
<td></td>
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<tr>
<td>Susanne</td>
<td>Moser</td>
<td>241709</td>
<td>Figure</td>
<td>OK. Energy</td>
<td>6.1 171</td>
<td>It might also be helpful to include any information about outages in figures like the large amounts of deactivating plants in 2000-2004. Why did these four years see such a spike in destabilizing plants?</td>
<td>This figure has been deleted from the chapter.</td>
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<tr>
<td>David</td>
<td>Digish</td>
<td>242116</td>
<td>Whole Chapter</td>
<td>OK. Energy</td>
<td></td>
<td>I really liked the chapter and organized it presents some important concerns about the vulnerability of US energy production to climate-related events such as storms and sea level rise. However, the chapter is missing one very important point: the US energy sector is a major source of CO2 emissions, both historically, currently, and into the future. The NCA authors were asked to consider, whenever possible, two different emissions scenario, a high scenario (RCP 8.5) and a medium scenario (RCP 4.5, rCP 6.0). These scenarios assume a particular evolution of global energy production over the next century, and the differences in the assumptions are striking. This chapter would be much more interesting and much more relevant to the goals of the NCA if it included a discussion of current emissions coming from the US (relative to global emissions) and the kind of energy sector that is implied by the two scenarios. Unlike the other chapter that talk about impacts of climate change on US interest, this energy sector analysis has a feedback on climate change that needs to be acknowledged in some way–to avoid it is intellectually dishonest and not consistent with the best available science. This should either be a key message or a footnote, a box.</td>
<td>The authors believe the comment addresses issues that are out of scope for the chapter.</td>
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<tr>
<td>Sarah</td>
<td>Davidson</td>
<td>242201</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>199 219 10 15</td>
<td>It is important to highlight that renewable energy is a growing sector which is becoming more innovative and competitive. especially liked the connection that air increased use in natural gas has led to an increase of grid flexibility which in turn, lowers the use of using solar and wind in keeping growth.</td>
<td>We thank the reviewer for the suggestions, and have added clarifying text as requested.</td>
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<tr>
<td>Sarah</td>
<td>Davidson</td>
<td>242202</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>199 219 14 19</td>
<td>I really liked the chapter and organized it presents some important concerns about the vulnerability of US energy production to climate-related events such as storms and sea level rise. However, the chapter is missing one very important point: the US energy sector is a major source of CO2 emissions, both historically, currently, and into the future.</td>
<td>We thank the reviewer for the suggestions, and have added clarifying text as requested.</td>
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<tr>
<td>David</td>
<td>Peterson</td>
<td>242408</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>167 168 11 9</td>
<td>It is important to highlight that renewable energy is a growing sector which is becoming more innovative and competitive. especially liked the connection that air increased use in natural gas has led to an increase of grid flexibility which in turn, lowers the use of using solar and wind in keeping growth.</td>
<td>We appreciate this suggestion but space is limited.</td>
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<tr>
<td>Laura</td>
<td>Cordile</td>
<td>242506</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>162 163 15 6</td>
<td>The sentence starting “Rising temperatures will...” seems somewhat complex for the general public to grasp. It is advisable to unpack it and emphasize the increase in power prices driven by the increased demand for cooling as well as the strain on the reliability of the transmission system that this increased demand could cause. Here is a suggested revision: “Rising temperatures will drive greater use of air conditioning in the summer months. The increase in electricity demand would increase power prices for Americans and add strain on the reliability of the electricity transmission system.”</td>
<td>The suggestion for moving the language was accepted.</td>
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<tr>
<td>Laura</td>
<td>Cordile</td>
<td>242507</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>163 163 4 5</td>
<td>As “Drier conditions may also increase the risk of wildfires and damages to energy systems.” It would be useful to explain what is meant by energy assets, perhaps by enumerating an example of two.</td>
<td>Comment accepted and definition provided as a footnote in the first sentence of key message 3, to read as: “The term ‘energy assets’ is used in this chapter to refer to a broad suite of energy equipment used in the production, generation, transmission, and distribution of energy.”</td>
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<tr>
<td>Laura</td>
<td>Cordile</td>
<td>242508</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>169 169 33 34</td>
<td>As “Solar and wind generation grew by 44% and 18% in 2016, respectively (EIA 2017b).” It would be useful to provide a comparison to which year this increase occurred.</td>
<td>We thank the reviewer for the suggestions. We have rewritten the sentence to clarify the time interval in question.</td>
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<tr>
<td>Laura</td>
<td>Cordile</td>
<td>242509</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>170 170 13 3</td>
<td>As “In addition, increased adoption of flexible demand programs...” It would be useful to quantify the “increased adoption” of the aforementioned measures by providing some growth numbers, to the extent possible.</td>
<td>We thank the reviewer for the suggestions and have revised the sentence to add clarity.</td>
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<tr>
<td>Laura</td>
<td>Cordile</td>
<td>242600</td>
<td>End Region</td>
<td>OK. Energy</td>
<td>170 170 17 19</td>
<td>As “Fuel availability for electricity generation can affect reliability and resilience.” Maintaining onsite fuel reservoirs is one way to improve fuel assistance, but most generation technologies have experienced fuel deliverability challenges in the past (DOE 2017b). We strongly advise situating the above sentence as multiple recent studies have shown that on-site fuel availability for power generation has had virtually no impact on either resilience or reliability, with extreme weather events included in the underpinning analyses. For instance, a recent analysis performed by the Rhodium Group concluded that outages caused by disruptions of fuel supply to generators appear to be virtually nonexistent. A mere 0.0007% of customer-hours lost to outages were caused by fuel supply emergencies between 2012-2016, a period when 52% of the country’s coal-fired power units and 6% of its nuclear generating units were retired. The same period also featured two of the coldest winters during the past 50 years in the Eastern United States, including the 2014 Polar Vortex. Analytically all of those customer-hours that were lost due to fuel supply disruption between 2012-2016 were related to a single incident involving one coalplant in Northern Minnesota (Houser, Larsen, and Marsters, The Real Electricity Reliability Crisis, October 3, 2017, found at <a href="http://rhg.com/notes/the-real-electricity-reliability-crisis">http://rhg.com/notes/the-real-electricity-reliability-crisis</a>). Similarly, in the National Academy of Sciences, Engineering, and Medicine’s recent report on “Enhancing the Resilience of the Nation’s Electricity System,” the authors explain the risks associated with many potential hazards to the electricity system from human actions and from natural causes. Nowhere in the report did the authors recommend maintaining or increasing the on-site fuel capabilities of certain generation facilities as a potential improvement to the grid’s resilience (National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation’s Electricity System. Washington, DC: The National Academies Press. Available at: <a href="https://doi.org/10.17226/24836">https://doi.org/10.17226/24836</a>).</td>
<td>We appreciate the reviewers suggested wording change and have adopted the suggestion.</td>
<td></td>
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</tbody>
</table>
We strongly recommend that the section authors refer to the comments to the recent DOE proposed Grid Resiliency Pricing Rule, recently rejected by FERC available in the FERC docket number RB15-1, found at https://www.federalregister.gov/a/82dc8153, where multiple groups reasonably argued that there is no evidence that fuel secure generation is linked to resiliency, and that the vast majority of electric service disruptions in the U.S. are virtually all linked to transmission and distribution outages, not unchallenged generation outages. In particular, we would recommend consulting comments submitted by the following groups, and dealing with this particular issue: The Rhodium Group (found in the FERC docket mentioned above), the Clean Energy Trade (also found here http://www.acom.org/Issues/publications/AIDOR_JointindustryComments....

The authors appreciate the comment about the FERC-recommending and believe that the major points made by the commenter have been addressed in the various sections of the chapter, including pointing out that cost and nuclear generation have not been shown to be more resilient than other sources, citing examples in which these generation failed to function during extreme weather events because the fuel supplies froze, flooded or were otherwise unavailable (see pages 174). As well as pointing out that transmission issues, rather than generation issues, have historically been the principal cause of significant disruptions.

We thank the reviewer for this comment. As there are many specific examples of supply comments contained within the reference, we are declining to include further specific examples here.

The authors appreciated the comment about the FERC recommending and believe that the major points made by the commenter have been addressed in the various sections of the chapter, including pointing out that cost and nuclear generation have not been shown to be more resilient than other sources, citing examples in which these generation failed to function during extreme weather events because the fuel supplies froze, flooded or were otherwise unavailable (see pages 174). As well as pointing out that transmission issues, rather than generation issues, have historically been the principal cause of significant disruptions.

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We thank the reviewer for the comment. As there are many specific examples of supply comments contained within the reference, we are declining to include further specific examples here.
scenarios will they be inadequate, etc. general and not providing information on why, which measures are better than others, under which climate the climate related risks under different climate scenarios? It will be very helpful to policymakers to know the increased wildfire risks due to climage change? areal coverage. What does the scientific evidence say about the overall risks to energy production from assumptions in the model.

The use of the term 'likely' to describe these cost increases should be carefully justified. Almost any long term energy cost projection is highly uncertain and dependent on many factors such as technology development, urban adaptation, etc. One might be better to use, 'Under assumptions about technology and urban development, it is likely... to indicate that the determination of 'likely' is conditioned on the starting assumptions in the model.

We thank the reviewer for this comment. We have adopted the recommendation.

The suggested change was made.

Comment accepted and sentence modified.

We thank the reviewer for their engagement. Given that the federal government is required to report to Congress under the Global Change Research Act of 1990, and that NCA4 is being prepared to comply with this statute, the suggestions appear to be outside the scope of this chapter and the NCA.

Comment accepted and sentence modified.

The text has been modified to refer to impact of both increases in air and water temperatures.

Greater clarity has been incorporated into the text.

The section discusses increases in energy demands. To what extent is there information on how changes in the bulk environment, e.g. more energy efficient homes, vehicles, etc. can offset increases in energy use due to air conditioning? Can the text be revised on the bulk environment? Discussing what is known about links between changes in the bulk environment and energy demands, and how these intersect around adaptation issues could be useful.

We thank the reviewer for the comment. We have added text at line 5 on page 170 to address the general suggestion.

Comment accepted and sentence modified.

Comment accepted and sentence modified.

We appreciate the reviewer’s thoughtful comment. We have rephrased the sentence to convey a broader sense of threats to the energy system, given that land cover and land use change, agriculture, and forests are the focus of their own chapter in NCA4.

Comment accepted and sentence modified.

The text has been modified to refer to impact of both increases in air and water temperatures.
**Table:**

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Comment</th>
<th>Response</th>
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<tbody>
<tr>
<td>Marjorie</td>
<td>Stork</td>
<td>241576</td>
<td>Whole</td>
<td>Energy</td>
<td></td>
<td>166</td>
<td>168</td>
<td>Focusing completely on hardening. (Focusing completely on hardening is focused on the energy system, production, transmission, distribution, and consumption. Several references in several places, the text states “extreme weather and climate change.” This can be more helpful and confusing. Climate change induces more frequent extremes. It would help to explain clearly that “Weather impacts the operation of the energy system, while climate and climate change impacts the design of the components.” Explain please that energy is the only commodity that is sold instantly it is produced. Energy systems operate on a four second refresh cycle. Weather is the primary threat to the safe delivery of energy. Climate, on the other hand, is used for the design of future energy systems. Renewable energy is inevitable as the next step in the energy evolution. Whereas previous energy infrastructure was “one-way” from production to consumption, renewable energy production can be on the “consumption” end of the energy system. Two-way production to consumption is a new design criteria, not only accounting for the needs to reduce CO2 emissions, but also accounting for the realities of local distributed production, at the point of consumption. Local production becomes more necessary in a changing climate.)</td>
<td>Comment accepted and sentence modified.</td>
</tr>
<tr>
<td>Lesley</td>
<td>antunesi</td>
<td>143805</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>166</td>
<td>168</td>
<td>The regional summary on page 166 includes mention of climate impacts on growing biofuel crops, highlighting a connection between the agriculture and energy sectors. The authors may want to seriously consider the potential connection between the forestry and energy sectors with regard to biofuels fuel for electricity generation. It seems like the climate impacts described in Chapter 6 of NCA4 across forest health, productivity, and forest management and operations within forest products sector could cause impant implications for the availability of wood and wood waste solids for biomass electricity generation. Is there any literature on this possible relationship that could be cited?</td>
</tr>
<tr>
<td>Dean</td>
<td>of Concerned Scientists</td>
<td>143808</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>169</td>
<td>The impact of climate on biofuels is briefly noted in a few areas, but there are those missing. For example, the impacts on (produced by climate change), and the possible impacts of changing climate &amp; seasonality on suitability of land for biofuels (either current, or innovative future biofuels, which could theoretically be well adapted to local climates and improve climate change resilience).</td>
</tr>
<tr>
<td>Dean</td>
<td>of Concerned Scientists</td>
<td>143809</td>
<td>Figure</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>169</td>
<td>What about biofuels? All in the same for wind and solar, what about competition for land?</td>
</tr>
<tr>
<td>Dean</td>
<td>of Concerned Scientists</td>
<td>143812</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>170</td>
<td>The report should acknowledge actions of deploying new innovative energy technologies that can both increase resilience and reduce emissions such as microgrids with wind, solar, biogas, storage and other low carbon technologies vs. focusing completely on hardening. (Focusing completely on hardening is focused on the energy system, production, transmission, distribution, and consumption. Several references in several places, the text states “extreme weather and climate change.” This can be more helpful and confusing. Climate change induces more frequent extremes. It would help to explain clearly that “Weather impacts the operation of the energy system, while climate and climate change impacts the design of the components.” Explain please that energy is the only commodity that is sold instantly it is produced. Energy systems operate on a four second refresh cycle. Weather is the primary threat to the safe delivery of energy. Climate, on the other hand, is used for the design of future energy systems. Renewable energy is inevitable as the next step in the energy evolution. Whereas previous energy infrastructure was “one-way” from production to consumption, renewable energy production can be on the “consumption” end of the energy system. Two-way production to consumption is a new design criteria, not only accounting for the needs to reduce CO2 emissions, but also accounting for the realities of local distributed production, at the point of consumption. Local production becomes more necessary in a changing climate.)</td>
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<td>of Concerned Scientists</td>
<td>143813</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system, such as frozen equipment, natural gas delivery problems, frozen coal piles, etc, which are discussed later in the chapter.</td>
</tr>
<tr>
<td>Dean</td>
<td>of Concerned Scientists</td>
<td>143814</td>
<td>Figure</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>170</td>
<td>This figure could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
</tr>
<tr>
<td>Dean</td>
<td>of Concerned Scientists</td>
<td>143815</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
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<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
</tr>
<tr>
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<td>of Concerned Scientists</td>
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<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
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<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
</tr>
<tr>
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<td>of Concerned Scientists</td>
<td>143817</td>
<td>Test Region</td>
<td>OK</td>
<td>Energy</td>
<td></td>
<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
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<tr>
<td>Dean</td>
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<td>Energy</td>
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<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
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<td>Energy</td>
<td></td>
<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
</tr>
<tr>
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<td>Test Region</td>
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<td>Energy</td>
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<td>167</td>
<td>170</td>
<td>The paragraphs could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.</td>
</tr>
</tbody>
</table>

**Comment:**

There are several issues raised in this set of comments. The authors modified the text to address many of the points including: hardening, key barriers, peak air temperatures. However a few comments were not addressed outside the scope of the review: providing additional treatment of the difference between climate and extreme weather; threats from electromagnetic pulse; and water intensity of nuclear power plants.
Lesley

Carole

Scientists

Concerned

Union of Scientists

Concerned

Scientists

Union of

First Name

Jantarasami

Last Name

143927

ID

Account

Traceable

Chapter

Whole

Figure/Table

Whole

4.1

Start

174

End

177

Start Line

19

End Line

21


Other comments touch on similar themes of broadening discussion beyond emphasis on infrastructure hardening including finance measures, storage, smart grids, and distributed generation. Suggested new language is tracked in attached revision on page 172 to place great emphasis on these points.

Lesley

Antarasi

14070

04. Energy

Figure

61

67

Recognizing that there is not much room for additional text in the Hydropower (should be one word, not two) text box, a bullet could be added that says: knowledge the potential for climate impacts to endangered species (e.g., salmon [discussed in Chapter 7 or 8]) to also result in changes to hydropower operations? There is a by-pass in the first bullet of the Pipelines text box. In the Wind and Solar text box, the first bullet mentions "changes in wind patterns and solar radiation" without a full explanation anywhere in the chapter about which aspects of climate change are being referred to. Are wind patterns referring to future projections related to storms? The phrasing implies that climate change is somehow changing solar radiation, but I don’t think that’s what the authors meant to say here. It may also be worth mentioning that there is likely to be more important regional differences in how climate affects wind and solar projects.

Carole

Goldbay

14092

Whole

Chapter

4. Energy

173

175

178

180

183

186

In the Tradable Account subsection, the first bullet mentions "changes in wind patterns and solar radiation" without a full explanation anywhere in the chapter about which aspects of climate change are being referred to. Are wind patterns referring to future projections related to storms? The phrasing implies that climate change is somehow changing solar radiation, but I don’t think that’s what the authors meant to say here. It may also be worth mentioning that there is likely to be more important regional differences in how climate affects wind and solar projects.

Lesley

Antarasi

14017

04. Energy

174

177

19

19

Has an important conversational reference for the chapter, and it would be helpful to expand it. Is there any additional explanation to the statement. For example, it’s not really clear what the “several key barriers” are. Key Message 3 also indicates that “barriers remain” without identifying what these are. The reader is also left to wonder how much of the insufficiency of resilience actions are due to the rapid pace of change in the energy sector (e.g., from significant technology advancements in renewable energy, energy storage, and energy efficiency) vs. due to the pace of climate change. In addition, it has proposed climate changes that the chapter authors conclude the energy sector is not totally prepared for, and it is also current observed climate impacts?

Lesley

Antarasi

14027

Trademark

Account

4. Energy

175

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190

Suggest separating this bullet into two because climate change-related wildfire impacts is a complex issue (see forest fire chapter) that is quite distinct from agricultural drought-impacts on biofuel. The wildfire bullet should specify what the damage and risks are to the energy system from climate change-related wildfire impacts. If the authors decide to keep their current approach of providing likelihood and confidence statements for each specific climate projection, they should also provide one wildlife impacts separately from biofuel.

Lesley

Antarasi

14039

Trademark

Account

4. Energy

174

177

19

19

The Tradable Accounts section could use a clearer look and overall editing to bring it up to level of some of the other chapters. Within each Key Message, the traceable account subsections should build on one another to provide a cohesive narrative of the author decision-making process. As written, none of the “Description of Confidence and Likelihood” sections provide clear explorations of why the scientific evidence outweighs the uncertainties and allows the authors to draw the conclusions they did regarding likelihood and confidence. In addition, under EMR, it’s not clear what the likelihood and confidence statements for each specific climate projection is in the “Description of Evidence” subsection are conclusions of the steel pipe themselves, or if the authors are basing their own likelihood and confidence conclusions for the individual projections. Generally, Tradable Accounts only use the likelihood and confidence language for the statements in the Key Messages for which the authors have surveyed/summarized the literature. The description of the evidence generally focuses on how much evidence (and its quality) exists for each of the individual statements or conclusions within the key messages (consider using the term “conclusions” rather than calling the key messages “claims”). We on line 16 of page 175 or line 20 on page 170. It is “The Description of Confidence and Likelihood” section that should explain the rationale for why the authors feel confident in their key messages and/or feel that a particular projection is likely. This section should be based only on the language in the key message. For example, HORM makes a Likelihood statement on page 177, lines 23-24, but the key message itself contains no Likelihood. The Tradable Accounts should also not bring in new information that is not described in the body of the chapter, the authors should cross-reference the information and either add it into the the chapter text or delete it.

The authors appreciate the comment but in general believe that they have appropriate adopted and implemented the NCA4 guidance for developing the traceable accounts.
Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated. 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Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evaporated. Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evaporated.
The following language addresses the comment: "Low lying energy facilities and systems located along inland waters or near the coasts are at elevated risk of flooding from more intense precipitation, rising sea levels and the extreme hurricanes.”

We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

---

Michael MacCracken 144249 File Region OK. Energy 169 168 16 12 In order to do it "may" here, could change sentence to say, instead, something like the Yikes file (or if that action is failed), more frequent or events are likely to make it. Providing such extra information really has the potential to be helpful to the reader. So getting rid of "may" can be done in ways that also provide more information and use the leasing, etc. Sentence from lines 24 to 26 could also be rewritten to get rid of "may" in a similar way. Just that a note at this focus on scaling "may" is a result of how well-known columned David McGarrah ministered text in a draft version of the first rational assessment, making the consequences seem much more than was intended; others reading "may" have in past said that were the result "may not" happen and thought an item not worth mentioning. Avoiding these problems is why the likelihood and confidence sections were developed, and though it takes a bit more effort to consider phrasing of the sentences, it can be worth doing to avoid confusion and exposition later that can take a lot more time.

We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

---

Michael MacCracken 144250 File Region OK. Energy 149 162 16 12 Here "may" can simply be changed to is "likely to" and be perfectly fine.

We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.

---

Michael MacCracken 144245 File Region OK. Energy 149 169 16 12 Here "may" can be simply changed to "would likely" and be perfectly few and on red list just drop "may" have been not necessary.

We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.

---

Michael MacCracken 144252 File Region OK. Energy 149 166 16 12 In both places "may" could change to "are likely to"

We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.

---

Michael MacCracken 144253 File Region OK. Energy 149 167 16 16 Here "may" could be changed to "but also have the potential to effect" and in the sentence add a phrase "unless [examples of actions] are taken.”

We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.

---

Michael MacCracken 144255 File Region OK. Energy 149 169 16 16 Here "May" could improve - or something similar (indeed, subsequent sentences give examples of things that can be effective and are being done.)

We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.

---

Michael MacCracken 144256 File Region OK. Energy 2 170 In a report such as this, it is better to have a figure that does not give any indication of energy sources other than fossil fuels. I would urge also noting that electricity is needed for generating Petroleum (refining, etc.)

We thank the reviewers for noting the perceived imbalance and we have adjusted the figure to better portray the intended meaning.

---

Michael MacCracken 144257 File Region OK. Energy 170 173 14 14 Here "may" could well be "will" there is any reason about this. So I would say "now" means well they might well interpret the word would say elsewhere, which I don't think is intended.

We thank the reviewer for the comment, and have adopted the suggested super.

---

Michael MacCracken 144258 File Region OK. Energy 171 176 2 2 Here "may" or in better would be something like "contributes to" it has to, someone has to pay the cost of this.

We thank the reviewer for the comment, and have adopted the suggested super.

---

Michael MacCracken 144259 File Region OK. Energy 171 174 9 7 Here sentence might be "unless care is taken..." (may also mention some steps to take), a more automated get the potential is increase. But this is actually less of a point to make. "Climate models" for AGW gives us as an example of how going to sewage treatment plants along them that can flood increases vulnerability for flooding can take down sanitation system for a whole city, whereas previously the vulnerability was just a few households. So, if we can see major improvement can lead to much bigger, widespread, and long-lasting impacts if it goes down. Same thing in stock market if invest in one stock instead of diversify, I'd suggest it might be worth devoting a couple of sentences or paragraphs to this issue.

Revised language tracked in the revised draft to address this point around unanticipated impacts of messages.

---

Michael MacCracken 144260 File Region OK. Energy 76 174 15 15 The phrase "less certain" implies that there are degrees to the word "certain" and this really makes no sense. One can have degrees of confidence and of uncertainty, but not certainty. Regarding "However... certain", it could be changed to something like "However, confidence is generally lower for other climate parameters derived from model-based climate change projections." So, if just a good practice requires scrapping the word "may". Good practice does not introduce degrees of certainty—or what does certainty mean?

Comment accepted and sentence modified.

---

Cheryl Satcher 144270 Traceable Account OK. Energy 177 180 18 18 The guidance for Traceable Accounts to see if it is an issue to include a better characterization of a sentence that is not a projection of future impacts. Generally it doesn't really make sense to do this for a sentence in the present tense ("are affecting")... also please double check that this key message matches the chapter text. It does not appear to be verbatim since "there is strong evidence" was dropped.

We thank the reviewer for the comment. The suggested consistency check and revisions have been made.

---

Angieka March 144272 Traceable Account OK. Energy 78 178 29 31 This is a great information, but check that the chapter text itself actually discusses multiple benefits (and add if it does). Mitigation and adaptation goals, etc. - are discussed in the text as examples of hardening, but there really isn't much discussion of multiple benefits. The Traceable Accounts should not bring in new information that is not described in the body of the chapter.

We thank the reviewer for these comments. The body of the chapter has been revised to include the multiple "benefits" content from the traceable accounts, with "miscellaneous" having been added in response to another comment.

---

Suley Latarnaami 144273 Traceable Account OK. Energy 179 179 14 21 In the document, there is no mention of examples that are not described in the body of the chapter.

We thank the reviewer for the comment. The suggested consistency check and revisions have been made.

---

Alexandra Pollack 144275 Traceable Account OK. Energy 180 180 17 7 It is a great information, but check that the chapter text itself actually discusses about the role of GHG stabilization. If it doesn't; this should absolutely be added to the chapter. The Traceable Accounts should bring in new information that is not described in the body of the chapter.

The following sentence was added to the text in the chapter (Page 171 after line 37): "Municipal, states, and tribal communities are also addressing climate change-related risks (DOE 2015a; 2015d) as in the case of the Rockefeller Foundation’s 100 Resilient Cities and C40 Cities that is empowering communities to collaborate, share knowledge, and drive meaningful, measurable, and sustainable action on resilience (Rockefeller Foundation 2017; C40 Cities, 2015).”

We appreciate the reviewer’s finding of additional concerns in the next chapter. The following language addresses the comment: "Low lying energy facilities and systems located along inland waters or near the coasts are at elevated risk of flooding from more intense precipitation, rising sea levels and the extreme hurricanes.”

We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

---

Suley Latarnaami 144276 Traceable Account OK. Energy 180 180 17 18 It is a great information, but check that the chapter text itself actually discusses about the role of GHG stabilization. If it doesn't; this should absolutely be added to the chapter. The Traceable Accounts should bring in new information that is not described in the body of the chapter.

We thank the reviewer for the comment. The suggested consistency check and revisions have been made.

---

Hristia Armstrong 141024 Whole Chapter OK. Energy 180 180 17 17 With the revised document, I think the impact discussion is more complete and informative compared to the original version.

The following language addresses the comment: "Low lying energy facilities and systems located along inland waters or near the coasts are at elevated risk of flooding from more intense precipitation, rising sea levels and the extreme hurricanes.”

We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

---

Hristia Armstrong 141024 Whole Chapter OK. Energy 180 180 17 17 With the revised document, I think the impact discussion is more complete and informative compared to the original version.

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We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

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Hristia Armstrong 141024 Whole Chapter OK. Energy 180 180 17 17 With the revised document, I think the impact discussion is more complete and informative compared to the original version.

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We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.

---

Hristia Armstrong 141024 Whole Chapter OK. Energy 180 180 17 17 With the revised document, I think the impact discussion is more complete and informative compared to the original version.

The following language addresses the comment: "Low lying energy facilities and systems located along inland waters or near the coasts are at elevated risk of flooding from more intense precipitation, rising sea levels and the extreme hurricanes.”

We thank the reviewer for the suggestions and have revised the sentence in line with suggestions.
play in keeping soil carbon pools in the soil. component to forest resilience, while prioritizing certain species over others and creating non-diverse stands has vulnerabilities must acknowledge that maintaining species diversity among individual stands is a critical management regime that could undermine forest resilience. Figures and any text discussing adaption to these impacts are not presented at a scale that will allow readers to fully understand what they might look like in their

The Forests chapter would benefit from greater use of specific examples in the text (as opposed to the use of illustrative and the science was appropriately characterized and summarized.

This sentence as written is difficult to understand. Please rewrite.

increase CO2 consumption by 2-3 billion tons of CO2 annually. My site is cctruth.org in May because of the truth in my paper. If we plant trees and shrubs by my all government policy we will The amazon rain forest devastation is the cause of 50 ppm of the recent atmospheric CO2 rise. My report on 13 drought, and increased disturbances.

11 Tree growth and carbon storage are expected to decrease in most locations as a result of higher temperature, more frequent 12 expected to decrease in most locations as a result of higher temperature, more frequent 110 key message 2: it is highly likely that climate change will mostly decrease the ability of forest 10 key message 2: it is highly likely that climate change will mostly decrease the ability of forest 9 Key message 1: it is highly likely that more frequent extreme weather events will increase the 8-9 frequency and magnitude of severe ecological disturbances, driving rapid (months to years) 7 disturbances, will alter forest productivity, health, and the distribution and abundance of 8 species at longer time scales (decades to centuries). Comment: this text falsely states as “highly likely” what is in fact more speculation based on questionable computer modeling. This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out for too many years by the previous reviews of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.

This sentence was made more specific by referring to the 2016 Wiens publication, and add 2017 data? Be clear on whether Alaska is included - numbers don’t match total acres in some accounts. The referenced text is correct. We believe that the reviewer may misunderstand something about the text or have not significantly altered this portion of the text. K41 See the Climate Science Special Report for detailed information. We appreciate the review comments, but are confident in our inferences based on the scientific literature, and have not significantly altered the present portion of the text. K41 See the Climate Science Special Report for detailed information.

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<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
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<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Mikko</td>
<td>Constible</td>
<td>142871</td>
<td>Red Region</td>
<td>06. Forests</td>
<td></td>
<td>233</td>
<td>233</td>
<td>21</td>
<td>21</td>
<td>This paragraph discussing the carbon balance dynamics of harvested wood products fails to present the complexity of this issue and the high level of uncertainty that remains regarding the presumed global carbon pool created by wood products in use. To a single source, now 67 years old, it also problematic, as this area has received significant study in the intervening years. The paragraph can also be read as making a causal policy recommendation: &quot;Accumulating the net global surplus of wood products depends on a sustainable increasing rate of harvest removals&quot;—without presenting a counterpoint (i.e., that such increases in removals could have the consequence of increased stress on forests that are already contending with the impacts of climate change discussed in this chapter). Further, the paragraph should be revised for clarity. It is currently difficult to discern whether certain conclusory statements have to do with carbon balance issues (likely) or simply with wood product use (likely).</td>
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<td>Mikko</td>
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<td>The discussion of current practices that are deemed &quot;climate smart&quot; would benefit from an examination of the literature that may find these practices to be harmful. Of particular concern is &quot;stand density management,&quot; which this paragraph suggests may be used to justify &quot;greater reductions in stand density.&quot; While this practice may indeed help a stand become more resilient to fire, insects, and drought, it is not clear that such a practice would lead to a net ecosystem benefit. Clarify as to this tradeoff would make policy recommendations of this sort stronger.</td>
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<td>Juanita</td>
<td>McFeely</td>
<td>142843</td>
<td>Red Region</td>
<td>06. Forests</td>
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<td>This sentence reads as an endorsement of plantation management regimes. These regimes are highly contentious and are typically accompanied by significant to severe environmental consequences. While the statement here is true, the context in which it is presented makes it facile an endorsement by the authors. If this is the case, it is highly recommended that literature on the benefits and the harms of plantation-based forest management be included in the chapter.</td>
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<td>Juanita</td>
<td>McFeely</td>
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<td>This sentence is misleading. It indicates that a fuel break is only one scenario for post fire. In some cases, reburn may indeed help a stand become more resilient to fire, insects, and drought, it is not clear that such a practice would lead to a net ecosystem benefit. Clarify as to this tradeoff would make policy recommendations of this sort stronger.</td>
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<td>The summary does not mention variation of climate change impacts on different forest types or regions and the underlying variation impacts on ecosystem services. Not all changes and forest types will experience the same or equal changes resulting from climate change. While this may seem obvious, it's important to acknowledge that both broad scale generalization will not apply in all places or systems. Also, a brief description of the variation in sensitivity and vulnerability (and factors that may contribute to vulnerability) of different forest types would also be helpful to include.</td>
</tr>
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<td>Juanita</td>
<td>McFeely</td>
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<td>Why is the term Forest Sector used rather than forests? Sector often refers to an economic group, but the sector is particularly focused on the status of forests, the net economic output of a forest-based economy.</td>
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<td>Juanita</td>
<td>McFeely</td>
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<td>Author is a standard term used by the National Climate Assessment to refer to the broad spectrum of topics related to forests. It does not imply anything about economic issues.</td>
</tr>
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<td>McFeely</td>
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<td>06. Forests</td>
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<td>14</td>
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<td>The sentence is misleading. It indicates that a fuel break is only one scenario for post fire. In some cases, reburn risk may increase. Suggest acknowledging potential for reburn as well as fuel break creation in a post fire report.</td>
</tr>
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<td>Juanita</td>
<td>McFeely</td>
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<td>16</td>
<td>There is no mention of changes in phenology (i.e., shifting requirements for bud burst) that may also be affected by warming temperatures. This could also greatly alter forest composition and function. Discussion seems very limited in scope, only mentioning reductions in growth and productivity. Recommend broadening discussion of potential forest changes in structure and composition resulting from climate change.</td>
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<td>Juanita</td>
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<td>Figure shows disturbance agents across nation. However, it is cited text as an example of how changes in disturbance will result in changes to carbon storage. The figure does not illustrate this point well. Suggest providing additional detail and specific examples about how different disturbances can alter carbon storage.</td>
</tr>
</tbody>
</table>

This portion of the discussion was revised considerably to improve accuracy and clarity regarding carbon issues. The literature citations are highly relevant and accurately reflect the state of science.
<table>
<thead>
<tr>
<th>First Name</th>
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<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
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<td>06. Forests</td>
<td>06. Forests</td>
<td>143</td>
<td>149</td>
<td>7</td>
<td>16</td>
<td>This is not a universally true statement. See 2013 Lundquist et al. (Lower forest density enhances snow retention in regions with warmer winters). Suggest modifying statement to rephrase more specifically clarify the point being made or include exceptions to the generalized statement.</td>
<td>Revised to better clarify the point.</td>
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<tr>
<td>Niki</td>
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<td>Text Region</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>135</td>
<td>136</td>
<td>16</td>
<td>2</td>
<td>Paragraph implies that active forest management tools are the only changes available for climate mitigation in forests. In reality, active forest management tools are not always applicable or appropriate. Protection of intact forest ecosystems (i.e., limiting development and harvest) is also a valid and important tool for maintaining resilience in forest ecosystems in many places. Recommend including forest protection as a strategy for maintaining forest resistance and resilience.</td>
<td>Revised to better clarify the point.</td>
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<tr>
<td>Niki</td>
<td>McFeely</td>
<td>142045</td>
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<td>06. Forests</td>
<td>06. Forests</td>
<td>143</td>
<td>145</td>
<td>7</td>
<td>14</td>
<td>This paragraph is not applicable to all forest types and language needs to be added to clarify when and where, and in what forest types, such actions may be appropriate. For example, in old-growth PNW western Cascade and coastal forests, there is no evidence to date that management or prescribed burning would be useful tools for reducing future risks from wildfire or insects. Using such tools effectively reduce these disturbance risk in this forest type would fundamentally change the natural forest structure and function that provides the ecosystem services generated by these forests.</td>
<td>Revised to better clarify the point.</td>
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<tr>
<td>Niki</td>
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<td>142066</td>
<td>Text Region</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>128</td>
<td>130</td>
<td>14</td>
<td>16</td>
<td>The text in this section is critical. The entire forest chapter is emphasizing how impacts to forests will be diverse and variable. It is important to address local forest conditions in influencing how climate change could affect wildfire or disturbance risk. Suggest highlighting this sentence in the executive summary of the chapter to emphasize the point.</td>
<td>Revised to better clarify the point.</td>
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<tr>
<td>Niki</td>
<td>McFeely</td>
<td>142077</td>
<td>Text Region</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>233</td>
<td>233</td>
<td>22</td>
<td>22</td>
<td>This section of text should start by describing why water resources from forests are important and what users rely on them. Suggest starting the Water Resource text with the following sentence: For example, unmanaged ecosystems provide critical water resources for multiple purposes, including municipal water supplies, agriculture and beverage, irrigation, and domestic uses, and in stream flows for endangered species and ecosystem health.</td>
<td>Revised to better clarify the point.</td>
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<tr>
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<td>McFeely</td>
<td>142058</td>
<td>Text Region</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>235</td>
<td>236</td>
<td>17</td>
<td>18</td>
<td>This text should acknowledge the heterogeneity in forest types, and therefore impacts. Suggest changing text to: &quot;...understanding of the effects of climate change on different types of forests...&quot;</td>
<td>Revised to better clarify the point.</td>
</tr>
<tr>
<td>Niki</td>
<td>McFeely</td>
<td>142059</td>
<td>Text Region</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>233</td>
<td>234</td>
<td>14</td>
<td>16</td>
<td>This text highlights the importance of forest ecosystems as &quot;...fuel...&quot; ecosystem components are more than just potential &quot;...fuels...&quot; for wildfire. They provide essential wildfire, defensible space, and restoration of ecological disturbance regimes as adaptation options. The Chapter authors must ensure that the statements are supported by the referenced citations, since this often is not the case, and ensure that this review does not leave out key studies and concepts, for example, managed wildfire, defensible space, and restoration of ecological disturbance regimes as adaptation options.</td>
<td>Revised to better clarify the point.</td>
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<tr>
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<td>142060</td>
<td>Text Region</td>
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<td>06. Forests</td>
<td>230</td>
<td>230</td>
<td>7</td>
<td>15</td>
<td>The paragraph overemphasizes our understanding of interaction of disturbance agents, particularly insects and fire, and perpetuates misconceptions and overly simplified generalizations. Please cite Miegs et al. (2005) results (i.e., although both bark beetles and defoliation alter fuels and associated fire potential, the windows of opportunity for increased or decreased fire likelihood are too narrow or the phenomena themselves too rare for one consistent signal to emerge across all forest types (e.g., coniferous forests) as an example of the complexity and variety of disturbance interactions.</td>
<td>Revised to better clarify the point.</td>
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<td>Niki</td>
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<td>Revised to better clarify the point.</td>
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<tr>
<td>Social Science</td>
<td>Coordinating Committee</td>
<td>142121</td>
<td>Whole Chapter</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>230</td>
<td>231</td>
<td>16</td>
<td>18</td>
<td>This text is a great way to point out detail about forest ecosystem dynamics, but treats custody largely as a black box. E.g. &quot;ecosystem services are provided to society.&quot; adaptation depends on social and economic conditions. It would be helpful to unpack these general statements with respect to forest-society interactions, on which there is a broad literature. Forest dependent communities, outdoor recreationalists, small woodland owners, and larger forest operations may have different climate change impacts, values towards forests, and forest policies. Please highlight specifically potential impacts of climate change on below-ground forest biomass and ecosystems. What are implications of below-ground ecosystem changes for overall forest health? E.g. mycorrhizae and nutrient cycling.</td>
<td>This portion of the discussion was revised considerably to improve accuracy and clarity; however, the appropriate references for the revised text did not include the Miegs reference.</td>
</tr>
<tr>
<td>Social Science</td>
<td>Coordinating Committee</td>
<td>142162</td>
<td>Whole Chapter</td>
<td>06. Forests</td>
<td>06. Forests</td>
<td>230</td>
<td>231</td>
<td>17</td>
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<td>The text in this section is critically important for the whole chapter in emphasizing how impacts to forests will be diverse and variable. It is important to address local forest conditions in influencing how climate change could affect wildfire or disturbance risk. Suggest highlighting this sentence in the executive summary of the chapter to emphasize the point.</td>
<td>Revised to better clarify the point.</td>
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<tr>
<td>Carrie</td>
<td>Jellison</td>
<td>143085</td>
<td>Whole Chapter</td>
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<tr>
<td>Mary</td>
<td>Wolf</td>
<td>144003</td>
<td>Whole Chapter</td>
<td>06. Forests</td>
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<td>Shaye</td>
<td>Wolf</td>
<td>14.0061</td>
<td>Whole Page</td>
<td>06. Forests</td>
<td>223</td>
<td>55:279-289</td>
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<td>Natural disturbance processes are important for forest ecosystem health and must be placed in context. A key message of the chapter is that severe ecological disturbances can alter forest ecosystems and discuss the adverse effects of logging and fire on forest ecosystem health and services. The chapter fails to acknowledge the important point that the largest source of disturbance to US forests is historical and current logging practices, which are well-documented to have adverse effects on forest ecosystem structure, services, and health. The chapter fails to discuss the significant impacts of historical and current logging on forest ecosystems, including negative effects on forest ecosystem health, and services. The chapter states that the state of the forest sector continues to acknowledge that logging is the largest source of disturbance to forest ecosystems and discuss the adverse effects of logging on forest ecosystem health and services. Natural disturbance processes are important for forest ecosystem health and must be placed in context. The chapter should put current and projected levels of wildfire and insect outbreaks in context. The chapter should make clear that (1) these ecological disturbances are natural components of forest ecosystem health, and (2) wildfires and insect outbreaks in forests do not appear to be occurring at levels that exceed historical levels, nor are they necessarily projected to be. In discussing wildfire in forests, the Chapter should acknowledge that (1) wildfire is a natural and necessary part of US forest ecosystems that is important for forest ecosystem health. Research has increasingly recognized the importance of biodiversity, ecologically significant, and unique complex early seral forest stands, also called &quot;snag&quot; or &quot;size&quot; forest habitats created by high-severity fire. More than 50% of the native wildlife species found in complex early seral forest are primary or almost exclusively found in such habitats, due to the high abundance of standing dead trees and downed logs and the abundance of shrub patches and young, naturally regenerated conifer and oak stands. Complex early seral forests created by high-severity fire support some of the highest levels of native biodiversity found in temperate conifer forests. The chapter should also acknowledge that (2) there is currently substantially less fire of all severities in the greater majority of western U.S. mixed-conifer, mixed-evergreen, and yellow pine forests than there was historically, and that most western forests are experiencing a fire deficit compared with pre-settlement conditions (Mouillet and Field 2005, Stephens et al., 2007, Marvin et al. 2012, Odion et al. 2014, Hanson et al. 2015, Parks et al. 2015). For example, Parks et al. (2015) concluded that US forests were experiencing a fire deficit from 1984 to 2012. They acknowledge that the review is concerned about the biophysical effects of logging on forest lands. However, this chapter focuses on the effects of climate change on forests, including both direct (e.g., temperature) and indirect (e.g., wildfire) effects that may be exacerbated in the future. Most of the reviewer's comments are beyond the scope of the chapter. We agree that additional context would be helpful, and have added two sentences to clarify the historical context for wildfires and wildfires.</td>
<td>We agree that additional context would be helpful, and have added two sentences to clarify the historical context for wildfires and wildfires.</td>
</tr>
</tbody>
</table>
In the context of climate change, logging can have detrimental effects on forest ecosystem services such as carbon storage. This should be acknowledged by the Chapter in the State of the Forest Sector section and Adaptation section. Harvest of live trees from the forest not only reduces current standing carbon stocks, but also reduces the forest's future rate of carbon sequestration and its future carbon storage capacity. By removing trees that otherwise would have continued to grow and remove CO2 from the atmosphere. Numerous studies indicate that protection from logging increases forest carbon storage, while thinning forests to reduce fire activity decreases forest carbon stocks and results in increased carbon emissions to the atmosphere that can persist for decades.

For example, Tan et al. (2015) found that by 2050, the climate change scenario that most heavily emphasized protection of forests from logging (B1) resulted in the highest levels of forest carbon storage and rates of carbon sequestration, while the scenarios that emphasized forest cutting (A1B and A2) reduced the proportional contribution of federal forests to the nation's overall carbon storage levels (see Table 2). Similarly, a study by D'Odorico et al. (2008) found that carbon storage on public forests is maximized when protection from logging is greater. A study by Campbell et al. (2012) concluded that thinning forests to avoid high-severity fire could actually reduce forest carbon stocks and increase overall carbon emissions. The study highlighted the importance of understanding the human influence on fire activity when setting forest fire management and policy. These studies highlight the importance of understanding the human influence on fire activity when setting forest fire management and policy. Campbell et al. (2012) concluded that thinning forests to avoid high-severity fire could actually reduce forest carbon stocks and increase overall carbon emissions.

The State of the Forest Sector section should acknowledge the dominant role of human activity in driving wildfires and their contribution to climate change. A study by Syphard et al. (2017) relating climate variables to fire activity across the US found that where human presence is more prominent, climate was less important in explaining fire activity meaning that “humans may not only influence fire regimes but their presence can actually override, or swamp out, the effect of climate.”

A study by Baisch et al. (2017) found that human started wildfires accounted for 89% of all wildfires, tripled the length of the fire season, and were responsible for nearly half of all area burned. These studies highlight the importance of understanding the human influence on the fire activity when setting forest fire management and policy. Baisch, J. et al. 2017. Human started wildfires expand the fire niche across the United States. PNAS 114: 2946-2951.


The issue of relevance of logging and thinning has been clarified elsewhere in the chapter. We assume that the reviewer refers to contemporary fires, not historical fires. In response, we added a sentence and literature citation that addresses human impacts on fire in the context of multiple stressors. A broader discussion of human influence is beyond the scope of the chapter.

Adaptation section.

We appreciate the reviewer's concern and have revised the sentence to improve clarity.
The case study on tree mortality in the Sierra Nevada was revised considerably to ensure accuracy and clarity.

The caption in Figure 6.3 states that it is likely that the severity has not changed during the past few decades. The Chapter should also discuss this important point in the text with supporting citations. As indicated in the caption in Figure 6.5, fire severity does not appear to be increasing in US forests, and this is supported by scientific research. Most recently, Keyser and Westerling (2017) tested trends for high-severity fire occurrence for western United States forests, for each state and each month. The study found no significant trend in high-severity fire occurrence during 1984-2015, except for Colorado. The study also found no significant increase in high-severity fire occurrence by month during May through October, and no correlation between size of high-severity fire and total fire size. A literature review by Dover and Santley (2016) concluded: "RSLF in the western USA (current study) indicate little change overall in high-severity fire trends, and also that area burned at high severity has overall declined compared to pre-European settlement H, region; and van Wageningen et al. (2012) Sierra Nevada). The case study was corrected to be Kearney et al. (2012) and added to the literature cited. The comments about California forests is very specific to one location, and while this might have been true for some California forests in some locations, especially those that were logged, it is certainly not true for most forests in the U.S., especially ponderosa forests. Therefore, we did not revise the existing text. We were asked to scrutinize and update the text so that it does not convey misleading information. The case study on tree mortality in the Sierra Nevada was revised considerably to ensure accuracy and clarity.

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Shaye Wolf 14.0884 Text Region 6k: Forests 150 231 17 15 The chapter fails to provide an accurate analysis of the scientific research on insect outbreaks and fire interactions.

On page 230, the chapter states that "Fire mortality associated with insect outbreaks increases production of dead fuels, which can influence wildfire intensity (and amount of heat energy released)." The chapter then provides an example of the intensity increasing short-term after beetle outbreak, citing a single study (Pliske 2012). However, multiple studies have found that fires killed by beetles and drought do not increase fire severity or extent. High-severity fire reduces forest susceptibility to future beetle outbreaks, and widespread and severe beetle outbreaks restrict subsequent outbreaks. Several empirical studies that have investigated the effects of actual fires in areas with known pre-fire snag levels from recent drought and bark beetle have found trees killed by bark beetles and drought do not influence fire severity or extent. Bond et al. (2010) was conducted in mixed-conifer and ponderosa/ Jeffrey pine forests of the San Bernardino National Forest in southern California, where fires occurred immediately after a large pulse of snag recruitment from drought/beetles. Bond et al. (2009) found no evidence that pre-fire tree mortality influenced fire severity. Hart et al. (2015) investigated whether there was a relationship between snag levels from drought/beetles and the rate of fire spread in conifer forests across the western U.S. Hart et al. (2015a) found the following: "No differences were observed in snag levels from drought/beetles and the rate of fire spread in conifer forests across the western U.S." Contrary to the expectation of increased wildfire activity in recently infested red-stage stands, we found no differences between observed area and expected area burned in red-stage or subsequent gray stage stands during peak three years of wildfire activity, which account for 46% of area burned during the 2002-07 period. In other words, in both the infest case, when drought and beetle levels were still on the trees, (Su/Su/gray stage) and in the later stage, seven years later, after needles and some snags have fallen (Su/gray stage). The fire did not spread faster or burn more area in forests with high levels of snags from drought and native beetles. This was also true specifically in ponderosa pine forests, where there was no significant effect on the spread of tree mortality from drought/beetles, and fire spread was nearly identical regardless of snag levels (see Figure 2D).

We appreciate the review comment, but it is difficult to reconcile the comment with the information currently in the chapter. Although a wide range of additional literature could be discussed, we feel it is more effective to focus on specific issues related to mountain pine beetles, their effects, and the brief space that we have. We are confident that the statement in the chapter is correct. Note that we do not mention severity, only extent. Much of the reviewer's comment focuses on severity, which is not a component of the discussion in this chapter.

Shaye Wolf 14.0885 Text Region 6k: Forests 131 231 23 15 In other words, in both the initial stage of snag recruitment, when dead needles are still on the trees (Su/Su/gray stage), and in the later stage, seven years later, after needles and some snags have fallen (Su/gray stage), the fire did not spread faster or burn more area in forests with high levels of snags from drought and native beetles. This was also true specifically in ponderosa pine forests, where there was no significant effect on the spread of tree mortality from drought/beetles, and fire spread was nearly identical regardless of snag levels (see Figure 2D).

The sentence was revised to include timber harvest. Other revisions were also made in the subsequent sentences to improve accuracy and clarity.

Shaye Wolf 14.0886 Text Region 6k: Forests 153 233 17 17 In other words, in both the initial stage of snag recruitment, when dead needles are still on the trees (Su/Su/gray stage), and in the later stage, seven years later, after needles and some snags have fallen (Su/gray stage), the fire did not spread faster or burn more area in forests with high levels of snags from drought and native beetles. This was also true specifically in ponderosa pine forests, where there was no significant effect on the spread of tree mortality from drought/beetles, and fire spread was nearly identical regardless of snag levels (see Figure 2D).

The sentence was revised to include timber harvest. Other revisions were also made in the subsequent sentences to improve accuracy and clarity.

Shaye Wolf 14.0887 Text Region 6k: Forests 134 234 10 10 The chapter should provide a more accurate description of the role of disturbances on water flows in forests.

The chapter depicts the influence of wildfire on water resources as purely negative, for example, stating that "wildfire increases erosion and sedimentation (in Western river systems)." However, a recent study by Boisrame (2016) found that during a frequent, mixed-severity regime to the Illilouette Creek Basin in Yosemite National Park had numerous ecohydrological benefits, including increased soil moisture and streamflow, decreased drought stress, and increased landscape diversity. Moreover, the effects of an emission following the fire typically short term in contrast to the more persistent damage to watersheds caused by logging and logging roads, including increases in erosion and sedimentation and degradation of water quality and aquatic habitats (Gustine et al. 2011, Trabant and Franzel 2000). Grazing also causes long-term damage to water resources. However, the chapter makes no attempt to discuss the effects of disturbances. We believe the statement in the chapter is correct. Note that we do not mention severity, only extent. Much of the reviewer's comment focuses on severity, which is not a component of the discussion in this chapter.

The sentence was revised to include timber harvest. Other revisions were also made in the subsequent sentences to improve accuracy and clarity.

The portion of the discussion was revised considerably to improve accuracy and clarity regarding forest density, fire, and water. A comprehensive discussion of all factors that affect hydrology and water supply is beyond the scope of the chapter. More detail is available in the Water chapter and Regional chapters.
The Chapter/R7s claim that stand density management and surface fuel reduction will increase forest resistance to increased temperature, drought and disturbance is not supported by the scientific literature or the references cited. At 235 the Chapter states: "Highly likely..." This was revised as suggested.

We respectfully disagree with the reviewer's comment on this issue. Our inferences are based on hundreds of publications in the scientific literature, based on both empirical data and modeling, that demonstrate the effectiveness of stand density management, only a few of which are referenced. The scientific literature on climate change adaptation reinforces the value of stand density management. No change was made.

We appreciate this comment, and have revised the language throughout the chapter where appropriate. The science.

This comment is inconsistent with the author team's thorough assessment of the science.

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The incidence of bumble infestations themselves may also be connected to changing climatic conditions. See https://www.fs.fed.us/sites/default/files/2015-Fire-Budget-Report.pdf

Many of the issues discussed in the suggested report are included in the chapter, but no direction is provided by the reviewer on which references they think should be included. No change made.

The reviewer comment suggests that many other issues could potentially be discussed in this section. There is already a statement in the text about smoke and human health. Because a large number of issues are already discussed in the chapter, including several more is beyond the scope of this section. No change made.

At this point, data from the 2017 wildfire season are preliminary. It might be possible to include these data prior to publication if they are confirmed as final.

We appreciate the review comment and there is already a statement in the text about smoke and human health. Additional detail on health-related issues is beyond the scope of the report, so we did not include additional citations. More information on health-related issues for smoke can be found in Chapters 13 and 14 of the 2015 Forest Service Wildland Fire Budget Report.pdf

May be “Net storage”? Or is this gross carbon uptake?


At this point, data from the 2017 wildfire season are preliminary. It might be possible to include these data prior to publication if they are confirmed as final.

We appreciate the review comment and there is already a statement in the text about smoke and human health. Additional detail on health-related issues is beyond the scope of the report, so we did not include additional citations. More information on health-related issues for smoke can be found in Chapters 13 and 14 of the 2015 Forest Service Wildland Fire Budget Report.pdf

May be “Net storage”? Or is this gross carbon uptake?

Is this really “Net storage”? Or is this gross carbon uptake?

many of the issues discussed in the suggested report are included in the chapter, but no direction is provided by the reviewer on which references they think should be included. No change made.
**First Name** | **Last Name** | **Comment ID** | **Comment Type** | **Chapter** | **Figure/Table Number** | **Start Page** | **End Page** | **Start Line** | **End Line** | **Comment** | **Response** |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
Sally | Claretta | F20150 | Ecot Region | 07. Ecosystems, Ecosystem Services, and Biodiversity | 241 | 241 | 7 | 7 | Please add an estimate of the CO2 emissions from US wildfires in recent years—for example, from the 2017 wildfires in California—to provide a sense of scale to those emissions, which they are contributing to climate change. | We have added estimates of CO2 from fires in the United States: implications for carbon management. 
https://doi.org/10.1186/1750-0680-2-10 |
Jay | Peterson | F200488 | Ecot Region | 07. Ecosystems, Ecosystem Services, and Biodiversity | 257 | 257 | 9 | 9 | Delete the word “change” | Thank you, for the comment. We have deleted this word. |
Sally | Sims | F201505 | Ecot Region | 07. Ecosystems, Ecosystem Services, and Biodiversity | 262 | 262 | 34 | 34 | Proposals suggest continued primary production increases over the next century under a higher carbon dioxide scenario (21%–59% under RCP 8.5). I strongly disagree that this will be the case under RCP 8.5. The papers cited do not adequately take mortality from “hot droughts” into account, especially under RCP 8.5 after about 2050. Friend et al. does recognize that the impact of droughts increases in MFP due to CO2 in certain areas of the globe, including western US. Droughts have been increasing across the US (see Peters, M., I. Freeman, and S. Matthews. 2004. Spatial-temporal trends of drought by forest type in the continental United States, 1960–2002 (scale: ~12,000,000). Res. Mgt NR-7. U.S. Department of Agriculture, Forest Service, Northern Research Station., Newtown Square, PA.) and are projected to increase greatly into future (we have 2 papers in press on this). | We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly and unequivocally. We also now specifically mention heat waves, drought, fire and insect effects with references, directing the reader to the Forest Chapter for more details. We must, however, acknowledge that existing model projections suggest an increase in primary production with the factors they do consider. |
Sally | Sims | F201509 | Ecot Region | 07. Ecosystems, Ecosystem Services, and Biodiversity | 274 | 274 | 14 | 14 | There is relative uncertainty in how climate change will impact productivity (Dobler and Duk 2013; Rykaczewski and Dunne 2013, Bopp et al. 2013, 2014). It is strongly suggested that this will be the case under RCP 8.5. The papers cited do not adequately take mortality from “hot droughts” into account, especially under RCP 8.5 after about 2050. Friend et al. does recognize that the impact of droughts increases in MFP due to CO2 in certain areas of the globe, including western US. Droughts have been increasing across the US (see Peters, M., I. Freeman, and S. Matthews. 2004. Spatial-temporal trends of drought by forest type in the continental United States, 1960–2002 (scale: ~12,000,000). Res. Mgt NR-7. U.S. Department of Agriculture, Forest Service, Northern Research Station., Newtown Square, PA.) and are projected to increase greatly into future (we have 2 papers in press on this). | We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly (see response to comment above). |
Sally | Sims | F201570 | Whole Page | 07. Ecosystems, Ecosystem Services, and Biodiversity | 257 | 257 | 16 | 16 | Note 6-8: After United States. Here sentence should read: Marine, terrestrial, and freshwater species are responding to climate change by expressing different traits, altering behaviors, shifting ranges, and changing timing of biological events. Climate change will likely outpace the rate at which some species can adapt. Use 9. Delete and after interactions. | Thank you for the comment. We have significantly changed this section, so the comment is no longer relevant. |
Sally | Sims | F201571 | Whole Page | 07. Ecosystems, Ecosystem Services, and Biodiversity | 259 | 259 | 15 | 15 | Use 12-14 instead. The impacts of climate change vary by region and species. Confidence has increased for many projected climate impacts. | We have updated our use of the term “aquatic” to that it applies to aquatic environments broadly (i.e., terrestrial and aquatic environments), and have used “freshwater” to distinguish from marine environments. |
Sally | Sims | F201573 | Whole Page | 07. Ecosystems, Ecosystem Services, and Biodiversity | 259 | 259 | 18 | 18 | Use 12-14 instead. The impacts of climate change vary by region and species. Confidence has increased for many projected climate impacts. | We have updated this section to: Our understanding of climate change impacts and responses of biodiversity and ecosystems has improved since 2010, and the expected consequences of climate change will vary by region, species, and ecosystem type. |
David | Klopik | F201516 | Ecot Region | 07. Ecosystems, Ecosystem Services, and Biodiversity | 257 | 257 | 11 | 11 | The key message doesn't seem well thought out. It seems like a lot of ideas in one key message. | We have made substantial changes to the key messages by expanding from 2 to 4 key messages and limited the scope of each message. |
Comment: This text falsely states a speculative conjecture as an established physical fact. It is not known that climate change poses increasing risks. The conjecture is based primarily on questionable computer models that are far too sensitive to human activities, especially CO2 emissions. Actual climate change may well be beneficial.

This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility, nor integrity. To begin with, there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.

Comment: This text falsely states a speculative conjecture as an established physical fact. It is not known that climate change poses increasing risks. The conjecture is based primarily on questionable computer models that are far too sensitive to human activities, especially CO2 emissions. Actual climate change may well be beneficial.

This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility, nor integrity. To begin with, there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411795</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>262</td>
<td>267</td>
<td>8</td>
<td>268</td>
<td>add period to &quot;et al.&quot;</td>
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411796</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>263</td>
<td>268</td>
<td>18</td>
<td>269</td>
<td>which should be &quot;that&quot;</td>
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<tr>
<td>David</td>
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<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>264</td>
<td>269</td>
<td>25</td>
<td>266</td>
<td>&quot;are&quot; should be &quot;is&quot;</td>
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<td>David</td>
<td>Vosepage</td>
<td>411798</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>264</td>
<td>269</td>
<td>18</td>
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<td>delete the second mention</td>
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<tr>
<td>David</td>
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<td>411799</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>269</td>
<td>274</td>
<td>15</td>
<td>275</td>
<td>compound adjective is missing a hyphen &quot;climate-induced&quot;</td>
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411800</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>264</td>
<td>269</td>
<td>14</td>
<td>270</td>
<td>which should be &quot;that&quot;</td>
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411801</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>269</td>
<td>274</td>
<td>17</td>
<td>275</td>
<td>This study was able to partition the adaptive response to climate change by a wildflower into plasticity and evolutionary components: Anderson, J. T., D. W. Inouye, A. McKerney, and T. Mitchell-Olds. 2012. Phenotypic plasticity and adaptive evolution contribute to advancing flowering phenology in response to climate change. Philosophical Transactions of the Royal Society 279(1743): 884-893.</td>
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411802</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>270</td>
<td>275</td>
<td>13</td>
<td>276</td>
<td>Thank you for the comment, which we agree is relevant to the chapter and an important aspect of changing phenology. We have incorporated text to reflect this example, although we determined that more recent and relevant citations are available to support this idea.</td>
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<tr>
<td>David</td>
<td>Vosepage</td>
<td>411803</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>271</td>
<td>276</td>
<td>31</td>
<td>277</td>
<td>add hyphen under-predicted</td>
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<tr>
<td>Luanne</td>
<td>Rosten</td>
<td>411794</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>269</td>
<td>274</td>
<td>14</td>
<td>275</td>
<td>Here and a few other places, e.g., Page 270 Line 23, there are split infinitives.</td>
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</tr>
<tr>
<td>Christian</td>
<td>Armstrong</td>
<td>411800</td>
<td>Whole-Page</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>260</td>
<td>265</td>
<td>1</td>
<td>266</td>
<td>Shouldn’t you include a discussion of complete loss of certain iconic habitats/biomes, the coral reefs? And how that will affect ecosystems?</td>
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<td>David</td>
<td>Knock</td>
<td>411821</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>264</td>
<td>269</td>
<td>3</td>
<td>270</td>
<td>cross reference Chapter 9 which also covers heat waves</td>
<td></td>
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<tr>
<td>David</td>
<td>Peterson</td>
<td>412297</td>
<td>Whole-Page</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>262</td>
<td>267</td>
<td>27</td>
<td>268</td>
<td>This chapter has an ambitious, perhaps impossible scope, covering a broad range of issues. The generation of a comprehensive biodiversity-based list that details the effects of climate change is interpreted as a negative, rather than a neutral, context. This could be remedied by including a broader range of scientific literature that supports positive and neutral outcomes, rather than the current focus on only the literature that supports negative outcomes. Note especially the first and last use of the word “null hypothesis,” rather than the more neutral “null effects.” Perception of negative changes is possible only in the context of human values, a point that needs to be stated clearly and often. Unfortunately, the perspective of this chapter is not consistent with the more balanced perspective of nearly all other chapters in the report.</td>
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<td>David</td>
<td>Peterson</td>
<td>412298</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>262</td>
<td>267</td>
<td>27</td>
<td>268</td>
<td>Thank you for the comments. We added examples of potential benefits, such as extended growing season, and proposed that the absolute value of the effects of climate change on ecosystem productivity that supports important provisioning services, including fisheries and forest for food and fiber.</td>
<td></td>
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<tr>
<td>David</td>
<td>Peterson</td>
<td>412299</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>262</td>
<td>267</td>
<td>22</td>
<td>268</td>
<td>Thank you for your comment. We agree that this is an important aspect of changing phenology, and have added additional text to reflect this point on pg 266. We also note to the reviewer that the positive impacts of a premature growing season are already noted elsewhere in the chapter (see pg 261).</td>
<td></td>
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<tr>
<td>David</td>
<td>Peterson</td>
<td>412300</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>265</td>
<td>270</td>
<td>14</td>
<td>271</td>
<td>We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly (see response to comment above).</td>
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<tr>
<td>David</td>
<td>Peterson</td>
<td>412301</td>
<td>Text Region</td>
<td>07. Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>271</td>
<td>276</td>
<td>8</td>
<td>277</td>
<td>Thank you for your comment. Fishing and forestry are commonly referred to as &quot;industries&quot; but we see a benefit from the point of view of fishing and forestry. We have revised the point to read as...</td>
<td></td>
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Response
Key Message 2: Natural resource management will increasingly require planning for an uncertain future. Adaptation strategies that are flexible and coordinated at landscape and 14 large marine ecosystem scales have rapidly progressed and their implementation is 15 essential to be refined by addressing surveying, impacts of climate change and how those 16 impacts are competing with other stresses on our valued resources.

Comment: This message is so vague that it is meaningless. However, the assumption seems to be that there are increased risks coming from climate change and extreme weather. This is speculation falsely asserted as an established physical fact. There is no scientific message here. It is increasingly likely that we have a little human-induced climate change that has already been beneficial. The fact that the E4MO models run not too well is unfortunate. See just as an example: "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Krapfenerger, Cato Institute, 2018. See just as an example: "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Krapfenerger, Cato Institute, 2018. We have reviewed the source of information suggested by the comment and find that it does not meet the guidance to authors on Information Quality. This guidance assures that sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. Volume 1 of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and Information Quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 [http://www.cio.noaa.gov/services_programs/info_quality.html]. For purposes of compliance with Section 515, these documents are deemed a "Highly Influential Scientific Assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 10115 standard which includes the necessary information to achieve reproducibility.

Thaye Wolf 14.6006 Whole Chapter 07. Ecosystems, Ecosystem Services, and Biodiversity 257 259 18 17 The Summary Overview and State of the Sector report certain paragraphs verbatim. This is is repetitive, and seems to occur in other chapters.

Thaye Wolf 14.6007 Whole Chapter 07. Ecosystems, Ecosystem Services, and Biodiversity 263 263 14 15 The last sentence in the Changing Primary Productivity section is confusing and seems to state that climate change will lead to increased productivity at higher levels and increased fisheries catch. This is not what the cited references suggest.

Based on guidance from USGCRP, the Executive Summary (in which the Summary Overview is contained) is to remain verbatim from the underlying text.
...and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing.

This section of text has been substantially reworked and no longer contains the reference to “may”. However, the clear statement on changes in the evidence from the previous NCA was much appreciated. It would be great to see more such statements throughout the report.

Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 2, and Key Message 4 and provide some more detail in those sections.

Thank you for the comment, examples have been added.

Thank you for the comment. This sentence has been rephrased.

Thank you for the comment. We have removed this sentence.

The phrasing of the sentence makes it seem as if the various species had conventions of their members and decided to have a smaller range. Rephrasing is needed to make clear this has been forced on them by climate change. So, sentence might be of form “Climate change has led to reduction in the latitudinal and/or elevation ranges of over half of studied terrestrial plant and animal species in North America; this has generally involved poleward shifts in latitude and upward shifts in their elevation.” The next sentence has a similar problem of making this sound intentional rather than forced.

Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 2, and Key Message 4 and provide some more detail in those sections.

Thank you for the comment, examples have been added.

Thank you for the comment. We have removed this sentence.

This section of text has been substantially reworked and no longer contains the reference to “may”. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing.

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Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 2, and Key Message 4 and provide some more detail in those sections.

Thank you for the comment, examples have been added.

Thank you for the comment. We have removed this sentence.

The phrasing of the sentence makes it seem as if the various species had conventions of their members and decided to have a smaller range. Rephrasing is needed to make clear this has been forced on them by climate change. So, sentence might be of form “Climate change has led to reduction in the latitudinal and/or elevation ranges of over half of studied terrestrial plant and animal species in North America; this has generally involved poleward shifts in latitude and upward shifts in their elevation.” The next sentence has a similar problem of making this sound intentional rather than forced.

Thank you for the comment. We have removed this sentence.

The phrasing of the sentence makes it seem as if the various species had conventions of their members and decided to have a smaller range. Rephrasing is needed to make clear this has been forced on them by climate change. So, sentence might be of form “Climate change has led to reduction in the latitudinal and/or elevation ranges of over half of studied terrestrial plant and animal species in North America; this has generally involved poleward shifts in latitude and upward shifts in their elevation.” The next sentence has a similar problem of making this sound intentional rather than forced.

Thank you for the comment, examples have been added.
The章节中需要对第三个主要组成部分进行编辑，即适应能力（AC）的范围。这可能影响到物种的生存。例如，如果物种的范围不断扩大，则需要考虑其影响。

The section of the text has been substantially reorganized and no longer contains the reference to “may”. However, the heart of this comment refers to the use of “may” generally. We have standardized the likelihood language and removed the use “may” where possible; however, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing.

Thank you for your comment. We have added specific details on anastomosis under two key messages.

The section of the text has been substantially reorganized and no longer contains the reference to “may”. However, the heart of this comment refers to the use of “may” generally. We have standardized the likelihood language and removed the use “may” where possible; however, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing.

Thank you for your comment. We have noted your suggestion and added more text on cascading stressors.

The chapter will benefit by adding more text and ongoing emphasis to the potential and effects of interactions of changes in climate with non-climate influences on species and habitat. For example, most of the reduction in habitat and impacts to species are still due to non-climate influences. However, there are increasing observations of such impacts being exacerbated by various aspects of climate change, and a greater role for climate change effects is expected in the future under increased rates of change. For example, if the climate changes, the species may be unable to adapt to the increased temperatures. In addition, the species may be unable to adapt to the increased precipitation. Regardless of the climate change scenarios used, the projections for increased dealing will increase the risk of extinction.

Comment accepted and revision to the text has been made.

This section of text has been substantially reworked and no longer contains the reference to “may”. However, the heart of this comment refers to the use of “may” generally. We have standardized the likelihood language and removed the use “may” where possible. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word “may” as it accurately describes the lack of knowledge in terms of likelihood or timing.

Thank you for your comment. We have added a new message (EM) on adaptation and natural resource management to assess what has been done and the challenges that remain to incorporate climate adaptation planning into natural resource management.

The chapter implies a too general level of implementation of climate change adaptation work than appears to be occurring. Although there are examples of such implementation around the US, they are mostly at a local level. In many (perhaps most) locations there is little or no implementation of such activity. Further, on the national level, there is no mechanism for tracking such work, and few states are likely to be tracking it. There is also a need for long-term monitoring that is designed to determine the effects of climate adaptation efforts.

Comment accepted and revision to the text has been made.

We have updated the sentence to: Our understanding of climate change impacts and responses of biodiversity and ecosystems has improved since NCA3, and the expected consequences of climate change will vary by region, species, and ecosystem type.

Thank you for your comment. We have edited the description of adaptive capacity to include dispersal ability.
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<td>07</td>
<td>Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>259</td>
<td>259 1 2</td>
<td>2</td>
<td>As written, the first sentence in this section implies that Earth's biodiversity has value only to the extent that it provides ecosystem services. A recommended edit is to add a phrase which recognizes that for many people, biodiversity has intrinsic value, regardless of whether there is a link to human health and well-being.</td>
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<td>08</td>
<td>Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>259</td>
<td>259 11 12</td>
<td>12</td>
<td>The phrase significant effort has been made toward incorporating adaptation measures to in land and water management - can easily be interpreted as implying for more widespread adaption and additional implementation that exists, particularly in areas where there is active resistance to accepting the reality of climate change. Suggested edit is to add: - although there undoubtedly are many locations where such efforts have not yet been made. For the value of full disclosure and transparency, it also would be appropriate to add a sentence to acknowledge that the federal role in such designing, intervening, or support such efforts is now under light of recent changes in policies and budget priorities across federal agencies with regard to activities related to climate change.</td>
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<td>07</td>
<td>Ecosystems, Ecosystem Services, and Biodiversity</td>
<td>259</td>
<td>259 13 16</td>
<td>16</td>
<td>We have removed this sentence but have expanded discussion of adaptation efforts and changes to natural resource management, both in terms of what is currently happening and areas of need. This includes some actions taken by federal agencies. However, we do not discuss the role of the federal government or any entity in designing, implementing, or supporting efforts as that could be viewed as policy prescriptive, which is outside the scope of this report.</td>
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<td>The description of adaptive capacity (AC) needs to be edited to add the third main component of AC, which is focused only on additional forms of AC. Additionally, we acknowledge that dispersal is a form of adaptive capacity in the Range shifts section. Finally, we cross referenced range shifts in the now-called 'Changing traits' section.</td>
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<td>A recommended edit is to add a sentence to the section which acknowledges that movements, including range shifts, are a component of adaptive capacity, although the topic is being treated separately from the other material on adaptive capacity. Some of the papers cited in the chapter describe movements which includes range shifts, as one of the three components of AC, e.g. Glick et al (2011, p.22) and Beever et al (2015).</td>
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<td>As written, the first sentence in this section implies that Earth's biodiversity has value only to the extent that it provides ecosystem services. A recommended edit is to add a phrase which recognizes that for many people, biodiversity has intrinsic value, regardless of whether there is a link to human health and well-being.</td>
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<td>The section will benefit from the addition of two text changes in the abundance of bark beetles (both native and non-native) due to warmer winters and extension of warm weather in spring and fall, as the beetles impacts on forests in recent years have been substantial, and in some locations this is continuing or is likely to resume off-and-on over time. For some locations this has implications related to forest composition and to the scope, frequency, and severity of wildfires, and coupled with changes in temperature and drought this relates to observed and projected changes in habitat (including spread of invasive species, replacement of some forest stands by shrubland), and thus also relates to animal/biodiversity: e.g. see Berner et al. 2017. Tree mortality from fire, bark beetles, and timber harvest during a hot and dry decade in the western United States (2002–2012). Environ. Res. Lett. 12: 065005. <a href="https://doi.org/10.1088/1748-9326/aa6f94">https://doi.org/10.1088/1748-9326/aa6f94</a></td>
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<td>The description of dispersal ability as a component indicator of AC need emphasis A is none of the three components of AC, and involves range shifts, so this part also ought to cross reference the sections on range shifts. Some of the papers cited in the chapter describe these 3 components of AC, e.g. Glick et al (2011, p.22) and Beever et al (2015).</td>
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<td>This action is proposed to be an effective action in so many ways. As to your comment, we have added a new key message entirely on adaptation and natural resource management.</td>
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<td>This action is proposed to be an effective action in so many ways. As to your comment, we have added a new key message entirely on adaptation and natural resource management.</td>
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builds resilience. Do you mean, build habitat quality where possible and adapt to changing conditions where not.

The sentence above needs to be clarified. Not clear how adapting to degradation of habitat integrity and quality resilience and decrease both direct and indirect impacts.

threat, as opposed to correctly stating that we have high confidence in the existence of the threat.

Note that, when these probabilities were presented in the CSSR and in Sweet et al 2017, they came with clear in upper bounds for 2100”), is a bit different than the unalloyed language here. Given the limited degree of confidence, particularly in the upper bounds, it seems a bit awkward to cite high-probability probabilities here. Note that, when these probabilities were presented in the CSSR and inSweet et al 2017, they came with clear in upper bounds for 2100”), is a bit different than the unalloyed language here. Given the limited degree of confidence, particularly in the upper bounds, it seems a bit awkward to cite high-probability probabilities here. Note that, when these probabilities were presented in the CSSR and inSweet et al 2017, they came with clear in upper bounds for 2100”), is a bit different than the unalloyed language here. Given the limited degree of confidence, particularly in the upper bounds, it seems a bit awkward to cite high-probability probabilities here.

Note that the meaning of the probability language in CSSR Chapter 12, which is softened by confidence language under consideration in the text.

Seems like 2010 is an outdated number considering it is closer to your projected year, 2020 and is before people started defining participatory adaptations.


The American ClimateProspectus (Houser et al., 2013; cited here as Gordon, 2014) did not use the NCA sea-level projection, and therefore its results cannot be compared as being associated with the "intermediate" scenarios. It did analyze property falling below mean sea level and falling below mean high water for RCP 2.6, 4.5 and 8.5. The central 66% probability ranges for property falling below MSL in RCP 2.6 are $66-$106 B in 2050 and $297-$507B in 2100. The associated sea-level rise projections are the full PDF for RCP 8.5 developed by Kopp et

"probable to occur" is not using formal probability language properly.

"the Gulf of Mexico, the Great Lakes, and Pacific and Caribbean islands" is not a list of the three oceans spanned by U.S. coasts. The three oceans are Gulf of Mexico, Great Lakes, and Pacific and Caribbean islands. This makes it sound like you are naming the three oceans as the great lakes, the gulf of mexico, and the islands. In the text, I am not sure why you are calling out those four and ignoring other major water bodies.

How is it there is virtually no difference in costs with adaptation between RCP 4.5 and RCP 8.5? It makes it sound like you are naming the three oceans as the great lakes, the gulf of mexico, and the islands. In the text, I am not sure why you are calling out those four and ignoring other major water bodies.

Note that this figure and the accompanying table which I interpret as the full text for SDG compliance is about adaptation. I suggest amended the title and caption to indicate that it is about regional coastal effects and adaptation examples. Editorialy, my suggestion is this figure is trying to do too much and it makes more sense with the structure of the chapter to have one figure here about coastal effects and a separate figure in section 8.3 with all the adaptation examples.

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This chapter has the potential to be a useful reference on the strategies that are being or could be used to adapt to sea-level rise, but the current discussion of coastal adaptation is limited to 2 paragraphs, plus one figure and a box on North Americans. It would be helpful to discuss the range of possible adaptation options currently practiced and under consideration in the text.

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The text falsely states speculative conjectures as established physical facts. As indicated by the references to IPCC scenarios, these conjectures are based primarily on questionable computer projects which are far too sensitive to human activities, especially CO2 increases. The referenced scenario data may well be flawed as the “baseline” or “business as usual” scenario (emissions without measures) used in the IPCC reports is not a constant, but changes with each update. This text exhibits neither quality, objectivity, nor integrity. To begin with, there is neither objectivity nor integrity, as these were not pointed out repeatedly during the previous series of National Assessments (attention should not be necessary), yet they persist. As a result there is no quality or utility.

Comment: This text falsely states speculative conjectures as established physical facts. No climate change projections and results presented in several peer-reviewed publications provide evidence to support a physically plausible GMSL rise in the range of 2.0 meters (m) to 2.7 m, and recent results regarding Antarctic ice sheet stability indicate that such outcomes may be far less likely than previously thought.

USGCRP, 2017: 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, 470 pp, doi: 10.7930/J0J964J6, which concludes, among other findings, that the projections and results presented in several peer-reviewed publications provide evidence to support a physically plausible GMSL rise in the range of 2.0 meters (m) to 2.7 m, and recent results regarding Antarctic ice sheet stability indicate that such outcomes may be far less likely than previously thought.

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Overall, it was refreshing reading this chapter compared to some of the others in NCA4, which are deeply flawed. This here is quite good already, so I have only a few comments.—Generally, do a “may” word check - the first two messages in particular include the vague language. We were not allowed to use such words in NCA4. I would assume you can't get that kind of feedback with the White House either.

Thank you for your comment. The author team has updated the language in question.

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Thank you for your comment. The author team has updated the language in question.

The key message indicates a vague statement on how adaptation “may” decrease losses and cascading economic impacts. But this is to be rather weak compared to the number given in Figure 8.1. BTW, please check the correctness of the take away message and of the numbers in the figure caption of 8.1. It seems to me the key message here is that stringent mitigation is the greatest cost saving of all. That seems to make the difference between 3.6 trillion vs. 820 billion, not?

And secondly there are the cost savings/damages avoided if adaptation measures were taken. The difference between no adaptation and with adaptation seems surprisingly small. Or am I missing something? Maybe the issue is that the two groups are really hard to distinguish. Anyway, there is something really weird about the graphics versus the text. Please check carefully and maybe extend the vertical scale to show the savings more distinctly.

Thank you for your comment. The sentence has been amended for clarity.

The figure caption is unclear - you need to clarify which of the two concepts is visualized in which part of the figure.

Thank you for your comment. The figure caption has been amended to more clearly denote which is the “equity” condition and which is the “equality” condition and how it directly relates to KM#3.

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Thank you for your comment. The section in question has been amended to include details on the other types of coastal communities and their ties to their region. The author team agrees that this concept goes beyond Indigenous Peoples.

Are you aware of the significant efforts that DOI has undertaken after Hurricane Sandy to assess the economic impacts. But this to be rather weak compared to the numbers given in Figure 8.1.

Thank you for your comment. The author team has added the climate resilience toolset to the report, which complements multiple resources including the DOI and NERR work.


Thank you for your comment. The author team added the greenhouse gas inventory as a case discussion.
Allison Allison 414027 East Region OB: Coastal Effects 400 401 23 28 A study has just been completed that is maybe one of the most detailed examinations of community adaptation funding challenges ever undertaken in the US or elsewhere. I would send a copy via the review email to USGCRP for your consideration.

Thank you for your suggestion. This report will be published beyond the USGCRP report timeline.

Piyush Singh 414028 East Region OB: Coastal Effects 118 120 1 Referring to format is highly uneven. Careful copyedit needed

Thank you for the comment. The document will be thoroughly copyedited in the subsequent stages of the process.

David Bishop 414023 Whole Page OB: Coastal Effects 299 Should include Ocean acidification and hypoxia as issues for the southwest region

The author team has collaborated with the Southwest chapter to address this comment and determined that this is not a high priority for that chapter; however, the Agriculture and Rural Communities chapter (Ch. 10) does include information on eastern rice really which can lead to hypoxia.

Hisa Brown 442155 Figure OB: Coastal Effects 2 298 The title of this figure should better represent the figure itself, i.e., it depicts coastal effects as well as selected adaptation measures. There is no need for a table to replace what is in the figure.

Thank you for your comment. The figure and table will look substantially different once the NCA goes to production. The table was used for the public comment process only and will not be included in the final figure.

Allison Combs 422137 East Region OB: Coastal Effects 294 296 3 11 This is an exceptionally well-written key messages, and very responsive to the author frame to these in a risk-based manner. However, it is really long. I would suggest deleting the adaptation sentence last sentence since NA and NA already cover this- and keeping this one key finding focused on the topic of increased flooding and associated economic loss. It is just too covered too much. May also combine the first two sentences to cut down on words: America’s trillion-dollar coastal property market and public infrastructure are threatened today by the ongoing increase in the frequency and severity of tidal flooding and higher storm surges due to sea level rise and changes in extreme precipitation, with cascading impacts to the larger economy.

Thank you for your suggested edit. The author team has accepted it and amended the language accordingly.

Allison Combs 422138 East Region OB: Coastal Effects 294 296 13 15 This is a nice key message but way too long too. The last two sentences seem to be redundant, so I suggest dropping the last sentence at least. I would suggest rewriting as well, “Disasters, tourism, human health, and public safety depend on the coastal ecosystems that are being transformed, degraded, or lost due to climate change. Coastal ecosystems and adopting nature-based infrastructure solutions can enhance resilience of the effects of sea level rise and extreme weather. Help ensure continued health of coastal communities and ecosystems.”

Thank you for your suggested edit. The author team has accepted it and amended the language accordingly.

Allison Combs 422139 East Region OB: Coastal Effects 294 296 19 26 The first half of this key message is great. The second half is repetitive and speculative. I would suggest deleting “These questions challenge existing legal frameworks,” since you then go on say they will test legal frameworks in the very next breath. I strongly suggest dropping the last question, as this is purely speculative and I doubt it is borne out in the scientific literature assessed for this chapter. It is also unnecessary, since you just said the same thing about coastal communities will be among the first to test these legal frameworks by default; so legal definition, they will be setting the precedent. Deleting these two parts of the KM will make it more concise and effective.

Thank you for your suggested edit. The author team has accepted it and amended the language accordingly.

Allison Combs 422140 East Region OB: Coastal Effects 294 296 23 28 Health outcomes since NCA4

Thank you for your comment. The language has been amended and the appropriate citation added.

Allison Combs 422141 East Region OB: Coastal Effects 295 297 11 12 Very glad you included mental health impacts. May want to cite the mental health chapter of the health assessment here (Dodgson et al 2020). Since one of your key findings was about social inequity, it would be nice to include a summary sentence on that topic in the summary overview.

Thank you for your feedback. The author team agrees and has added language about the specific mental health impacts of climate- and weather-related disasters to the summary and included the Dodgson et al (2020) citation.

Allison Combs 422142 East Region OB: Coastal Effects 296 298 12 At line 30--this is one way to, this one seems to imply that the three oceans you are talking about are all the off of Mexico, great lakes, and islands. Not that are in addition to the three oceans. May also replace with “as well as”

Thank you for your suggestion. The statement has been amended for clarity.

Allison Combs 422143 East Region OB: Coastal Effects 296 298 18 Rather than using the captions to reprint the numbers from the table, I suggest you just say what an economic benefit the cost is. I think you can get across to the committee point about loss without the number.

Thank you for your suggestion. The table captions has been shortened to include only the “headline” and the number. The author team agrees that this facilitates readability.

Allison Combs 422144 East Region OB: Coastal Effects 297 299 9 10 While a high premium on space in these chapters, a sentence like this one could be deleted. It doesn’t really say much. Also the term “mitigate” could be confusing, as the figure is points to is about adaptation, not mitigation (if you’re using mitigate colloquially as into adverse risks, but in a climate report is this is easily confused)

Thank you for your suggestion. The author team agrees with your comment the use of “mitigate” in these circumstances could be confusing. As a result, the sentence has been amended for clarity.

Allison Combs 422145 Figure OB: Coastal Effects 2 298 This makes for a great regional roll-up and would be a stunning visual interactive, but there is as useful of a list of the points in the figure, but it also seems to be missing citations. These should be added to each bullet point. I would recommend that the authors cut back on text substantially, possibly limited each sector to one to two bullet points. Remove text that is not specifically calling out a state from the caption itself. While I like m-dashes, this one seems to imply that the three oceans you are talking about are the gulf of Mexico, the Great Lakes, and the islands. Not that are in addition to the three oceans. May also replace with “as well as”

Thank you for your comment. The table and figure will look substantially different once the NCA goes to production.

Allison Combs 422146 East Region OB: Coastal Effects 313 319 17 17 I’m surprised that there are only two states here on storm surge and that at least one is rather old. What about recent BAMS reports or papers out of NOAA, or even the NOAA state facts sheets? Even NCA4. And of course, this is very badly in the CSSR

Thank you for your suggestion. A reference to Chapter 12 of the Climate Science Special Report has been added.

Allison Combs 422147 East Region OB: Coastal Effects 324 329 15 16 You just finished saying this hugely catastrophic thing is still in the realm of possibility, but then you conclude this well-written paragraph with a rather weak statement about risk management approaches (yawn). I urge the reader to cut down on words: “America’s trillion-dollar coastal property market and public infrastructure are threatened today by the ongoing increase in the frequency and severity of tidal flooding and higher storm surges due to sea level rise and changes in extreme precipitation, with cascading impacts to the larger economy.”

Thank you for your suggestion. The author team has reviewed the key messages and editorial suggestions. The team has decided to keep the language as written to provide the full context about the threats and defenses that can mitigate them.

Allison Combs 442148 East Region OB: Coastal Effects 206 208 8 5 The EPA Indicators report (2012) also has values for wetland land loss, and in my personal knowledge of this dataset does as well.

Thank you for your comment. The author team added the Climate Change Indicators Report (2012) as a citation and documented the loss of wetlands cited in that study.
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<th>First Name</th>
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<th>Chapter</th>
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<th>Page</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>142149</td>
<td>Text Section</td>
<td>BE. Coastal Effects</td>
<td>106</td>
<td>150</td>
<td>10</td>
<td>Thank you for your suggestion. The author team has added the NRC citation since the new mitigation figure shows more detailed than the bullet in the region.</td>
<td>Allison's selection and the strategy and decision process regarding review scope. In particular for author structure, please refer to &quot;Appendix 3. Report Development Process,&quot; where there is additional information about the options for author team structure. Note that there are additional information about the options for author team structure. There are so many topics covered in this chapter that it's hard to say which one is the best. This text is ok, but a little overly general. It seems like it's a good question.</td>
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<td>108</td>
<td>108</td>
<td>10</td>
<td>We've seen this a million times on Facebook, and it's a good one. But I don't think how the figure is showing the added value of a separate section on coastal effects, which is a good practice to have. We've seen this a million times in the literature, so it should be as short as possible.</td>
<td>The chapter was really adaptation heavy, with many key messages and sections talking about adaptation in some way (most of the figures used boxes too). What about mitigation? I appreciated the figure that showed the difference between RCP4.5 and 8.5, but I was surprised there was no comparison to existing adaptation. The author team decided it was appropriate to focus on the latest USGCRP projection science. The CSSR and technical work in this area has been added. The author team decided it was appropriate to focus on the latest USGCRP projection science as opposed to trying to detail changes in projection methodologies. The author team decided it was appropriate to focus on the latest USGCRP projection science.</td>
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<tr>
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<td>Text Section</td>
<td>BE. Coastal Effects</td>
<td>109</td>
<td>109</td>
<td>10</td>
<td>The example of migration after Hurricane Maria in NCA. It would be weak if Allison could only project information on the diaspora of Puerto Ricans this year. That's very early and there may not be full data yet, even reporting estimates would be of no use.</td>
<td>The example of migration after Hurricane Maria in NCA. It would be weak if Allison could only project information on the diaspora of Puerto Ricans this year. That's very early and there may not be full data yet, even reporting estimates would be of no use.</td>
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<tr>
<td>Allison</td>
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<td>142152</td>
<td>Text Section</td>
<td>BE. Coastal Effects</td>
<td>110</td>
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<td>10</td>
<td>This is it, but a little overly general. It seems to put just adaptation is needed, but not hard, and somewhat there are some examples. What sort of adaptation is needed? How would it help protect against coastal impacts? What benefits would you see? How much would it cost? It would also be really interesting to note, if you can find literature on the topic, how much is it being talked about in the literature.</td>
<td>Thank you for your comments. The National Climate Assessment is a scientific document that provides a basis for decision making, but does not prescribe policy or specific adaptation measures. Discussion of these topics is beyond the scope of the assessment. The wide range of costs, adaptation types, and communities affected make it impossible to go into detail in a chapter such as this one. You will find greater detail about particular projects in the regional chapters. The coastal effects chapter looks more at the broad trends that are facing all of the coastal regions.</td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>142153</td>
<td>Figure Section</td>
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<td>110</td>
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<td>10</td>
<td>The plot is it, but a little overly general. It seems to put just adaptation is needed, but not hard, and somewhat there are some examples. What sort of adaptation is needed? How would it help protect against coastal impacts? What benefits would you see? How much would it cost? It would also be really interesting to note, if you can find literature on the topic, how much is it being talked about in the literature.</td>
<td>Thank you for your comments. The National Climate Assessment is a scientific document that provides a basis for decision making, but does not prescribe policy or specific adaptation measures. Discussion of these topics is beyond the scope of the assessment. The wide range of costs, adaptation types, and communities affected make it impossible to go into detail in a chapter such as this one. You will find greater detail about particular projects in the regional chapters. The coastal effects chapter looks more at the broad trends that are facing all of the coastal regions.</td>
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<td>Text Section</td>
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<td>110</td>
<td>111</td>
<td>16</td>
<td>The inclusion of Figure 8.4 provides important context for the concept of social equity.</td>
<td>Thank you for your suggestions. The author team has added a reference that includes case studies as examples.</td>
</tr>
<tr>
<td>Allison</td>
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<td>Table Section</td>
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<td>14</td>
<td>The summary overview mentions some mental-socio-physical impacts, the chapter itself did not. I would suggest adding a sentence or two in about the mental health impacts of all these coastal damages, particularly when people lose or need to abandon their homes (see Dodgen et al 2016 in the health assessment).</td>
<td>Thank you for your feedback on the chapter. The length is impacted by the inclusion of the cover page, executive summary, and table for Figure 8.2. Once fully formatted, the length will meet USGCRP guidelines. The authors have considered your comments regarding changes to section 3.8 and have decided to retain the section to provide the necessary context for understanding the social, economic, and environmental impacts of rising sea level and flooding on the coasts and their communities. Likewise, the author team has concluded that the inclusion of Figure 8.4 provides important context for the concept of social equity.</td>
</tr>
<tr>
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<td>Thank you for your comments. The author team agrees that the paragraph is equally clear with or without the change.</td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>142158</td>
<td>Traceable Account</td>
<td>BE. Coastal Effects</td>
<td>112</td>
<td>112</td>
<td>13</td>
<td>This is one of the better traceable account entries. Anything else you would add about author selection on decisions that the author team made regarding scope? For instance, are some topics covered in other chapter and so not covered here?</td>
<td>Thank you for your comments. The traceable account has been updated to add additional information regarding author team selection and the strategy and decision process regarding review scope. In particular for author team structure, please refer to &quot;Appendix 3. Report Development Process,&quot; where there is additional information about the options for author team structure. Note that there are additional information about the options for author team structure. There are so many topics covered in this chapter that it's hard to say which one is the best. This text is ok, but a little overly general. It seems like it's a good question.</td>
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<td>BE. Coastal Effects</td>
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<td>113</td>
<td>2</td>
<td>The chapter was really adaptation heavy, with many key messages and sections talking about adaptation in some way (most of the figures used boxes too). What about mitigation? I appreciated the figure that showed the difference between RCP4.5 and 4.5, but I was surprised there was no comparison to existing adaptation. The author team decided it was appropriate to focus on the latest USGCRP projection science. The CSSR and technical work in this area has been added. The author team decided it was appropriate to focus on the latest USGCRP projection science as opposed to trying to detail changes in projection methodologies. The author team decided it was appropriate to focus on the latest USGCRP projection science.</td>
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<td>Traceable Account</td>
<td>BE. Coastal Effects</td>
<td>113</td>
<td>113</td>
<td>11</td>
<td>Because there is only one back-reference/bibliographic statement for this very very long key message filled with multiple topics and points, I am uncertain what exactly you have high confidence/likely in. Suggest adding more statements at the end of each point (e.g. regarding damages, economic impacts, transformations of coastal communities).</td>
<td>The chapter was really adaptation heavy, with many key messages and sections talking about adaptation in some way (most of the figures used boxes too). What about mitigation? I appreciated the figure that showed the difference between RCP4.5 and 4.5, but I was surprised there was no comparison to existing adaptation. The author team decided it was appropriate to focus on the latest USGCRP projection science. The CSSR and technical work in this area has been added. The author team decided it was appropriate to focus on the latest USGCRP projection science as opposed to trying to detail changes in projection methodologies. The author team decided it was appropriate to focus on the latest USGCRP projection science.</td>
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<td>142161</td>
<td>Traceable Account</td>
<td>BE. Coastal Effects</td>
<td>113</td>
<td>113</td>
<td>14</td>
<td>A little more &quot;description&quot; in the description of evidence base would be nice. Are these topics well studied, with research dating back years and years, and everyone is convinced? Or is this new, emerging science? For example, noting that there are not many economic sector models that quantify damages under alternative climate scenarios (ready, just Flacki Business and CMAO) wouldn't help his/ her case, but being more detailed about the content over methodologies for projecting sea level and how these estimates have changed (not the numbers, but just that they changed with events scientific advancements) would also help. This same text is in NMA is a good example.</td>
<td>The author team has reviewed the text and agree that with updates made to the key message text the confidence and likelihood statements do apply to the entire key message.</td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>142162</td>
<td>Traceable Account</td>
<td>BE. Coastal Effects</td>
<td>114</td>
<td>114</td>
<td>25</td>
<td>Then, the authors say &quot;very high confidence&quot;, but above in the key finding it was just &quot;high confidence&quot;. These should be made consistent, which would help. Add additional confidence levels were provided for each topic within the key message.</td>
<td>The author team wants to express an overall confidence level for the Key Message in the chapter text. But overall, the traceable account includes a reference to a specific section of that Key Message in which the author team has very high confidence.</td>
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<tr>
<td>First Name</td>
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<td>Comment ID</td>
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| Devin     | Coreille  | 142477     | Text Region  | EB. Coastal Effects | 105      | 20 | 28 | an NERCC analysis found that between 1986-2014, FEMA spent $56.6 billion on Public Assistance Grants in areas subject to a federal disaster declaration. These grants were predominantly used to repair or replace public buildings ($12.6 billion), public utilities ($7.4 billion), roads and bridges ($5.5 billion), and water and sanitary facilities (dams, dams, and pumps ($10 billion). The biggest recipients were Louisiana ($13.7 billion), New York ($10 billion), Florida ($11.1 billion), Texas ($5.5 billion), and Mississippi ($4.1 billion). [See https://www.nrcs.usda.gov/Internet/Faces/Publicavadoc...]
| Devin     | Coreille  | 142478     | Text Region  | EB. Coastal Effects | 106      | 500 | 11 | 14 | Coastal wetlands provide flood mitigation benefits as well, which should be referenced in this section. A recent study found that in Ocean County, New Jersey, existing coastal wetlands were responsible for $625 million in avoided flood damages during Hurricane Sandy. [See The Value of Coastal Wetlands for Flood Damage Reduction in Northeastern USA, Nature Climate Change, August 2013.]
| Devin     | Coreille  | 142479     | Text Region  | EB. Coastal Effects | 108      | 508 | 3 | 19 | NERCC analyzed FEMA floodinsurance data and found that lower value homes, presumably owned by lower income owners, suffer much higher levels of flood damage relative to the property's value. This is a clear indication of inequality in disaster losses. Among severely-repetitive loss properties, less valuable homes were more likely to suffer flood damages that exceeded the property's value. Among single-family homes worth less than $210,000, the average sum of all damages ($125,000) exceeded the value of the average home ($100,000). Among single-family homes worth more than $250,000, however, average damages were some $250,000 less than the average home's value. |
| Devin     | Coreille  | 142480     | Figure      | EB. Coastal Effects | 109      | 503 | 1 | 208 | To highlight the inequality that exists in repeatedly flooded homes and the disproportionate damages that lower income homeowners often suffer relative to their home's value, we suggest including the graphic referenced above. (See Appendix A, Fig. 4.) "Lower income homes are more likely to suffer "flood" damage that exceeded the property's value," NERCC, July 2017, available at https://www.nrcs.usda.gov/Internet/Faces/Publicado...;]
| Kari       | Bumbaco   | 143127     | Figure      | EB. Coastal Effects | 109      | 527 | 1 | 297 | The figure is misleading, and suggesting removing the chapter from the figure. Figure caption is plagiarized directly from the cited EPA report. In addition, "Protective Adaptation Measures" as stated in the caption are never discussed in the text. |
| Devin     | Thomas    | 143130     | Figure      | EB. Coastal Effects | 110      | 501 | 1 | 288 | This is a homemade graphic based entirely on subjective opinion. The figure is sourced as "NOAA," but no data sources are provided as background information for this figure. Moreover this figure is not reproducible outside of this publication. In addition, using four full pages of text as a figure caption is ridiculous. This is obviously necessary because the figure itself is squarified and illegible in current state. If this figure is to stay in the chapter, significant supporting documentation must be provided (i.) for each region, 2. for each icon used within each region, and 3. appropriate cross-check with the other regional chapters. In short, strongly recommend deleting this non-reproducible figure. |
| Devin     | Thomas    | 143131     | Figure      | EB. Coastal Effects | 110      | 503 | 1 | 289 | "Newport News...coastal property market..." Please provide supporting documentation or references for the use of million dollar. |
| Kari       | Bumbaco   | 143132     | Text Region  | EB. Coastal Effects | 110      | 501 | 21 | 291 | With respect to tropical/commodity intensity increases, while this is true there is no assumption of an associated increase in the probability of any cause of impact. This is not to say, just because T&Cs are intensifying, it doesn't mean they are always going to hit land. |
| Devin     | Thomas    | 143134     | Text Region  | EB. Coastal Effects | 110      | 405 | 17 | 5 | Strongly suggest moving this entire paragraph to the discussion of figure 8.1. |
| Devin     | Thomas    | 143135     | Text Region  | EB. Coastal Effects | 110      | 405 | 15 | 5 | Please explain what is meant by "the Atlantic and Gulf coasts facing greater-than-average risk." It needs out of context with the rest of the paragraph. |
| Kari       | Bumbaco   | 143137     | Text Region  | EB. Coastal Effects | 110      | 500 | 11 | 14 | These are the only two sentences on coastal wetlands in the entire chapter. Given their inherent importance in protecting coastal properties I would like to see a more comprehensive exploration of their importance and as an alternative to coastal shoreline hardening. |
| Devin     | Thomas    | 143139     | Figure      | EB. Coastal Effects | 110      | 506 | 22 | 290 | "Build smarter approaches..." Please provide documentation and/or concrete examples for what is meant by "build smarter" infrastructure. |
| Devin     | Thomas    | 143141     | Figure      | EB. Coastal Effects | 110      | 507 | 3 | 297 | Each image needs to be described specifically in the figure caption. For example, the upper left panel could be labeled "A," upper right corner "B" and so on with a corresponding description of each panel with its new label in the figure caption. |
| Devin     | Thomas    | 143142     | Text Region  | EB. Coastal Effects | 110      | 508 | 8 | 298 | "...decimating many densely populated areas that provide many climate-related impacts." This needs more elaboration in an effort to steer clear of political motivations in this sentence. |
| Devin     | Thomas    | 143143     | Text Region  | EB. Coastal Effects | 110      | 508 | 14 | 299 | "...Pathway forward..." Please provide concrete examples by what is meant by this. |
| Devin     | Thomas    | 143144     | Figure      | EB. Coastal Effects | 110      | 509 | 2 | 299 | The section needs due to context or should be removed entirely. I believe the authors are trying to address climate migration as one form of adaptation but have only called out "sea level rise" examples from Newtok, Alaska. The cited reference (Beven 2011) is a lawyer who wrote an article about the legal challenges of moving one Alaska town from A to B. As such it is a stretch to link this particular example to a whole method of adaptation. |
| Devin     | Thomas    | 143147     | Figure      | EB. Coastal Effects | 110      | 509 | 12 | 299 | The section needs due to context or should be removed entirely. I believe the authors are trying to address climate migration as one form of adaptation but have only called out "sea level rise" examples from Newtok, Alaska. The cited reference (Beven 2011) is a lawyer who wrote an article about the legal challenges of moving one Alaska town from A to B. As such it is a stretch to link this particular example to a whole method of adaptation. |
| Devin     | Thomas    | 143149     | Text Region  | EB. Coastal Effects | 110      | 511 | 11 | 301 | Residents may need to relocate (Fears 2012). I am wondering if this reference and the cities cited within it are still a valid argument. |

Thank you for your comment. The table and figure will look substantially different once the NCA goes to publication; in particular, it will be interactive in the online version. The table was used for the public comment process only and will not be included in the final figure (either the print or online version). The figure will also be better sourced back to the NCA4 regional chapters, which is where this information was derived. With the paper citation back to the regional chapters, this figure would be reproducible.

Thank you for your feedback. The authors have considered your comment and opted to retain the figure. The figure citation has been properly footnoted and permission received to use the figure in the Coastal Effects chapter. The caption is not an issue. Additionally, while the term "protective adaptation measures" is not included in section 8.1, other adaptation efforts are and examples of protective adaptation measures are detailed in Key Message 2. Thus, no change has been made.

Thank you for your comment. The standard for this report is to keep citations out of the Key Message itself. However, the citation has been added where appropriate in the Key Message narrative section.

Thank you for your comment. This sentence has been amended for clarity to focus on the idea that how the communities will fare long-term after storm damage is not yet known.

Thank you for your comment. The author team agrees that it originally worded, this passage only described increased livestock mortality, not the impact due to landfall. The passage has been amended to make it more clear.

Thank you for your comment. The author team has considered your suggestion and opted to retain the paragraph in its original location, as it does not speak to gains from adaptation, rather those losses from impacts.

Thank you for your comment. This sentence has been amended to make the wording more clear. It now explains that these regions of the country will face greater-than-average risks when compared to other regions other than the U.S.

Thank you for your comment. The author team agrees that they are important; the chapter has been updated and amended to include additional references related to wetlands including (Neray et al., 2016) and (Barlera et al., 2010).

Thank you for your comment. This sentence has been reworded to focus on broad ideas related to nature-based infrastructure, rather than getting into detailed discussions of particular programs.

Thank you for your comment. The figure and table will look substantially different once the NCA goes to publication; in particular, it will be interactive in the online version. The table was used for the public comment process only and will not be included in the final figure (either the print or online version). The figure will also be better sourced back to the NCA4 regional chapters, which is where this information was derived. With the paper citation back to the regional chapters, this figure would be reproducible.

Thank you for your comments. The standard for this report is to keep citations out of the Key Message itself. However, the citation has been added where appropriate in the Key Message narrative section.

Thank you for your comment. This sentence has been amended to better reflect the content of the article in question.

Thank you for your comment. The Executive Summary was produced per the guidance from USGCRP and will not immediately precede the chapter in the final version of NCA4 (as it did in the public review copy). As the final NCA product will not show the executive summary, the reader may not see the additional discussions of particular programs.

Thank you for your comment. The standard for this report is to keep citations out of the Key Message itself. However, the citation has been added where appropriate in the Key Message narrative section.

Thank you for your comment. The authors team did not add the NRDC issue brief as the organization tends to be policy prescriptive.

Thank you for your comment, but it does not appear to raise a question or suggest a revision for the document. The verbatim in this section has not been amended.

Thank you for your comment. The new citation has been added.
<table>
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<tr>
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<th>Comment ID</th>
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<th>End Line</th>
<th>Comment</th>
<th>Response</th>
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</thead>
<tbody>
<tr>
<td>Ken</td>
<td>Moraff</td>
<td>143150</td>
<td>Coastal Effects</td>
<td>08</td>
<td>297</td>
<td>111</td>
<td>112</td>
<td>2</td>
<td>2</td>
<td>Intermediate law and extreme. This is direct reference to the RCP 2.6 and 4.5. I am curious how other chapters refer to these scenarios. For the sake of consistency across the chapters and this chapter, might it be better to use the actual RCP numbers and simply refer the readers back to chapter 2 if they want to know more about them?</td>
<td>Thank you for the comment. The Technical Services Unit of USGCRP is tasked with ensuring consistency across the chapters.</td>
</tr>
<tr>
<td>Ken</td>
<td>Moraff</td>
<td>143154</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>297</td>
<td>1</td>
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<td>The description should read: &quot;compared to $10 billion with adaptation?&quot;</td>
</tr>
<tr>
<td>Ken</td>
<td>Moraff</td>
<td>143155</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
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<td>We have many municipal adaptation efforts underway in the New England. A habitat could be added to this list to buy &quot;for further information on adaptation efforts in the Northeast, please see <a href="http://www.epa.gov/laws">www.epa.gov/laws</a>.</td>
</tr>
<tr>
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<td>Moraff</td>
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<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>Tools used in this context as a name for specific climate impact changes. Please add a definition in the document and in each chapter.</td>
</tr>
<tr>
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<td>143157</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
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<td>ADD &quot;changing precipitation patterns&quot; to the icon list as it is one of the most significant impacts for the northeast region, as stated in the Northeast chapter.</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143263</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
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<td>Regional case studies should include citations.</td>
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<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
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<td>Examples in figure/table should include existing cases of managed retreat (e.g. HUD/take de Jean Charles case on p. 110, Sec 5.)</td>
</tr>
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<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143265</td>
<td>Figure</td>
<td>Coastal Effects</td>
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<td>298</td>
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<td>Adaptations can be categorized by implementation stage (e.g. <a href="https://toolkit.climate.gov/Maps">https://toolkit.climate.gov/Maps</a>).</td>
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<tr>
<td>Social Science Committee</td>
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<td>2</td>
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<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>Impact icons are too numerous to focus on. Several could be grouped (e.g. &quot;coastal flooding/erosion&quot;).</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143267</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>The meaning of the &quot;Extreme Events&quot; impact is unclear. Why does the Caribbean have this icon, but not the Southeast?</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143268</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>Examples in the Mid-Atlantic and Southeast Great Plains categories should be reduced in length and more examples should be included.</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143269</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>Examples in the Western and Pacific Islands section to explore purpose of listed policy initiatives (e.g. [Mayors Declar].) All examples should describe the action.</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143270</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>298</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>Add U.S. Climate Resilience Toolkit (<a href="https://toolkit.climate.gov/">https://toolkit.climate.gov/</a>).</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143271</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>310</td>
<td>310</td>
<td>312</td>
<td>23</td>
<td>24</td>
<td>Add U.S. Climate Resilience Toolkit (<a href="https://toolkit.climate.gov/">https://toolkit.climate.gov/</a>).</td>
</tr>
<tr>
<td>Social Science Committee</td>
<td>Coordinating Committee</td>
<td>143272</td>
<td>Figure</td>
<td>Coastal Effects</td>
<td>2</td>
<td>317</td>
<td>317</td>
<td>317</td>
<td>23</td>
<td>23</td>
<td>Major uncertainties should include more commentary on differences in state law regarding coastal impacts as well as the pace at which common law is responding to change.</td>
</tr>
</tbody>
</table>
| Social Science Committee | Coordinating Committee | 143439 | Whole Chapter | Coastal Effects | 2         | 396                 | 396        | 396     | 12        | 12       | The text reads: "U.S. coasts span three oceans: the Gulf of Mexico, the Great Lakes, and Pacific and Caribbean islands." For clarity, the sentence should read: "An adaptation effort that will better frame the likely impacts and the effort that will be necessary to prevent many coastal climate change impacts. Also, this will illustrate the benefits and necessity of reducing emissions to avoid unacceptable climate change damage. Relaying solely on RCP4.5 projections discourages the terrible impacts that will occur at lower emissions trajectories such as RCP2.6, and how RCP2.6 and below should truly be the goal. | Thank you for your feedback. The author team agrees that the scenarios should be referenced more consistently where possible and has amended the language. Note: The author team received helpful instructions to use the RCP 4.5 as the low-end scenario (https://coronapi.globall.Change.gov/accomplishment/1158)
Scientists Union of Scientists Concerned Scientists

Concerned Scientists Union of Scientists

Union of Concerned Scientists

Michelle Tigchelaar

143820

2nd Region

Coastal Effects

294 294 34 25

This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Seraphim.

In Key Message 3 it says: "Coastal communities will be among the first in the nation to test climate-relevant legal frameworks and policies against these impacts. To help inform and policy makers and the public about the nature of these impacts, it is important to reframe the language from "possibly affected" to "likely to be affected".

Thank you for your suggestion. The Isle de Jean Charles example is included in the text.

Year of concerned scientists

Union of Concerned Scientists

143821

2nd Region

Coastal Effects

294 294 34 13

"Infrastructure provides important lifelines for coastal communities, so impacts there would have further rippling through the country. (b) some important personal- and household-scale impacts are missing. Suggest change to "housing and infrastructure".

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143822

2nd Region

Coastal Effects

294 294 34 19

"The coasts are economic engines that house some of our nation's major urban centers, that support jobs..." A key reason the coasts are economic engines is because of the economic productivity of these big cities, which are heavily floored and in turn, their broader communities. (b) some important personal- and household-scale impacts are missing. Suggest change to "unavoidable degradation"?

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143823

2nd Region

Coastal Effects

294 294 34 25

This chapter includes some very important, key messages that can help expand understanding of the urgency of coastal risk in important ways. As support for these messages and key findings, however, the body text is in some places lacking important (non-technical) information and explanation for the policy maker and lay audience. Many of the comments here are non-technical or reference-driven; rather they call out small changes and additions that are needed to provide an adequately helpful backdrop for those key messages, and to make them fully understandable and applicable.

Thank you for taking the time to review the chapter. This comment does not appear to raise a question or suggest a revision that the authors can adequately address from your comment.

Year of concerned scientists

Union of Concerned Scientists

143824

2nd Region

Coastal Effects

294 294 34 16

Suggest change to "to global trade"

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143825

2nd Region

Coastal Effects

295 295 8 9

Suggest change to "housing and infrastructure"

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143826

2nd Region

Coastal Effects

295 295 8 12

This last assertion is both sweeping and too limited. (a) These adverse impacts certainly exist, but they affect people primarily in storm-affected areas, and increasingly in totally flooded areas. Need to say they are rippling through the country. (b) Some important personal- and household-scale impacts are missing. Suggest change to "to global trade"

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143827

2nd Region

Coastal Effects

295 295 14 15

"Movies...about $1 trillion to affect "real estate". The threatened national wealth is larger (military bases, ports, airports transportation-infrastructure, etc.)"

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143828

2nd Region

Coastal Effects

296 296 7 2

"The coast is an economic engine because of the economic productivity of these big cities, which does not depend solely (or even primarily) on defense, fishing, tourism, and trade. Suggest something like: "The coasts are economic engines that house some of our nation's major urban centers, that support jobs..."

Thank you for your comment. The sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143829

2nd Region

Coastal Effects

296 296 7 0

A key reason the coasts are economic engines is because of the economic productivity of these big cities, which does not depend solely (or even primarily) on defense, fishing, tourism, and trade. Suggest something like: "The coasts are economic engines that house some of our nation's major urban centers, that support jobs...

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143830

2nd Region

Coastal Effects

296 296 7 8

Suggest change to "global trade"

Thank you for your comment. This sentence has been amended to include the suggested phrase.

Year of concerned scientists

Union of Concerned Scientists

143831

2nd Region

Coastal Effects

296 296 11 12

Other weak words added or clarification that water bodies in this list are not oceans.

Thank you for your comment. This sentence has been amended for clarity.

Year of concerned scientists

Union of Concerned Scientists

143832

2nd Region

Coastal Effects

296 296 16 29

"The rate at which the water levels are rising in the estuaries, but it's not an impact. The impact (not already listed here) might more accurately be "coastal inundation and loss".

Thank you for your comment. The rate at which the water levels are rising in the estuaries is not an impact. The impact (not already listed here) might more accurately be "coastal inundation and loss".

Year of concerned scientists

Union of Concerned Scientists

143833

2nd Region

Coastal Effects

296 297 12 2

"Suggest specifying what is meant by "coastal" - transportation infrastructure? Needs like it could mean buildings."

Thank you for your feedback. The author team agrees that the sentence as written is unclear. The language has been amended to enhance clarity of meaning.

Year of concerned scientists

Union of Concerned Scientists

143834

Figure

Coastal Effects

2

"These are goals of climate risk, stressors, vulnerabilities, and impacts. With the image, this seems fairly well-balanced, but it is a mix of apples and oranges, plus banana...".

Thank you for your comment on the figure. It does not appear to offer a comment or suggestion for improvement; as such, the author team was unable to take action on this comment in a way that enhances the figure.

Year of concerned scientists

Union of Concerned Scientists

143835

Figure

Coastal Effects

2

"We know that the climate is changing...It's not an impact. The impact (not already listed here) might more accurately be "coastal inundation and loss".

Thank you for your comment. The climate is changing, but it's not an impact. The impact (not already listed here) might more accurately be "coastal inundation and loss".

Year of concerned scientists

Union of Concerned Scientists

143836

Figure

Coastal Effects

2

"In terms of more in scope or a potential impacts be, could change "critical infrastructure at risk" to "critical infrastructure damages"."

Thank you for your suggestion. The author team has decided that leaving lu as is makes sense, given that the overall impacts to climate change, resulting in an impact of SfR. The table has not been amended. For more information regarding climate as the overall stressor, please see the Climate Science Special Report (Vol. 1 of the National Climate Assessment), in particular Chapter 2 (Physical Drivers of Climate Change) and Chapter 12 (Sea Level Rise).

Year of concerned scientists

Union of Concerned Scientists

143837

Figure

Coastal Effects

805 805 24 24

Infrastructure provides important lifelines for coastal communities, so impacts would have further "consistent focus for the entire nation" is its anchor from this sentence that the second statement should follow the first. What is the source of the cascade? Clarify/additional text needed.

Thank you for your comment. The author team has amended the in-text reference to more clearly demonstrate a link between coastal infrastructure and inland communities that either rely on it or supply it.
### Response

**First Name** | **Last Name** | **Comment ID** | **Comment Region** | **Comment Type** | **Chapter** | **Figure/Table Number** | **Start Page** | **Start Line** | **End Page** | **End Line** | **Comment** | **Response**
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
Scientists Concerned | Anna Killius, J.D. | 143832 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The key message text has been updated to include the reference. |
Scientists Concerned | Anna Killius, J.D. | 143833 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143834 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. This sentence has been amended for clarity. |
Scientists Concerned | Anna Killius, J.D. | 143835 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. This sentence has been amended for clarity. |
Scientists Concerned | Anna Killius, J.D. | 143836 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The language has been amended for enhanced clarity. |
Scientists Concerned | Anna Killius, J.D. | 143837 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143838 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143839 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143840 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended for clarity. |
Scientists Concerned | Anna Killius, J.D. | 143841 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143842 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143843 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The key message text has been updated to reflect this comment. |
Scientists Concerned | Anna Killius, J.D. | 143844 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended for clarity. |
Scientists Concerned | Anna Killius, J.D. | 143845 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your suggestion. The author team agrees and has included this reference. |
Scientists Concerned | Anna Killius, J.D. | 143846 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. This comment has been updated to clarify its meaning. |
Scientists Concerned | Anna Killius, J.D. | 143847 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143848 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. This comment is the same as Comment 143847. It appears to have been submitted in error twice. No action has been taken on this comment. Please see the response to Comment 143847. |
Scientists Concerned | Anna Killius, J.D. | 143849 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended for clarity. |
Scientists Concerned | Anna Killius, J.D. | 143850 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143851 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143852 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143853 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143854 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143855 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Scientists Concerned | Anna Killius, J.D. | 143856 | Text Region | Text Region | 08. Coastal Effects | | | | | | Thank you for your comment. The sentence has been amended to reflect your proposed change. |
Michelle Concerned Union of Concerned Scientists 14.0837 Coastal Effects 08. Coastal Effects 113 113 50 50 "Deet et al. 2017 found that ... "The results also underscore the importance of limiting future warming and sea-level rise under the Intermediate-Low scenario, used as a proxy for sea-level rise under the Paris Climate Agreement, 109 fewer communities would be effectively inundated by 2100." Dahl, KA; et al. 2017 Effective minimization of continental United States communities with 21st century sea level rise. Elem Sci Anth, 5: 37, DOI: https://ubs.org/3.31255/elements.234

Michelle Concerned Union of Concerned Scientists 14.0838 Coastal Effects 08. Coastal Effects 113 113 50 50 "In some cases, flood exposure may be less than expected."
Thank you for your comment. The sentence that this comment is referring to has changed and no longer directly references nuisance flooding.

Michelle Concerned Union of Concerned Scientists 14.0839 Coastal Effects 08. Coastal Effects 113 113 50 50 "... Implementing adaptation measures to ensure that public infrastructure is resilient to current and future flood scenarios will be tremendously expensive." Thank you for your comment. The author team agrees that this re-worded statement more accurately conveys the intended meaning. The verbage has been amended to reflect this change.

Michelle Concerned Union of Concerned Scientists 14.0840 Coastal Effects 08. Coastal Effects 113 113 50 50 communities' economies
Thank you for your suggestion. The author team would add this reference.


Michelle Concerned Union of Concerned Scientists 14.0843 Coastal Effects 08. Coastal Effects 114 114 35 35 Addressing Affordability in the National Flood Insurance Program. http://opim.wharton.upenn.edu/doc/library/2014_8E_Accessing-Affordab... Thank you for your suggested citations. The author team has added the Kousky report, but did not add the NRDC issue brief as the team felt it learned too close to policy prescription.

Michelle Concerned Union of Concerned Scientists 14.0844 Coastal Effects 08. Coastal Effects 114 114 2 2 Atomic Thank you for your suggested edit. The final version has been made in-text.

Michelle Concerned Union of Concerned Scientists 14.0845 Coastal Effects 08. Coastal Effects 114 114 2 2 This may be stated differently and/or expanded on to make a stronger case for 1) the Cost benefit of investing in the front end (pre-disaster mitigation) and 2) the multiple benefits of natural infrastructure & cost reduction 2016. http://conversingonclimate.org/ConversationsFunction/Main/functions/library/... New NIBS report should be cited and described here: http://www.nib.org/52011/A06D11241556650821548F73FF0EDE60 National Hazard Mitigation Saves: 2017 Interim Report Download Form: https://www.nibs.org/getmedia/00558e63-9ab7-4b28-a258-9d85c8f31f8e/2017-interim-report.pdf Thank you for your suggestions. The author team has added the NRDC citation since the new Mitigation Saves report does indeed help build the case for the economic benefits. The first citation was not added because it is focused on financing options, which is beyond the scope of the chapter.

Michelle Concerned Union of Concerned Scientists 14.0846 Coastal Effects 08. Coastal Effects 64 64 308 Thank you very much for the positive feedback on the figure. The author team has considered your feedback and concluded that the figure provides necessary and meaningful context about the concept of social inequality to frame Message 3. However, the concept of equality vs. equity is being addressed by a number of other chapters, this figure is available for their reference and thus it will be elevated throughout the report.

Michelle Concerned Union of Concerned Scientists 14.0847 Coastal Effects 08. Coastal Effects 92 92 288 Thank you for your suggestions on the figure. It will change dramatically as it transitions to an interactive graphic that is accessible online. The layout will not appear as it does in the review document with all of the text at once. Ocean acidification has been referenced where those particular regional chapters have referred to it as an impact resulting from climate change. As the National Climate Assessment is revised and the individual regional chapters amend their writing, the figure will change as well to synthesize their examples and findings. The examples about Puerto Rico drought (under Caribbean) and Binghamton (under Northeast) also are not about coastal issues.
The text should be modified to include New Orleans in list of example of major cities making investments in
disasters in the US as measured by NFIP payouts. Significant economic impacts. For example, Hurricane Katrina, Sandy, and Ike are the top three most expensive
storms in U.S. history. The text has been amended to include New Orleans.

Thank you for your suggestion. The adaptation examples included in Figure 8.2 have been pulled from the NCA4
regional chapters. If this comment (with additional citations to support the comments statement) was also
addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

Thank you for your comment. This reference to Chapter 26 has been included.

Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4
regional chapters. If this comment (with additional citations to support the comments statement) was also
addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4
regional chapters. If this comment (with additional citations to support the comments statement) was also
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addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

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addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

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regional chapters. If this comment (with additional citations to support the comments statement) was also
addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

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regional chapters. If this comment (with additional citations to support the comments statement) was also
addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.

Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4
regional chapters. If this comment (with additional citations to support the comments statement) was also
addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.
This is a good general assessment for estimated coastal effects, however for regional and local planning and mitigation there would need to be a much more detailed analysis. It could be beneficial to include other case studies that might help designers in their mitigation plans.

Thank you for your comments. The authors have focused on broad themes and a few key examples rather than provide a deep level of specificity on urban planning and adaptation.

Michael MacCracken 144310 2nd Region OB Coastal Effects 294 294 11 11 Somewhere here it needs to be pointed out that sea level will continue to rise throughout the 22nd century and that even mid-range scenarios will lead to very significant change, just a couple of decades later, on the issue is one that will be devastating in the future—just not clear if it will be 2, 3 or even 4 generations in the future. And does that really matter? Basically, I'd like to see the way that sea level uncertainty would better be presented to that is not well defined in particular level (1 meter, 2 meters, etc.) and the only uncertainty is exactly when this is most likely to happen.

Thank you for your comment. This timescale goes beyond the scope of NCA4. For that information, please see table 12.5 in the CSSR report (https://science2017.globalchange.gov/)

Michael MacCracken 144311 2nd Region OB Coastal Effects 294 294 11 11 For the "site" needs to be changed to accord with the local scale scenario (and this needs to be done throughout the chapter); see also issue on the 18.

Thank you for your feedback. The wording has been amended for clarity.

Michael MacCracken 144312 2nd Region OB Coastal Effects 294 294 10 11 About what can likely be done is to delay the situation a little. Sea level is going to continue, so I'd urge taking about delay instead of decrease.

Thank you for your comment. As written, the sentence is describing using adaptation to decrease losses, not to decrease SLP itself. The sentence has not been amended.

Michael MacCracken 144313 2nd Region OB Coastal Effects 294 294 12 12 What about also migrating birds and other species—might it not be appropriate to also mention them?

Thank you for your comment. The sentence in question ("fishing, tourism, human health, and public safety, beyond open human coastal ecosystems") focuses on items that are directly impacted by changes in coastal ecosystems. While there may be effects on other species, they are not the primary focus of this sentence. No change has been made.

Michael MacCracken 144314 2nd Region OB Coastal Effects 294 294 28 28 I think it would be appropriate to indicate that sea level can only reach for inland by affecting rivers, estuaries, etc.—that is, the coastal region is quite broad.

Thank you for your comment. The text has been revised to include this comment.

Michael MacCracken 144315 Figure OB Coastal Effects 297 297 1 The step rate the experts of the surveys will be quite substantial—it is purely fictitious, likely caused by the time step of the model used to make the calculation. Smatching is needed. Also, that discounting is done at all needs to be explained as the actual damage is going to increase exponentially upward as the rate of sea level rise increases. And it needs to be said that the calculation has been done for a sea level rise scenario that does not include any significant collapse of an ice stream/shelf, etc. So, really, I'd suggest that this graph is exceedingly misleading. Were there to be a line indicating the case of the US economy using the 3% discount, the line would be level, and the fact that the line here is rising indicates that the proportion of the economy the impacts is rising—this point does not come across from this graph at all. Very misleading.

Thank you for your comment. The improper nature of the graph is due to the fact that the analysis evaluates storm surge risks every ten years, beginning in 2005. This figure is from a published report and cannot be modified. For additional information see (U.S. EPA. 2017. Multi-Member Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency. EPA-630-R-17-001)

Michael MacCracken 144316 Figure OB Coastal Effects 298 298 The figure has far too small text. And needing a couple of the write-up on the notes, they are not about the "coastal effects of climate change" but seems to be about how groups in various areas are responding. So either the caption or figure needs to be changed in addition to greatly reducing the text associated with the figure, which is more like a poster than a figure for a report.

Thank you for your comment. The figure captures both the effects of climate change as well as regionally expected adaptation examples that have been drawn from the NCA4 regional chapters. The adaptation examples will be better titled/identified in the final figure. Additionally, the table accompanying Figure 8.2 was used for the public comment process only and will not be included in the final figure rendering (either the print or online versions).

Michael MacCracken 144317 Figure OB Coastal Effects 303 303 9 9 Need to change "may" and use words from literature, or perhaps say something like "have the potential to delay other losses and causing impacts in some locations for several decades.

Thank you for your suggestion. The author team has revised the section to be more clear.

Michael MacCracken 144318 Figure OB Coastal Effects 305 305 28 17 To provide sufficient insight, there is a need to replace "may" with a word from the literature.

Thank you for your suggestion. The author team has revised the section to be more clear.

Michael MacCracken 144319 Figure OB Coastal Effects 306 306 3 1 I would urge adding "time-experiencing items" (or whatever the right wording) to the list. For example, sea level rise will have impacts well up the Hudson River, Chesapeake Bay, Sacramento-San Joaquin, etc.—so well inland that these "items" have time to adapt.

Thank you for your comment. The author team agrees that inland areas will experience impacts as a result of sea level rise—however, this portion of the assessment is specifically focused on the immediate coastal areas. Other regional chapters in the National Climate Assessment will go into greater detail about climate impacts on inland areas as does chapter 12 (Sea Level Rise) of the Climate Science Special Report (Vol. 1) of the National Climate Assessment. A short sentence has been added in a reference to Ch 12 to the text.

Michael MacCracken 144320 Figure OB Coastal Effects 308 308 12 12 The word "these" is not really very clear—it's those from Florida and Alaska, or the underrepresented and undersubscribed climate change receptors on these lines to make clear it is the broader set. Perhaps give an example as well of a group that experienced hurricane impacts.

Thank you for your comment. The author team has revised the section to be more clear.

Michael MacCracken 144321 Figure OB CoastalEffects 309 309 11 11 It seems to me that the limitations of judging impacts on odds need to be mentioned. As mentioned above, wave zones can be higher; in addition, losses by emergency responders during times of storms can become impossible. So, while odds can be helpful to perhaps protect the building, they really do not allow the need to evacuate. So, perhaps distinguish between assets to save property, and to save people, the former not always achievable the latter.

Thank you for your comment. The author team has noted your concern about the effectiveness of such adaptation measures; however, the purpose of this portion of the document is not to describe a cost/benefit analysis of each method of home modification. This passage remains unchanged in the document.

Michael MacCracken 144322 Figure OB CoastalEffects 309 309 20 20 Another good example, perhaps worth also mentioning, is the 1907 Lower Mississippi River flood. Indeed, such events can have impacts across the entire nation due to evacuation and then no place to return to.

Thank you for your comment. The author team cites the example of Katrina, which is the most relevant national event. The sentence has not been amended.

Michael MacCracken 144323 Figure OB CoastalEffects 310 310 14 14 Now about saying "over the next several decades" to give a bit more precise information or even "over the next few decades."

Thank you for your comment. The text has been revised to include this comment.

Michael MacCracken 144324 Figure OB CoastalEffects 310 310 19 19 Figure building odds can be used to be adapting. —it seems to me, however, that such odds are really an attempt to put odds dealing with the issue.

Thank you for your comment; however, it does not appear to raise a question or offer a suggestion. The idea that building odds is as a form of adaptation is accepted by the author team. The sentence in the document has not been changed.

Michael MacCracken 144325 Figure OB CoastalEffects 311 311 3 3 Also threatens some quite historic neighborhoods and structures

Thank you for the recommended inclusion. "Historical neighborhood" has been added to this passage to expand the number of things at risk from tidal flooding.

Michael MacCracken 144326 Figure OB CoastalEffects 313 313 21 21 I don't think it is really defensible to give two figure precision to the estimates made here. While a specific study might use some approach to get such specific figure, I would make sure to somehow indicate that there is reasonable uncertainty regarding the specific numbers—but that the general sense of there is much cleaner.

Thank you for your comment. The author team agrees with the reviewer and has deleted the probability and clarified the language.

Mike Less 144327 Whole OB Coastal Effects 20 Marine Resources 11 This perhaps is over the next several decades. I'm sure that building seawalls as a form of adaptation is accepted by the author team. The sentence in the document is over the next several decades.

Thank you for your comment. The number of things at risk from tidal flooding.

Mike Less 144327 Whole OB Coastal Effects 20 Marine Resources 11 This perhaps is over the next several decades. I'm sure that building seawalls as a form of adaptation is accepted by the author team. The sentence in the document is over the next several decades.

Thank you for your comment. The number of things at risk from tidal flooding.

Mike Less 144327 Whole OB Coastal Effects 20 Marine Resources 11 This perhaps is over the next several decades. I'm sure that building seawalls as a form of adaptation is accepted by the author team. The sentence in the document is over the next several decades.

Thank you for your comment. The number of things at risk from tidal flooding.
<table>
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<td>Feely</td>
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<td>8.4.10.37</td>
<td>335</td>
<td>353</td>
<td>14</td>
<td>25</td>
<td>The authors will hire an expert on the topic for the next draft of the book.</td>
<td>This comment is inconsistent with the current state of the science on the topic and does not apply specifically to this chapter. Sea level rise is covered extensively in the Climate Science Special Report (Chapter 12) and observed and projected impacts are discussed in the Coastal Effects chapter (Chapter 8). Sea levels are rising and the evidence linking sea level rise to higher carbon dioxide levels is very strong. The suggestion that clouds could provide a negative feedback is well understood and parameterized in global circulation models (see CSSR Chapter 2). The suggestion that feedbacks, such as the decreased albedo due to melting Arctic ice, are more significant. See IPCC “Climate Change 2013: The Physical Science Basis”, Chapters 7-8.</td>
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<td>Storlazzi</td>
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<td>9.1</td>
<td>332 334</td>
<td>34</td>
<td>36</td>
<td>The authors have been asked multiple times to credit the authors of the original work. This issue has been addressed multiple times, including but not limited to the first draft of the Climate Science Special Report.</td>
<td>We appreciate the suggestion and recognize the desire to credit the original authors. Our chapter was built from multiple sources and we have made efforts to credit the original authors throughout the manuscript. We appreciate the suggestion and recognize the desire to credit the original authors. Our chapter was built from multiple sources and we have made efforts to credit the original authors throughout the manuscript.</td>
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<tr>
<td>Curt</td>
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<td>337</td>
<td>The 2010-2016 data that resulted in the bleaching of more than 30% of the US and many areas of other countries and the overall projected impact is discussed in the Coastal Effects chapter (Chapter 8). Sea levels are rising and the evidence linking sea level rise to higher carbon dioxide levels is very strong. The suggestion that clouds could provide a negative feedback is well understood and parameterized in global circulation models (see CSSR Chapter 2). The suggestion that feedbacks, such as the decreased albedo due to melting Arctic ice, are more significant. See IPCC “Climate Change 2013: The Physical Science Basis”, Chapters 7-8.</td>
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<td>In summary, our results are consistent with the original work and the authors have added the 2015/16 bleaching event to Figure 3. Note the reason Figure 3 includes the 2015 bleaching event is that we were asked to select a figure for inclusion with our summary. This figure is very similar in content to a figure we included in our previous comments.</td>
<td>This comment is inconsistent with the current state of the science on the topic and does not apply specifically to this chapter. Sea level rise is covered extensively in the Climate Science Special Report (Chapter 12) and observed and projected impacts are discussed in the Coastal Effects chapter (Chapter 8). Sea levels are rising and the evidence linking sea level rise to higher carbon dioxide levels is very strong. The suggestion that clouds could provide a negative feedback is well understood and parameterized in global circulation models (see CSSR Chapter 2). The suggestion that feedbacks, such as the decreased albedo due to melting Arctic ice, are more significant. See IPCC “Climate Change 2013: The Physical Science Basis”, Chapters 7-8.</td>
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<td>The statement “The availability of calcium carbonate is expressed as the term Ω” is incorrect. Ω refers to the solubility of calcium carbonate mineral phases in seawater. Ω needs to be properly defined in this chapter.</td>
<td>We appreciate the suggestion and recognize the desire to credit the original authors. Our chapter was built from multiple sources and we have made efforts to credit the original authors throughout the manuscript.</td>
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<td>We appreciate the suggestion and recognize the desire to credit the original authors. Our chapter was built from multiple sources and we have made efforts to credit the original authors throughout the manuscript.</td>
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<td>We have added several references to this paragraph.</td>
<td>We appreciate the suggestion and recognize the desire to credit the original authors. Our chapter was built from multiple sources and we have made efforts to credit the original authors throughout the manuscript.</td>
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The text has been revised to incorporate this suggestion. The references have been corrected.

Note to authors: I suggest that you include some statements about corrosive conditions in the coastal waters surrounding Alaska, since they are probably more corrosive in some places than in the southeast Pacific.

The text has been revised to incorporate this suggestion. The references have been corrected.

The message has been retained but the text has been changed from 'become more acidic' to 'acidify' to respond to reviewer comment.

The text has been revised to incorporate this suggestion. The references have been changed to Chen K, GreiwEKOWSKI C, Kwon YO, Zhang WG. 2015. The role of atmospheric forcing versus ocean advection during the extreme warming of the Northeast U.S. continental shelf in 2012. Geophys Res C. 120; 6429–4339. http://doi.org/10.1002/2014JC010547.

The text has been revised to incorporate this suggestion. The references have been corrected.

The references were updated to better include Alaskan waters: 'Extreme corrosive (Ω < 1) and/or low oxygen events also occur regularly in modern coastal waters of the Pacific Coast of the U.S. (Siedlecki et al. 2015; Feely et al. 2016; Chan, Barth, Blanchette, et al. 2017). Deep waters brought to the coast during upwelling are generally corrosive (low ΩG) and have low oxygen levels. The intensity of these events is increasing due to more intense winds and ocean acidification is making the waters even more corrosive (Chan et al. 2008; Pavlov and Romanov, 2017; Sutton et al. 2016; Turu et al. 2016). In Alaskan waters, these events are associated with freshwater inputs and storm events (Mathis et al. 2012; Evans et al. 2013, 2015; Mathis et al. 2015a,b; Harn et al. 2013; Siedlecki et al. 2015; Feely et al. 2016; Chan, Barth, Blanchette et al. 2017). Deep waters brought to the coast during upwelling are generally corrosive (low ΩG) and have low oxygen levels. The intensity of these events along the upwelling margin of the Pacific coast of the U.S is increasing due to more intense winds over the past decade, and ocean acidification is making the waters even more corrosive (Chan et al. 2008; Pavlov and Romanov, 2017; Sutton et al. 2016; Turu et al. 2016). In Alaskan waters, these events are associated with freshwater inputs and storm events (Mathis et al. 2012; Evans et al. 2013, 2015; Mathis et al. 2015a,b; Harn et al. 2013; Siedlecki et al. 2015).'

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The text has been revised to incorporate this suggestion. The references have been corrected.
The following comments are submitted on behalf of the Marine Fisheries Advisory Committee (MAFAC), a NOAA federal advisory committee:

**Subject**
The authors of the NCA4 Oceans and Marine Resources Chapter did an excellent job providing an update on the impacts and risks of carbon emissions to marine ecosystems and resources in the U.S. This is a rapidly developing field and the authors captured key events and findings in a very succinct manner, using a broad range of regional examples. In addition, they offered important insights and optimism for our potential to adapt to the changes, as well as increase the resilience of marine ecosystems. The draft was well-written for a general audience and the figures very much enhanced the communication of key points to a broad audience. The following points raised in the draft of Chapter 9, Oceans and Marine Resources are particularly important to mention:

- We are living with the impacts of climate change now (e.g., extreme weather events such 100 year floods, intense hurricanes, and marine heat waves as well as long-term shifts in fish populations). The distribution and productivity, intensity and frequency of events is increasing. [example: Key Messages, p. 311, p. 332, figure 14-20; figure 9.3.]

- The focus on the impacts of changes occurring in the oceans: warming, acidification, and deoxygenation is important. The cumulative impacts of these changes and their interactions will determine what species thrive in their current locations, where they may exist in the future, and which will decline or cease to exist in the future. [example: Key Message 2, p. 311 and 316-314.]

- The fact that the oceans play a pivotal role in the global climate system is important to emphasize. The changes have received relatively little attention in past climate assessments (both national and international). It is important to recognize their importance to the central issue of climate change and potential feedbacks. [example: Overview, p. 339, lines 11-15.]

- The importance of identifying and continuing assessments on the most vulnerable marine ecosystems (e.g., tropical, polar, and island ecosystems in the U.S. and U.S. Territories). [example: p. 338, lines 14-17, p. 340, lines 4-9.]

- The importance of fostering resilience in our marine ecosystems and resources by taking specific actions. [example: p. 332, line 11; p. 338, line 24; p. 341, lines 6-8.]

The comment is not consistent with the state of the science on these issues. The CSSR Chapters 1 and 4 provide the rationale and the confidence for the use of the suite of models used in NCA4. They also present an evaluation of the model skills to support use of the models and projections. The NCA also has strict requirements that the conclusion of the assessment should be built from peer-reviewed sources. The reports highlighted in the comment do not meet this standard.

---

**Comment:** We agree with the reviewer and have added a reference to Sutton et al 2016.

**Response:** We greatly appreciate the thoughtful comments and are pleased with the MAFAC’s general support for our initial draft of the chapter. While the wording has changed in places, we have retained the major themes that the MAFAC found especially appealing.

---

**Comment:** We greatly appreciate the thoughtful comments and are pleased with the MAFAC’s general support for our initial draft of the chapter. While the wording has changed in places, we have retained the major themes that the MAFAC found especially appealing.

---

**Comment:** Thank you for this suggestion. The 2015/16 bleaching event has been added to the figure based on the global bleaching database cited in Hughes et al. 2018.

**Response:** We added reference to Cai et al 2011 to this sentence.

---

**Comment:** In addition to the modeling-based results of Helmova et al. referenced here, it would be good to also reference the observation-based results of Sutton et al. 2010 (which is already referenced elsewhere).

**Response:** We agree with the reviewer and have added a reference to Sutton et al 2010.
While there is no mention of Undersea thermal or Radiation contamination from Fukushima. The tsunami also led to the meltdown of the Fukushima Daiichi plant. The meltdown released radiation into both the air and the adjacent ocean in form of various radionuclides. The tsunami formed by a number of radioactive materials. Furthermore, these concentrations are limited to the immediate waters off of the reactor site, and are thus beyond the scope of the NGA which focuses on impacts on US interests. Finally, while nuclear reactors reach very high temperatures, that heat is concentrated in a small area. For example, one ton of spent nuclear fuel emits 3x10^12 W of heat. This is actually quite small compared to the energy that falls on a patch of ocean roughly the size of two queen-sized beds. The Pacific Ocean is enormous (5x10^7 trillion square meter) so there is an incredible amount of heat mixing through surface. While water coming out of a nuclear plant is warm, the temperature is very low by comparison. Daiichi nuclear plant caused geological, chemical, and physical consequences for the North Pacific Ocean, their impact is outside the scope of the geographic and topical purview of the 4th NCA for the reasons described below. Furthermore, the reviewer’s recommendation is inconsistent with the state of the science. The main impact on the ocean was the large tsunami that triggered the earthquake. The tsunami could be a massive increase in geothermal heating in order to explain the rise in global ocean heat content. There would also be a clear spatial pattern, with more heating along mid ocean ridges and less vertical stratification (since the heating at depth would destabilize the water column). Neither of these have been observed, so there is no evidence that would refute surface heating as the dominant driver of ocean temperatures and enhanced surface heating due to global warming. The US Earth and Wildlife Five-year Review of polar bears in 2017 does not give evidence for high bear population size and retained their listing on the US Endangered Species Act as “Threatened”. The IUCN Red List of Threatened Species retained the “vulnerable” listing for polar bears in 2016; and other references in the chapter) Heating from geothermal sources is also small—~1% of the surface heating according to Mullerney et al. (2006, http://dx.doi.org/10.1029/2005GL024956). There would have to be a massive increase in geothermal heating in order to explain the rise in global ocean heat content. While the impact of the March 11, 2011 Tōhoku earthquake and the resulting meltdown of the Fukushima Daiichi nuclear power plant caused geological, chemical, and physical consequences for the North Pacific Ocean, their impact is outside the scope of the geographic and topical purview of the 4th NCA for the reasons described below. Furthermore, the reviewer’s recommendation is inconsistent with the state of the science. Oceanographers have been monitoring temperature anomalies. There is strong evidence that both the North Pacific “Blob” and the Northwest Atlantic warmwater were formed by increased heating at the ocean surface (see Chen et al. 2014; Di Lorenzo & Maresca 2016; and other references in the chapter) Heating from geothermal sources is also small—~1% of the surface heating according to Mullerney et al. (2006, http://dx.doi.org/10.1029/2005GL024956). There would have to be a massive increase in geothermal heating in order to explain the rise in global ocean heat content. There would also be a clear spatial pattern, with more heating along mid ocean ridges and less vertical stratification (since the heating at depth would destabilize the water column). Rather than these have been observed, so there is no evidence that would refute surface heating as the dominant driver of ocean temperatures and enhanced surface heating due to global warming, as the main driver of the long-term trend in ocean temperatures.
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<td>We appreciate the suggestion to develop a stronger link with the Alaska chapter. We have referenced this chapter in several places and specifically highlighted the observation that waters in this region may already be underestimated with respect to calcium carbonate.</td>
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<td>Armstrong</td>
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<td>Whole Page</td>
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<td>108</td>
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<td>We refer to chapter 26, section on Ocean Acidification for good detail on projected impacts of OA on crustaceans and fish.</td>
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<tr>
<td>David</td>
<td>Wipps</td>
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<td>Oceans and Marine Resources</td>
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<td>Reference the coastal reef loss from HM 4 in Chapter 27.</td>
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<td>We appreciate the suggestion. We have cited the EPA report in several places in the document and the author team did not feel that a citation at this location is necessary.</td>
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<td>The tsunami also led to the meltdown of the Fukushima Daiichi nuclear plant. The meltdown released radiation into the air and the adjacent ocean in form of various radionuclides. Bausor el al. [2012], <a href="https://doi.org/10.1073/pnas.1207941109">https://doi.org/10.1073/pnas.1207941109</a> found levels of radioactive cesium off of Japan that were 10-1000 times higher than background levels. However, these levels are not expected to pose a health threat to marine organisms. For instance, the annual intake of cesium is estimated to be about 10-20 Bq per square meter. This means that one ton of fuel is emitting the same energy that falls on a patch of ocean roughly the size of two soccer fields. The Pacific Ocean is enormous (105 billion square meters) so there is an incredible amount of heat moving through surface. While water coming out of a nuclear plant is hot, the temperature signal is quickly diluted as the water cools and mixes with the ocean. Thus, it is not physically possible for a nuclear plant, whether operating normally or abnormally, to emit enough heat to create a significant temperature anomaly. There is strong evidence that both the North Pacifc Blob and the North Atlantic Hurricane were formed by increased heating at the ocean surface (see Chen et al. 2014, St. Lense &amp; Markus 2016; and other references in the chapter).</td>
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<td>We appreciate the comment. Note that we have not included any references to the Fukushima Daiichi nuclear plant in this document.</td>
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<td>30</td>
<td>We appreciate the comment and make it clear that we do not feel that the &quot;positive, negative, or no effect&quot; phrase may have been reviewed or applying over the long term. This was not our intent. The first part of the sentence (&quot;positive, negative, or no effect&quot;) is the critical part, so we removed the other part of the sentence. The few new sentences provide more details and include references.</td>
<td></td>
</tr>
<tr>
<td>Alison</td>
<td>Collins</td>
<td>421268</td>
<td>Red Region</td>
<td>Oceans and Marine Resources</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>We greatly appreciate the reviewer's comments about this report and hope that the content is useful. We are eager to see the results of the earth system models and hope they are useful for the next National Climate Assessment.</td>
<td></td>
</tr>
</tbody>
</table>

Response: We appreciate the reviewer's comments about the report and hope that the content is useful. We are eager to see the results of the earth system models and hope they are useful for the next National Climate Assessment.
<table>
<thead>
<tr>
<th>First Name</th>
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<th>Chapter</th>
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<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42109</td>
<td>Figure</td>
<td>09. Oceans and Marine Resources</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
<td>This is a red map so sort of confusing. At first I was looking everywhere for a legend that would tell me what the colors mean. Then I found what the pink color meant in the caption, but that only made me wonder why the SCA was picked as the threshold. Why isn’t there a range of temperatures? What is so special at 5.5°C?</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42171</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td>11</td>
<td>14</td>
<td>22</td>
<td>28</td>
<td>This chapter is 12 pages long, so it’s clear the length is meant to be a lot. That means a lot of text needs to be cut out. There are some places of redundancy where whole paragraphs can be cut (tested in other comments). This chapter would also benefit from fewer sub-headings. I would suggest not separating out observed sections from projected sections. Opportunities for reducing risk is good, but I wonder if the mitigation ones can be combined and go under Key Message 1 and the adaptation ones under Key Message 2, so you don’t need separate sections under each key message. The climate ready fisheries management section on the top of page 341 would make a nice text box. The emerging issues text can all be printed to the traceable accounts. That could help you consolidate the sections under just the overview and three key messages. You also don’t need a conclusion, like a journal article. These can just end when the information is done. Also, all of your figures are maps, which is a little messy but also gives you a lot of leeway. But I wonder if you could save space by having a &amp;dip; panel set of maps in one figure. Or by overlapping the marine hardness on top of the projected ocean temperatures in Figure 5.1 A. If the area east, it would save a lot of these same figures.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42171</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>139</td>
<td>138</td>
<td>18</td>
<td>18</td>
<td>The EPA Indicator report 2018 that maps NOA data (would make a nice interactive figure too)</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42172</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>341</td>
<td>346</td>
<td>27</td>
<td>37</td>
<td>Let the paragraph down by about half--maybe just two sentences--and put in the Major Uncertainties section of the traceable account for this key message. After consideration of this point, we have determined that the existing text is clear. Specifically, the referenced section refers to an adaptive response to extreme events (the page of KM1) and not to adaptation in fisheries (e.g. KM2).</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42173</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>341</td>
<td>345</td>
<td>23</td>
<td>24</td>
<td>We greatly appreciate the reviewer's complement on our work.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42174</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>341</td>
<td>345</td>
<td>20</td>
<td>24</td>
<td>This is redundant text and about projections--suggest deleting, and just putting the info on projections from the last 4 sentences of this section up into the main text of Key Message 1. (e.g. no separate projections section)</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42175</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>344</td>
<td>347</td>
<td>6</td>
<td>12</td>
<td>Can the text be shortened and included under Key Message 2?</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42176</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>344</td>
<td>347</td>
<td>6</td>
<td>12</td>
<td>Move most of the emerging issues info (lines 23-32) into traceable accounts (most of this can be cut down) and the last two sentences from this section (lines 32-36) up into the main text of Key Message 3. Delete Conclusions section. After consideration, the author team determined that the narrative flow best as written. The uncertainty section on the behavior of the jet stream and its relationship to sea ice is an important result gap that we would like to see elaborated.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42177</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>346</td>
<td>346</td>
<td>1</td>
<td>12</td>
<td>It could be helpful to add here any information you have on the decision the authors made about scope. What is this in the chapter, versus what is in the Coasts chapter and how did you decide that? Is there a topic here you decided not to cover because it is covered in a regional chapter; or because it was covered beyond what was felt to be worthy? Why so much focus on fisheries and not, say, changes in phytoplankton communities, or deep sea species, or how climate changes will affect shipping or Arctic transportation or methane clathrates or whatever?</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42178</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>346</td>
<td>346</td>
<td>11</td>
<td>16</td>
<td>We appreciate the suggestion and have added a paragraph that describes our discussions with the Coasts chapter and our rationale for focusing on ecosystem services like fisheries where the economic benefits can be calculated.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>42179</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>349</td>
<td>350</td>
<td>3</td>
<td>4</td>
<td>All three of your figures are maps and all three use the same map projections.</td>
<td></td>
</tr>
</tbody>
</table>

We greatly appreciate the reviewer's comment. Based on this and other feedback, we are replacing this figure with a sequence of images that illustrate the impacted ecosystems and human connections to the ocean.

We appreciate the reviewer's suggestions on how to reduce the length of the chapter; however, our chapter is consistent with the guidance set out by USGCRP. In particular, the 6 page limit is exclusive to the traceable accounts. We appreciate the suggestion to remove the conclusion. We will work with the other chapter teams to make sure our chapter is consistent with the avoid form of the NCA.

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<th>End Page</th>
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<th>End Line</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Kathy</td>
<td>Commires</td>
<td>142182</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>152</td>
<td>153</td>
<td>14</td>
<td>10</td>
<td>All of this text is redundant to the chapter and can be deleted. Replace with a description of the evidence, not the evidence itself.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142401</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td>133</td>
<td>134</td>
<td>1</td>
<td>6</td>
<td>The confidence and likelihood statements in the section do not match those in the key message above. Lines 13-14 is an incomplete sentence and doesn’t seem to belong to this key message.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142702</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td>133</td>
<td>135</td>
<td>14</td>
<td>21</td>
<td>The oceans could be more early in the document that ocean acidification is not an impact of climate change.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142403</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>133</td>
<td>133</td>
<td>14</td>
<td>21</td>
<td>Examples of adapting fisheries to a changing climate should be given.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142404</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>133</td>
<td>138</td>
<td>17</td>
<td>18</td>
<td>In discussing the potential movement of fisheries, it would be wise to give specific examples.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142405</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>131</td>
<td>131</td>
<td>3</td>
<td>8</td>
<td>Key Message 1 is important to retain in the final document.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>142406</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>131</td>
<td>131</td>
<td>11</td>
<td>13</td>
<td>The focus on the effects of changes occurring in the oceans (warming, acidification, and deoxygenation) is important to retain in the final document.</td>
<td></td>
</tr>
<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143110</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td>133</td>
<td>133</td>
<td>9</td>
<td>11</td>
<td>The need to better understand the potential impacts to Native Americans is important to retain and emphasize in the final document.</td>
<td></td>
</tr>
<tr>
<td>Lois</td>
<td>Mickels</td>
<td>143107</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>14</td>
<td>16</td>
<td>We added text noting the DECAOD (predicted) prediction of very modest price increases over the next decade and the great uncertainties over a longer time frame.</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142474</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>2</td>
<td>12</td>
<td>Process description needs more information on who the stakeholders were. Were the only scientists? Did fishery users participate?</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142475</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>2</td>
<td>12</td>
<td>Process description should repeat information on how certainty/likelihood is defined.</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142476</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>17</td>
<td>17</td>
<td>Include ecological and economic impacts of specific Coral Reef / Hawaiian reef events referenced here.</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142477</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>1</td>
<td>11</td>
<td>Include confidence statement for impact of marine ecological disruption to humans.</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142478</td>
<td>Traceable Account</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>134</td>
<td>1</td>
<td>22</td>
<td>Include any available economic projections of future U.S. fisheries demand.</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>Corellie</td>
<td>142479</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>134</td>
<td>133</td>
<td>11</td>
<td>16</td>
<td>As an example of an impact to a specific community, this line is really important. Elaborate further on severe socioeconomic stress. Who was affected? What happened to them?</td>
<td></td>
</tr>
<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143110</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td>135</td>
<td>135</td>
<td>12</td>
<td>14</td>
<td>The sentence does not seem to follow directly from the preceding one. A tighter connection to the paragraph would be useful.</td>
<td></td>
</tr>
<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143108</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>136</td>
<td>136</td>
<td>15</td>
<td>16</td>
<td>Are there citations to support this sentence?</td>
<td></td>
</tr>
<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143101</td>
<td>Text Region</td>
<td>09. Oceans and Marine Resources</td>
<td>138</td>
<td>138</td>
<td>4</td>
<td></td>
<td>Marine protected areas are one example, but a number of studies are showing that good fisheries management can also play an important role in buffering climate impacts to commercial species (Sillero et al. 2010; Costello’s work). It may also be valuable to note that the performance of MPAs under future climate scenarios has not been widely evaluated and is likely a research gap to address in order to use these tools most effectively moving forward.</td>
<td></td>
</tr>
<tr>
<td>First Name</td>
<td>Last Name</td>
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<td>Comment Type</td>
<td>Chapter</td>
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<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143407</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>199</td>
<td>201</td>
<td>14</td>
<td>16</td>
<td>Have the reviewer for suggesting the two additional single-species studies. The text has been amended to include them.</td>
</tr>
<tr>
<td>Kathy</td>
<td>Mills</td>
<td>143410</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>199</td>
<td>201</td>
<td>14</td>
<td>16</td>
<td>This is the interpretation may be a bit off in this sentence.  First, it's unclear what, if not referenced against, the past or the future?  The main message of the paper is that as temperatures warm (or warm earlier), more females will make it upstream to spawn before the fishery opens. I think this message is somehow getting turned around in this sentence.</td>
</tr>
<tr>
<td>Diane</td>
<td></td>
<td>143411</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>199</td>
<td>201</td>
<td>14</td>
<td>16</td>
<td>The sentence has been made clearer as suggested by the reviewer.</td>
</tr>
<tr>
<td>Alice</td>
<td>Delach</td>
<td>143414</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>158</td>
<td>160</td>
<td>17</td>
<td>19</td>
<td>Are these citations to offer for this sentence?  I think it would be valuable to point to examples, even if they are from other countries. Hobday et al. 2016 may be useful.</td>
</tr>
<tr>
<td></td>
<td>Mills</td>
<td>143416</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>184</td>
<td>187</td>
<td>17</td>
<td>19</td>
<td>We appreciate the suggestion. We added an alternative earlier reference for the first part of the sentence and took the reviewer's citation suggestion for the second part of the sentence.</td>
</tr>
<tr>
<td></td>
<td>Mills</td>
<td>143415</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>181</td>
<td>183</td>
<td>17</td>
<td>19</td>
<td>We appreciate the suggestion. We added an alternative earlier reference for the first part of the sentence and took the reviewer's citation suggestion for the second part of the sentence.</td>
</tr>
<tr>
<td></td>
<td>Mills</td>
<td>143420</td>
<td>Ed Region</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>181</td>
<td>183</td>
<td>17</td>
<td>19</td>
<td>This text has been revised to incorporate this suggestion. We added a topic sentence to the paragraph and removed &quot;these.&quot;</td>
</tr>
<tr>
<td>Anne</td>
<td>Delach</td>
<td>143408</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>444</td>
<td>447</td>
<td>5</td>
<td>5</td>
<td>We greatly appreciate the reviewer's comment.</td>
</tr>
<tr>
<td>John</td>
<td>Forney</td>
<td>143443</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>305</td>
<td>309</td>
<td>19</td>
<td>21</td>
<td>We appreciate the thoughtful comments. Throughout the NCA process, we have been advised whenever possible, to contrast projected outcomes under RCP 8.5 with RCP 4.5. The difference between these scenarios provides an indication of the benefits to be gained through emission reductions. We appreciate the value in including other scenarios, however this would be inconsistent with NCA guidance. Furthermore, it is rare to see all three scenarios presented in the ocean climate literature.</td>
</tr>
<tr>
<td>Michelle</td>
<td>Tegeder</td>
<td>143477</td>
<td>Whole Chapter</td>
<td>09. Oceans and Marine Resources</td>
<td></td>
<td>337</td>
<td>341</td>
<td>28</td>
<td>33</td>
<td>Thank you for your ample comments. Please note that ocean acidification impacts in the Northwest were referenced only as a Projected Impact in Key Message 2: &quot;Ocean acidification is expected to reduce harvest of US shellfish.&quot; Page 337, Line 19. Oyster aquaculture is also referenced in this section. The section on page 339, Lines 34-36 does reference the apparent losses to shellfish harvests in the future due to OA.</td>
</tr>
</tbody>
</table>

There are other good single-species studies to cite from high-value fisheries if interested: Le Boit et al. 2016 (American lobsters); Cosely et al. 2015 (sea scallops).
sustainable agricultural techniques of the green revolution for sound practices that preserve soil and water quality. However, with the increased dependence on fossil fuels for energy, the soil is being able to store significantly less carbon than it used to; changing farming practices can make our soil more variable precipitation.

There are clear gradients of particulate matter in the air surrounding CAFOs, and the resulting air quality results in an increased incidence of respiratory diseases in the nearby residents. The water, carbon, and pollution produced by these large animal agriculture operations (CAFOs) is a major issue for sound practices that preserve soil and water quality. It is inevitable that prices in food will go up as we exchange the extremely efficient but unsustainable agricultural technologies for more sustainable methods. The way that traditional agriculture is practiced also needs to change. Modern agricultural techniques result in the soil being able to store significantly less carbon than it used to; changing farming practices can make our soil more variable precipitation. The way that traditional agriculture is practiced also needs to change. Managed agricultural techniques result in the soil being able to store significantly less carbon than it used to; changing farming practices can make our soil more variable precipitation.

We greatly appreciate the reviewer's comment and support of this key message. We are pleased that our thinking is in agreement with that of our reviewers. We have received guidance from USGCRP to refrain from including excessive repetition in the key messages so we will not include the suggested references in the key message text.
Comment: This text falsely states speculative projections as established physical facts. These projections appear to be based entirely on the use of questionable computer models, especially the projections to 2050. That these health claims are highly questionable has already been pointed out by the USGCRP and others.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based entirely on the use of questionable computer models, especially the projections to 2050. They have cited this paper nowhere. The paper does not relate to crop response to high temperature vices. The USGCRP has chosen to ignore this information.

Comment: This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the “quality, objectivity, utility, and integrity of information disseminated by the agency.” This text exhibits neither quality, objectivity, utility nor integrity. To begin with, there is no quality or utility. As a result there is no quality or utility. To begin with, this sentence has been deleted during revisions.

Comment: This Key Message is based on information provided in the fully referenced CSSR.

Comment: This sentence has been deleted during revisions.

Comment: This sentence has been deleted during revisions.

Comment: This Key Message is based on information provided in the fully referenced CSSR and the published report of Climate Change and Human Health - USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment” by Patrick J. Michaels and Paul C. Cohn. There is no quality or utility.
<table>
<thead>
<tr>
<th>First Name</th>
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<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
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<tr>
<td>Juanita</td>
<td>Gammon</td>
<td>144200</td>
<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>175 176 22 25</td>
<td>10. Agriculture and Rural Communities</td>
<td>Crop insurance is mentioned as an option for farmers to mitigate risk from climate change. However, this might not be appropriate, as crop insurance can actually be a barrier to crop rotation (another important risk mitigation strategy) because it incentivizes monoculture cropping through yield formulas. The section also names soil erosion technologies and altering crop inputs as strategies for mitigating risk. However, it would be more appropriate to mention improved soil health. Soil health management practices include soil erosion reduction and lead to reduced crop inputs, but soil health is now viewed more holistically as a biological, chemical, and physical system. A slight modification of language could reflect modern thinking on soil science and avoid promoting crop insurance as a sole risk-management strategy. For example, this sentence could be modified to read: “These include altering crop inputs; adoption of a systems approach to soil health management practices; improved management of livestock production systems; integrated pest and disease management; use of climate forecasting; and diversified farming and crop rotation to reduce production risks.”</td>
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<td>Social Science Coordinating Committee</td>
<td>144201</td>
<td>Whole Chapter</td>
<td>10: Agriculture and Rural Communities</td>
<td>Key Message 6: Adaptive Capacity of Rural Communities, is not only entailing as a key message in the executive summary, but the section itself lacks the specificity of statistics and examples of the other three key messages. It needs more researched and less significant compare to the other sections. Suggestions add missing statistics, examples, and citations or break it up and use the relevant text to enhance the other three messages. Particularly key Message 1 which in the executive summary does not mention the impact on former livestock. Furthermore, each of the key messages in the executive should include the human component in some way.</td>
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<tr>
<td>Social Science Coordinating Committee</td>
<td>144204</td>
<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>177 177 13 26</td>
<td>10. Agriculture and Rural Communities</td>
<td>See 18: rice can include the actual social impacts of increased wildlife invading economic costs and community displacement. This paragraph also needs citations, particularly for the sentence ‘Rural communities are particularly vulnerable’ (line 180) and ending on (line 22) with controls.</td>
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<tr>
<td>Social Science Coordinating Committee</td>
<td>144205</td>
<td>Whole Page</td>
<td>10: Agriculture and Rural Communities</td>
<td>173</td>
<td>10. Agriculture and Rural Communities</td>
<td>The information on the state of rural communities is good. But it would connect to the key takeaway in it, if it made a stronger point about the impact of climate change (drought, precipitation- and crop yields, infrastructure, and income loss) on the decline in population, the increase in poverty. As it needs, its as if they are completely separate processes, the work.</td>
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<td>Social Science Coordinating Committee</td>
<td>144209</td>
<td>Whole Chapter</td>
<td>10: Agriculture and Rural Communities</td>
<td>This chapter mainly discusses the impacts of climate change affecting the agricultural sector qualitatively. In the ‘Rural Accounts’ section, there is reference to the body of literature that evaluates the impacts of climate change on agricultural yields, markets, trade, and rural welfare quantitatively, such as through empirical studies in modeling. The authors can consider providing high-level findings from three studies (such as AAFC; from the USDA Economics Research Services, USDA Climate impacts and Risk Analysis (2017) and other studies cited in the chapter), to give readers a sense of the magnitude of potential impacts and their regional distributions (with the latter discussed in more detail in the regional chapters).</td>
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<td>Social Science Coordinating Committee</td>
<td>144250</td>
<td>Whole Chapter</td>
<td>10: Agriculture and Rural Communities</td>
<td>In addition to discussion of impacts of climate change on agriculture and rural communities, this chapter can also consider to include some discussion of measures for reducing GHG emissions, and their synergies for enhancing resilience of the sector.</td>
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<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>380 380 21 27</td>
<td>10. Agriculture and Rural Communities</td>
<td>In addition to discussion of crop yield impacts, it would also be helpful to add some discussion of the economic impacts (such as on prices, market outcomes), to give readers a sense of the welfare impacts on producers and consumers.</td>
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<tr>
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<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>371 371 14 17</td>
<td>10. Agriculture and Rural Communities</td>
<td>In this paragraph we also need to help the readers make a link between some of the data on agricultural output/population in rural communities. Not all rural population are engaged in agricultural activities, and the decline also reflects the reduced output and jobs in manufacturing and processing.</td>
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<td>10: Agriculture and Rural Communities</td>
<td>374 374 1 18</td>
<td>10. Agriculture and Rural Communities</td>
<td>In this paragraph we also need to help the readers make a link between some of the data on agricultural output/population in rural communities. Not all rural population are engaged in agricultural activities, and the decline also reflects the reduced output and jobs in manufacturing and processing.</td>
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<td>144254</td>
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<td>10: Agriculture and Rural Communities</td>
<td>374 374 8 16</td>
<td>10. Agriculture and Rural Communities</td>
<td>Suggest to start a new paragraph with ‘Current state of the agricultural systems...’</td>
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<tr>
<td>Social Science Coordinating Committee</td>
<td>144255</td>
<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>384 384 1 18</td>
<td>10. Agriculture and Rural Communities</td>
<td>This key message conveys important points and makes linkages with factors that determine social vulnerability in the agricultural sector and rural communities that may be exacerbated by climate change. It’s well written.</td>
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<tr>
<td>Michelle</td>
<td>Aglinkar</td>
<td>144670</td>
<td>Test Region</td>
<td>10: Agriculture and Rural Communities</td>
<td>380 380 25 26</td>
<td>10. Agriculture and Rural Communities</td>
<td>No comment was prepared after discussions for subgroups of the University of Washington Program on Climate Change and the Public Comment Document. Among those who participated in discussions, the following wished to be named: Mary Fisher, Morgan Egekem, Dr. Michelle Thachikhr, Dr. Cecilia Ito, Dr. Richard Sarno. The potential offsetting effect of CO2 fertilization on crop yields is only discussed in one sentence on p. 380 (l. 24), as well as in the evidence base on p. 388 (l. 1-2). This topic has been studied extensively, and is sometimes used in popular media as a reason not to worry about future crop growth, but many uncertainties remain. We therefore suggest that the authors either include more discussion on this in the main text, or include it under major uncertainties on p. 388.</td>
<td></td>
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</tbody>
</table>
Michelle Tigchelaar 143707 143713 143714 Arctic Region 10: Agriculture and Rural Communities 107 171 171 171 143713

This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were specifically named: Mary Fisher, Magon Feldmire, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon.

We agree that the mechanisms for heat tolerance in major grains are extremely complex and poorly understood, it is our understanding that the mechanisms for heat tolerance in major grains are extremely complex and poorly understood, and that progress in this area has been modest despite the innovation of techniques to accelerate breeding (Ortiz et al., 2008; Mittler & Blumwald, 2010; Chapman et al., 2012; Jha et al., 2014). This sentiment is supported by a recent (2006) review in Science that pointed to climate change as a decreasing concern for agriculture and food security (Kant et al., 2012). It is our understanding that the mechanisms for heat tolerance in major grains are extremely complex and poorly understood, and that progress in this area has been modest despite the innovation of techniques to accelerate breeding (Ortiz et al., 2008; Mittler & Blumwald, 2010; Chapman et al., 2012; Jha et al., 2014). This sentiment is supported by a recent (2006) review in Science that pointed to climate change as a decreasing concern for agriculture and food security (Kant et al., 2012).


We have corrected the Executive Summary.

Agronomy 143706 143708 Arctic Region 10: Agriculture and Rural Communities

The decision was made by the USGCRP and was not at the discretion of the authors. This issue was not addressed in the previous version of the chapter. The decision was made by the USGCRP and was not at the discretion of the authors. This issue was not addressed in the previous version of the chapter.

We have reviewed the Key Messages and reorganized the paper to streamline the flow and clarity.


We have made the correction to the Executive Summary.

We have revised the Executive Summary.

We have revised the Executive Summary.

We have revised the Executive Summary.
Concerned Union of Scientists

10. Agriculture and Rural Communities

This sentence is no longer in the summary.

Rural Communities

agricultural production will affect the agricultural sector on a global scale. Food security, which is already a

The “changing patterns of invasive…” seem more like a driver (and one of many) of the crop failure and loss of

It may be stronger to make the case that rural communities ARE, have been, or will be particularly strongly

Figure/Table 10.1 lists the most important value added sectors.

We have edited the word Consequently.

We agree with the comment and have revised the paragraph to link to agriculture and added several citations.

We have deleted “relatively rapid”

We have inserted examples of inputs.

Charged to “ret are viable in different climates”.

The authors appreciate the comment. However, Figure 10.1 lists the most important value added sectors.

The sentence was reworded.

We agree with the comment and have revised the paragraph to link to agriculture and added several citations.

We deleted “relatively rapid”

We deleted “relatively rapid”

We deleted “relatively rapid”

We deleted “relatively rapid”

We deleted “relatively rapid”

Deletion to discussion on environmental impacts of current agricultural systems.

We have removed the word Consequently.

The Executive Summary has been edited to clarify.

We have not added the figure due to space limitations

We have inserted the comment after the sentence.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We agree and the paragraph is revised to link it to agriculture.

We have not added these issues to this section but addressed bird use and nutrient and water cycling in other parts of the text.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We deleted “relatively rapid”

We have edited the sentence as suggested.

We have not added the figure due to space limitations.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We have added the comment after the sentence.

We deleted “relatively rapid”

We deleted “relatively rapid”

We have added the comment after the sentence.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We agree and the paragraph is revised to link it to agriculture.

We agree with the comment and have revised the paragraph to link to agriculture and added several citations.

We have not added the figure due to space limitations.

We agree with the comment and have revised the paragraph to link to agriculture and added several citations.

We deleted “relatively rapid”

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We have added the comment after the sentence.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We agree with the comment. However, Figure 10.1 lists the most important value added sectors.

We have not added the figure due to space limitations.
This sentence is complex and has a lot of overlap with following sentences specific to crop or livestock. Possible to simplify this sentence to provide an overview, and then go into specifics? E.g., "These include altering what is produced, modifying the inputs used for production (e.g., fertilizers, pesticides), adopting new technologies (including climate forecasting), adjusting management strategies (including integrated pest management), and diversifying the crop or livestock insurance coverage."

The sentence above is revised to cover broad range of adaptation strategies and avoid repetition.

We are only stating that proper adoption of these strategies have the potential to reduce climate change impacts and help sustain productivity growth and improve efficiency of production.

We have removed the sentence from our key message.

We are not aware of specific attribution of this drought to climate change but used this example to indicate the magnitude of losses that could be associated with future climate conditions. "Drought" was deleted from drought-disaster areas.

We disagree with the comments and have therefore not made changes.

These are great strategies and citations, but they are provided in the same level detail above so perhaps it would be better to currently write. Since they apply to both crop and livestock systems, they might fit better above (and can be deleted here). However, several strategies have not been mentioned anywhere. What about no-till, cover cropping, crop rotations, perennial crops, integrated crop-livestock systems, diversification, agroforestry, etc?

We disagree with the comments and have therefore not made changes.

The sentence above is revised to cover broad range of adaptation strategies and avoid repetition.

We disagree with the comments and have therefore not made changes.

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We disagree with the comments and have therefore not made changes.

We disagree with the comments and have therefore not made changes.

We disagree with the comments and have therefore not made changes.
resilience. 

Inherent resilience doesn’t seem like the right phrase, given the context of major climate changes and recent extreme events that have been very challenging for the livestock sector despite their historical and/or relative “inherent resilience”. It also doesn’t seem to fit well in this section which seemed to have focused on temperature extremes. Some refocusing here or elsewhere could help.

But what about hot days that are not necessarily concurrent with drought? Or other changes to temperature extremes. Some refocusing here or elsewhere could help.

How are the “most intense” storms defined? Is this referring to storms that specifically impacted agriculture?

Seems out of place. This is about drought rather than extreme temperatures. Also, the statement about crops might hit better (or should at least be introduced) in a section focused on crops rather than livestock.

Since the section is framed to be focused on temperatures, these points feel out of place. Consider refocusing/sectioning or editing this text.

This message has been missing in all previous text, and is not clearly linked to agriculture currently.

None of this is clearly linked to agriculture (or rural communities).

This content is important, but feels out of place and not particularly relevant here (especially as the starting point in this section).

We removed the word “inherent”.

Agreed: Revised the sentence to include these regions.

We removed the word “inherent”.

Agreed: Revised the sentence:

We removed the word “inherent”.

We removed the word “inherent”.

We removed the word “inherent”.

We removed the word “inherent”. This was corrected.

We removed the word “inherent”. This was corrected.

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<th>Year of Concerned Scientists</th>
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<tr>
<td>2014</td>
<td>Agriculture and Rural Communities</td>
<td>371-372</td>
<td>Key Message</td>
<td>Need to change “increasing” to “increasingly” and is often a major employer in the region.</td>
<td>The change has been made as suggested.</td>
</tr>
<tr>
<td>2015</td>
<td>Agriculture and Rural Communities</td>
<td>387-388</td>
<td>Key Message</td>
<td>Webster “grain number” per head</td>
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<tr>
<td>2016</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>Would be great if a few choices or more clear. Also consider changing “Practices” to “Agricultural Practices” and KM4 focuses on vulnerability and adaptive capacity of rural communities.</td>
<td>This is an important point. Young (2017) refers to insects, diseases, and weeds, which would include beneficial insects. However, data are lacking on specific beneficial insect responses to climate change. This was added to emerging issues and research needs section.</td>
</tr>
<tr>
<td>2017</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>Although there are numerous programs, are they enough to address the need? Many of these programs are not well-trodden background information, and used the space to more clearly explain the projected impacts of climate change on agriculture, the contributions of agriculture to emissions, and the needs and opportunities for adaptation and mitigation.</td>
<td>The authors appreciate the importance of this comment, but adequacy of current or future funding is beyond the scope of this report.</td>
</tr>
<tr>
<td>2018</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>We have added discussion of climate impacts on weeds and beneficial and pest insects and microorganisms and added a section on research needs, including this.</td>
<td>We added “agricultural management practices and” and inserted sentences about adaptation and mitigation benefits of increased soil carbon. Specific practices to increase soil carbon are given in Paustian et al., 2016; 14, 2015; Brown and Herrick, 2016; Derner et al., 2015; Blanco-Canqui et al., 2015; Parton et al., 2015.</td>
</tr>
<tr>
<td>2019</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>There are great references in this section, but it’s unclear whether this content fits within this key message. Nighttime temperature effects on crop yield and quality are discussed briefly.</td>
<td>Done. Revised the text</td>
</tr>
<tr>
<td>2020</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>The sentence has been revised to communicate the broader economic impact beyond livelihood.</td>
<td>The sentence has been revised to communicate the broader economic impact beyond livelihood.</td>
</tr>
<tr>
<td>2021</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>There have been numerous new agricultural technologies and other advances that are briefly described in this chapter.</td>
<td>We agree with the comments. Additional details about water are in other portions of the text.</td>
</tr>
<tr>
<td>2022</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>There are many new agricultural technologies and other advances that are briefly described in this chapter.</td>
<td>We agree with the comments. Additional details about water are in other portions of the text.</td>
</tr>
<tr>
<td>2023</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>The business of agriculture drives the make up and character of the business community in rural communities, and is often a major employer in the region.</td>
<td>The sentence has been revised to communicate the broader economic impact beyond livelihood.</td>
</tr>
<tr>
<td>2024</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>These Key Messages are much more briefly stated than in other chapters (I read through the chapter. I noted that the Key Messages in the chapter are longer and more useful—I’m leaving this comment here, but now realize the problem could be fixed by including the full key message here). What seems to be missing is that the statements don’t seem to provide adequate context to stand alone—basically not providing any context of human-induced climate change being a strong force for these changes. I would suggest a bit of amplification so that each of the findings can stand completely on its own. It would also be helpful if some indications can be given on the relative magnitude and importance of these issues compared to other factors affecting the Agriculture Sector. Also, these lines only have 3 key messages and the chapter has 4 of them.</td>
<td>Done. Revised the text</td>
</tr>
<tr>
<td>2025</td>
<td>Agriculture and Rural Communities</td>
<td>390-391</td>
<td>Key Message</td>
<td>This section was moved to KM1, now related to reduced agricultural productivity. While all plants are impacted by climate change stressors, most of the peer-reviewed literature focuses on major commodity crops.</td>
<td>Done. Full Key message text is added</td>
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<td>Agriculture and Rural Communities</td>
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<td>lando</td>
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<td>166833</td>
<td>Text Region</td>
<td>11</td>
<td>Built Environments, Urban Systems, and Cities</td>
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</tbody>
</table>
Casey, Kavindh/Gail 141203 First Name Last Name Comment ID Comment Type Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 425 426 15 23 There is a recent publication on the effectiveness of the role city networks such as C40 and ICLEI in cities’ adoption of climate policies. This research covered 127 cities around the globe, including those of the US. Therefore, I would recommend you have a reference to that: effectiveness: Original text: ‘strong leadership and political will are central to addressing these challenges’ (Bulder et al. 2016, 54, 2015, Vogel et al. 2016). Many U.S. cities participate in networks such as the U.S. Conference of Mayors, IC2 (International Council for Local Environmental Initiatives), C40/Cities Climate Leadership Group, and 100 Resilient Cities. Multi-city networks foster peer-to-peer learning, share best practices, and provide technical assistance for adaptation and mitigation (Clark and Clark 2014, Aper 2013, Rosenow et al. 2015, Vogel 2016). Suggested change: ‘Strong leadership and political will are central to addressing these challenges’ (Bulder et al. 2016, 54, 2015, Vogel et al. 2016). Many U.S. cities participate in networks such as the U.S. Conference of Mayors, IC2 (International Council for Local Environmental Initiatives), C40/Cities Climate Leadership Group, and 100 Resilient Cities. Multi-city networks foster peer-to-peer learning, share best practices, and provide technical assistance for adaptation and mitigation (Clark and Clark 2014, Aper 2013, Rosenow et al. 2015, Vogel 2016). These networks have played an important role in shaping climate policy frameworks and are key drivers for cities’ climate policy adaptations (K. Rashidi & Patt, 2017). References: Roshál, E., & Patt, A. (2017). Subsidize over symbols: the role of transnational municipal networks on cities4pC (climate policy innovation and adoption). Mitigation and Adaptation Strategies for Global Change. http://doi.org/10.1007/s11027-017-9720-y

Henry Miller 141194 Whole Page First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 412 413 5 27 What is missing here is the emphasis on the importance of the role of co-benefits of climate policies in urban policy adaptations. There is a growing body of literature highlighting the importance of the key driven in shaping the mindsets of urban policy makers. Consideration of the co-benefits of GHG mitigation projects seems to be important for various stakeholders: 1- Urban policy makers: They will understand that it is not just about GHG reduction, but these types of projects result in job creation, air pollution reduction, improved health benefits, productivity gains, etc. These are all local gains of majority of climate policies. 2- City residents: If they see a clear link between their tax payments and specific investments (i.e. the type of investment that offers benefits beyond GHG mitigation), they will be more willing to participate. Whether in the form of purchasing municipal green bonds, direct investments, or purchasing additional tax, user fees, etc. 3- Federal regulator: Consideration of co-benefits of urban climate policies, can possibly increase the breadth of reaching federal aides. I would like to refer you to our latest publication (Kavindh, Roshál, Stiddum, B., & Patt 2017), which you might find interesting. References: Roshál, E., Stiddum, B., & Patt, A. (2017). Valuing co-benefits to make low carbon investments in cities bankable: the case of waste and transportation projects. Sustainable Cities and Society, 36, 69-87108. http://doi.org/10.1016/j.scs.2017.06.003

David Chopik 141485 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 419 420 5 27 Here is the text: 26 Urban adaptation and integration sectors can affect current and projected impacts of climate change and provide near-term benefits. Comment: This text falsely states speculative projections of impacts as established factual points. These projections appear to be based purely on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the “quality, objectivity, utility, and integrity of information disseminated by the agency.” The text exhibits neither quality, objectivity, utility, nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should be necessary), they persist. As a result there is no quality or utility.

Jeffrey Munson 141830 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 413 414 14 13 What percentage of Americans live in urban areas? The limitation might be more by revisiting how many Americans to whom this is important.

Jeffrey Munson 141831 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 415 416 14 14 Are urban areas the primary source of greenhouse gas emissions because of increased population and urban development? It might help to say that here.

Jeffrey Munson 141833 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 420 421 1 23 Trended, this section does a great job of summarizing effects of climate change on urban utilities. It could be improved, however, by a little more writing about the problem outlined in Figure 11 3, namely the effects of flooding on sewage systems and the associated risks to urban populations. Rather than being somewhat self-contained in the figure itself.

Raja Roy 141900 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 417 418 2 23 In some places in the chapter, it states “buildings and infrastructure” and in other places it is described as “urban infrastructure”. It seems like there should be a distinction made between these two terms to improve clarity.

Nicholas Kajouji 141562 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
Whole Page 413 In the “State of the Sector”, there are good data on the importance of the built environment and cities. However, if this chapter is going to include a discussion of the building stock, it would be helpful to include descriptive statistics that talk to the number of buildings, the value of the buildings and their contents, and the overall importance buildings have to climate change mitigation and adaptation. For example, buildings use nearly 40% of the total energy in the U.S. Exposure to high temperatures often happens indoors; dealing with heat waves may increase energy use and air pollution, etc.

Rosney Thembur 141903 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 419 In the “State of the Sector”, there are good data on the importance of the built environment and cities. However, if this chapter is going to include a discussion of the building stock, it would be helpful to include descriptive statistics that talk to the number of buildings, the value of the buildings and their contents, and the overall importance buildings have to climate change mitigation and adaptation. For example, buildings use nearly 40% of the total energy in the U.S. Exposure to high temperatures often happens indoors; dealing with heat waves may increase energy use and air pollution, etc.

Rosney Thembur 141907 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 419 In the “State of the Sector”, there are good data on the importance of the built environment and cities. However, if this chapter is going to include a discussion of the building stock, it would be helpful to include descriptive statistics that talk to the number of buildings, the value of the buildings and their contents, and the overall importance buildings have to climate change mitigation and adaptation. For example, buildings use nearly 40% of the total energy in the U.S. Exposure to high temperatures often happens indoors; dealing with heat waves may increase energy use and air pollution, etc.

Rosney Thembur 141971 First Name Last Name Comment ID Chapter Figure/Table/Name Comment
11. Built Environment, Urban Systems, and Cities 427 428 15 36 Please define “tail” events – this is only used one other place in the NCA; page 1410, line 8. In the appendix, it’s described as a “fat tail,” consistency would be helpful for readers.

We appreciate this suggestion. We have refined our discussion on co-benefits and added the suggested reference to the supporting text to key Message 4.
11. Built Environment, Urban Systems, and Cities
415
414
21
1 From this sentence, it’s unclear if sea level rise contributed to damage as part of Hurricane Joaquin or if it
projected to cause problems in the future.
Thank you for your observation. We did not mean to imply that cities can achieve adaptation and mitigation
goals on their own. We have added more details to our discussion of the factors that constrain urban adaptation
and mitigation. We specifically highlight the role of policy decisions at other scales.
11. Built Environment, Urban Systems, and Cities
417
417
31
36 The report mentions extreme heat several times, but there is no mention of cold temperatures. While the NCA4
states that heavier snows will affect in the future, it also states on page 252 (Box 10) that declines in arctic sea
ice may cause the atmospheric jet stream to get stuck in place for days and weeks. This can lead to colder
weather in North America. Extreme cold can also cause mortality and morbidity, and cause failures to heating
systems in buildings and damage to urban infrastructure. Should this also be included in this chapter?
Because of limited space, we are not able to add the suggested graphic. The sectoral interdependencies chapter has
included a graphic that addresses this topic.
Nicholas Rajkovich
241074
Ent Region
11. Built Environment, Urban Systems, and Cities
417
417
31
36 The report discusses interconnections among sectors increasing, however there is little discussion of where these
interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these
interconnections can lead to cascading failures (beyond Figure 3.3 which only describes heavy rainfall) would
help illustrate this point. While the energy-water nexus is a good example, other sectors like commerce are
affected by a loss of electricity, water, sewage, etc. Very few organizations can function if a critical building
system is offline, degrading the economy and hampering recovery.
We revised Figure 11.4 and its caption to increase its clarity and impact. In the supporting text to Key Message 4, we
highlight the variety of governmental and non-governmental policies and strategies for urban adaptation.
We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
John Davidson
241082
Chief/Region
11. Built Environment, Urban Systems, and Cities
418
418
21
23 Climate crisis and actions to reduce it are affecting human health in urban areas. For example, sea level rise
is increasing the frequency of flooding, and urban heat islands are increasing the temperature and humidity.
Also see e.g. Rockström et al. (2017, doi:10.1126/science.aah3443) and Figueres et al. (2015, doi:10.1016/j.bulrev.
2016.02.005) for other examples. Also see e.g. Rockström et al. (2017, doi:10.1126/science.aah3443) and Figueres et al.
We added discussion about slow moving changes such as salt water intrusion to the Regional Roll Up. We also
specified that stressors are acute and chronic.
John Davidson
241080
Chief/Region
11. Built Environment, Urban Systems, and Cities
419
419
21
23 The chapter describes many extreme events but does not describe other slow-moving changes (other than sea
level rise) that may have a negative impact on buildings and infrastructure. These include changes in pest
dergans like termites that can damage to wood framed buildings, sediments due to dressing water out from
aquifers and salt water intrusion, and changes to building envelopes and foundations required by shifts in
temperature and humidity.
We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
Nicholas Rajkovich
241076
Ent Region
11. Built Environment, Urban Systems, and Cities
421
421
14
14 Consider adding more science-based information about urban emissions and mitigation. This information seems
critical given urban contributions to US emissions and the number of US cities that have made pledges to
reduce emissions reductions needed to meet lower emissions targets. It could be incorporated by adding Key
Message 4 or possibly with an additional message that meeting these city-level pledges likely requires or is
significantly challenged without action at state and federal levels (actions do not need to be specified or
specified that stressors are acute and chronic.
11. Built Environment, Urban Systems, and Cities
424 The figure shows working at night, cooling tower, and other policies that are not included in the chapter. It may
be helpful to describe some of these policies like changes to building codes at the state level, changes to
_standards (e.g., ASHRAE Standard 55 for thermal comfort, etc.), and voluntary protocols like the LEED Rating
system. Not all policies that affect urban life are determined by cities, and organizations at other levels may
impact city performance during extreme events. See for example: Gordon, Kathryn C., Rajkovich, Nicholas B.,
White-Nasawama, Jakarne, Laser, Larnice, & Monte S. O’HaraMck. 2011. Preventing cold-related mortality and
Shindell, D., and Nicholas B. Rajkovich. 2010. Addressing climate change in urban standards. Building and
We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
Nicholas Rajkovich
241077
Ent Region
11. Built Environment, Urban Systems, and Cities
1240-00%
12 The report discusses interconnections among sectors increasing, however there is little discussion of where these
interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these
interconnections can lead to cascading failures (beyond Figure 3.3 which only describes heavy rainfall) would
help illustrate this point. While the energy-water nexus is a good example, other sectors like commerce are
affected by a loss of electricity, water, sewage, etc. Very few organizations can function if a critical building
system is offline, degrading the economy and hampering recovery.
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We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
Sarah Davidson
241081
Chief/Region
11. Built Environment, Urban Systems, and Cities
151
151
20
20 Key Message 4 states that cities are leading efforts to respond to climate change. However, in addition to city
government, there are a number of professional organizations, NGOs, and philanthropy that are contributing
significantly to this cause. The role of professionals (e.g., architects, urban planners, etc.) through their
professional societies is critical; they are developing new model codes, standards, and policies for adoption by
decision makers. The document currently reads as though cities are taking the lead, but this work is often
supported by or carried out by these other organizations. Recognizing these contributions to adaptation
is important to building the response to climate variability and change.
We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
Sarah Davidson
241087
Chief/Region
11. Built Environment, Urban Systems, and Cities
164 The report discusses interconnections among sectors increasing, however there is little discussion of where these
interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these
interconnections can lead to cascading failures (beyond Figure 3.3 which only describes heavy rainfall) would
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specifically highlight the role of policy decisions at other scales.
Sarah Davidson
241088
Chief/Region
11. Built Environment, Urban Systems, and Cities
161 The report discusses interconnections among sectors increasing, however there is little discussion of where these
interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these
interconnections can lead to cascading failures (beyond Figure 3.3 which only describes heavy rainfall) would
help illustrate this point. While the energy-water nexus is a good example, other sectors like commerce are
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We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
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Sarah Davidson
241089
Chief/Region
11. Built Environment, Urban Systems, and Cities
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interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these
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system is offline, degrading the economy and hampering recovery.
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highlight the variety of governmental and non-governmental policies and strategies for urban adaptation.
We added more details to our discussion of the factors that constrain urban adaptation and mitigation. We
specifically highlight the role of policy decisions at other scales.
urban areas can adapt and better prepare for the effects of climate change. It is critical to understand how and why certain areas might be left vulnerable while others are offered investment and protection.

The chart is very instructive, but not the only source of information on how population might shift in the future. We highly recommend including information from “Migration induced by sea-level rise: a critical threat to the well-being of coastal communities in the United States” (Shastri and Mace, Nature Climate Change, 17 April 2017). This paper made more refined projections of how the populations of various coastal cities may be affected and what areas of the country may receive an influx of population as a result.

We appreciate the reviewer’s comment. Clarification and references are provided in traceable accounts. This chapter is focused on the urban built environment, so we made some changes to improve focus on the urban systems and city challenges.

We thank you for the feedback. We added the reference to orient readers to what is new in this chapter since NCA5.

The text has been revised to incorporate this suggestion. We added the modifier “many” added to text.

Thank you for the reference. We added information Hauer’s main findings to the text and have the reference in the reference list. The reason we use the US EPA population projections is because they are the official NCA4 population scenario to maintain consistency across chapters.

Thank you for this insightful comment. We expanded our discussion of urban inequality to include literature that addresses how social inequality is related to vulnerability to climate change, as well as how it intersects with adaptation and mitigation efforts. We cross-reference the coastal chapter and other relevant chapters on this topic.

Thank you for this suggestion. We added a sentence in the introduction to orient readers to what is new in this field since NCA5.

Thank you for this insightful comment. We expanded our discussion of urban inequality to include literature that addresses how social inequality is related to vulnerability to climate change, as well as how it intersects with adaptation and mitigation efforts. We cross-reference the coastal chapter and other relevant chapters on this topic.

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Thank you for the reference. We added information Hauer’s main findings to the text and have the reference in the reference list. The reason we use the US EPA population projections is because they are the official NCA4 population scenario to maintain consistency across chapters.

Thank you for this insight. We expanded our discussion of urban vulnerability to highlight how historic urban infrastructure patterns increase differential risks to urban populations and properties.

Thank you for this observation. We addressed this comment by highlighting the importance of different parts of the built environment to urban quality of life in both the introduction and supporting text to Key Message 1.

Thank you for this observation. We added the reference to orient readers to what is new in this field since NCA5.

Thank you for the reference. We added information Hauer’s main findings to the text and have the reference in the reference list. The reason we use the US EPA population projections is because they are the official NCA4 population scenario to maintain consistency across chapters.

The text has been revised to incorporate this suggestion. We added the modifier “many” added to text.

The text has been revised to incorporate this suggestion. We added the modifier “many” added to text.

Thank you for the comment. Clarification and references on risk management strategies regarding these uncertainties are provided in traceable accounts.
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<td>Mike</td>
<td>McFeeley</td>
<td>143862</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>421 422 5 6</td>
<td>We recommend changing the 2nd sentence of KM4 to be Climate change can exacerbate existing urban challenges affecting the popular quality of life. . . .</td>
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<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143688</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>413 414 14 14</td>
<td>What are smaller micro areas? Can you use a footnote to define?</td>
<td></td>
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<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143309</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>413 414 16 16</td>
<td>We recommend putting the five largest cities in the text to referring to a footnote. By specifically mentioning the five largest cities it makes the reader wonder who’s those are.</td>
<td></td>
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<td>Mike</td>
<td>McFeeley</td>
<td>143171</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>415 416 18 18</td>
<td>To be consistent with other chapters, it would be helpful if the Regional Summary referenced the NCA regions. Recognizing that this Chapter's focus on cities, perhaps you could say Cities in the Southwestern, such as Los Angeles, CA and Phoenix, AZ, are more vulnerable to...</td>
<td></td>
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<tr>
<td>Mike</td>
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<td>143072</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>416 416 18 19</td>
<td>Add reference (see Ch. 4: Energy) to the end of the sentence.</td>
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</tr>
<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143073</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>417 417 4 5</td>
<td>What and not 2015 is not in the reference list and based on a quick search, doesn’t even seem like the right reference for this statement.</td>
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</tr>
<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143074</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>419 420 11 11</td>
<td>The text should probably define the term forward-looking. Does the mean residents or adaptive?</td>
<td></td>
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</tr>
<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143076</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>422 422 10 17</td>
<td>This text cites does not mention the leading edge work of municipal water providers within cities to plan for and adapt to climate change. Suggest adding the following statement at the end of the paragraph of text: Large municipal water providers within cities are also pioneering ways to assess and adapt to climate impacts that are fundamental to city resilience. Water Utility Climate Alliance (2017).</td>
<td></td>
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<tr>
<td>Mike</td>
<td>McFeeley</td>
<td>143077</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>428 429 10 11</td>
<td>We agree that additional urban stakeholders other than municipalities, including the water sector, play important roles in urban adaptation efforts. We revised this sentence accordingly and added details about water utility roles in the supporting text for Key Messages on urban adaptation.</td>
<td></td>
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<tr>
<td>Social Science</td>
<td>Coordinating Committee</td>
<td>143207</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>411 411 14 14</td>
<td>Two of the four key messages relate to social systems. The linkages are a bit vague, unclear and leave important components unidentified e.g. ‘many areas of urban flooding—what does this mean?’</td>
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<tr>
<td>Social Science</td>
<td>Coordinating Committee</td>
<td>143208</td>
<td>Text Region</td>
<td>11. Birth Environment, Urban Systems, and Class</td>
<td>411 411 24 26</td>
<td>Links center around linking climate change impacts and events on residents of urban cities e.g. Heavy rainfall are expected to increase in frequency and intensity. This statement should be followed by potential scenarios of impacts and examples. We already see impacts from these events—how are social systems reacting?</td>
<td></td>
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</tbody>
</table>

**Response**

Thank you for your suggestions. The text has been revised to read “residents, not urban residents”.

Thank you for your suggestion. The text has been revised to read “residents, not urban residents”.

After consideration, the author team determined that the existing word choice is appropriate, and no change was made.

After consideration, the author team determined that the existing word choice is appropriate, and no change was made.
<table>
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<tr>
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<td>MacCracken</td>
<td>144356</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>411</td>
<td>411</td>
<td>1</td>
<td>7</td>
<td>Key Message 1 doesn't deliver a clear, strong take-away, particularly the first sentence which refers only to urban residents although the evidence notes that urban areas are the major economic engine of the nation. It may be phrased better. Urban areas create opportunities and provide resources that are critically important to the health and well-being of urban residents and the nation.”</td>
<td>Thank you for the suggestion. After careful consideration, the authors decided to retain the existing Key Message phrasing.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144357</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>415</td>
<td>415</td>
<td>13</td>
<td>15</td>
<td>In the definition of urban areas, the name on page 412 is 12.17. It is not clear that communities are more efficient emitters of GHG’s as they are more than a greater share of population than share of GHG emissions. In general, discussion of the efficiency of urban areas and the relationship with density and wealth is lacking.</td>
<td>Thank you for raising this issue. The available literature does not support our ability to make statements that are national in scope about the relationship among urban emissions efficiency, density, and wealth. We welcome further research in this area. We do cross-reference the mitigation chapter on mitigation actions cities are taking to reduce emissions.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144358</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>415</td>
<td>415</td>
<td>1</td>
<td>4</td>
<td>The key discussion of urban impacts on the environment does not mention the impacts of increasing suburbanization/greenfield development on climate resilience, such as on water supplies</td>
<td>Not highlight the intersection of climate change with urbanization, including the impact of sprawl (suburbanization), on urban resilience.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Schumacher</td>
<td>144308</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>416</td>
<td>416</td>
<td>1</td>
<td>1</td>
<td>There appear to be any major construction within the past decade that have interpreted climate projections? If so, how might this or these construction projects set an example for the future of climate change ready construction?</td>
<td>Thank you for your suggestion. We added a sentence on how the five case study cities were selected by the Process Description paragraph of the Traceable Accounts. Because of space limitations, we were not able to include additional cities.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Schumacher</td>
<td>144309</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>419</td>
<td>419</td>
<td>22</td>
<td>27</td>
<td>We thank the reviewer for the helpful suggestion. We revised the text to change “may be constrained” to “is often constrained” as this modification is supported by the scientific literature. The first sentence of this section is not a good example of how to state that constraints are often constrained.</td>
<td>Thank you for the suggestion. Clarification and references are provided in traceable accounts.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144356</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>415</td>
<td>415</td>
<td>13</td>
<td>17</td>
<td>Since 80% of Human-caused greenhouse gases come from urban areas, does that mean that even a slight change in an urban area to decrease emissions will have a large impact on the total?</td>
<td>Agreed that additional urban stakeholders other than municipalities, including the water sector, play important roles in urban adaptation efforts. We revised this sentence accordingly and specified measures that water utilities are taking to protect assets essential to the functioning of urban systems.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144357</td>
<td>Figure</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>414</td>
<td>414</td>
<td>100.00%</td>
<td>1.00%</td>
<td>N/A. Regarding the color key for the population, the breakdowns at the higher population levels that go to Figure 55 (incorporation of data from all US data on climate change and the environment).</td>
<td>Yes, it is still the低碳的California has experienced (Thomas Tier), so updates are necessary.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144358</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>415</td>
<td>415</td>
<td>24</td>
<td>26</td>
<td>Line 18 of the fire information might be new necessary.</td>
<td>Thank you for the suggestion. We have revised Figure 11.1 to have a consistent and logical coloring and numbering scheme.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144359</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>417</td>
<td>417</td>
<td>24</td>
<td>25</td>
<td>The word “may” needs to be replaced by a word from the lexicon to provide a useful indication of likelihood. “I can’t say anything. Here, I would suggest saying “femist are likely not to be able” is justified.</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144360</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>418</td>
<td>418</td>
<td>6</td>
<td>6</td>
<td>We might change “may experience...” to something similar—use the likelihood lexicon for the possible.</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144361</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>418</td>
<td>418</td>
<td>27</td>
<td>27</td>
<td>Change “may not be able to” to “are unlikely to be able to” accord with the lexicon</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144362</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>419</td>
<td>419</td>
<td>1</td>
<td>2</td>
<td>On line 413, “change” to “likely to...”</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144363</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>419</td>
<td>419</td>
<td>11</td>
<td>13</td>
<td>On line 11, “change” to “likely to...” and on the 12 change to “are likely to...”</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144364</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>422</td>
<td>422</td>
<td>2</td>
<td>3</td>
<td>Need to change “may lead to...” to “generally lead directly to”.</td>
<td>Thank you for the comment. We changed “may” and used more appropriate terminology.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144365</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>422</td>
<td>422</td>
<td>10</td>
<td>11</td>
<td>“Urban populations who already experience food insecurity” is a pretty long euphemism for “the poor”</td>
<td>We agree with the commentor that food insecurity is not only limited to the poor. Because of that, and the focus of the paragraph on food supplies specifically, we are leaving the sentence as is.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144366</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>425</td>
<td>425</td>
<td>3</td>
<td>5</td>
<td>We reviewed the text to incorporate the suggestion by adding word “often” to modify the sentence.</td>
<td>Thank you for the reviewer for the helpful suggestion. We revised the text to change “may be constrained” to “are often constrained” so that the recommendation is supported by the scientific literature. The first sentence of this section makes the observation that cities are mainstreaming adaptation and mitigation into other aspects of planning, we also touch on this issue in key message 1 and 2.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144367</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>425</td>
<td>425</td>
<td>8</td>
<td>8</td>
<td>Need to replace “may,” perhaps say “is often constrained to lower priority than addressing current problem areas.”</td>
<td>We think the reviewer for the helpful suggestion. We revised the text to change “may be constrained” to “are often constrained” so that the recommendation is supported by the scientific literature. The first sentence of this section makes the observation that cities are mainstreaming adaptation and mitigation into other aspects of planning, we also touch on this issue in key message 1 and 2.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144368</td>
<td>Test Region</td>
<td>11</td>
<td>Built Environment, Urban Systems, and Cities</td>
<td>427</td>
<td>427</td>
<td>27</td>
<td>27</td>
<td>There are not degrees of “certainty” (see also a similar term in the lexicon). This is a pretty long euphemism for “the poor”</td>
<td>We agree with the commentor that food insecurity is not only limited to the poor. Because of that, and the focus of the paragraph on food supplies specifically, we are leaving the sentence as is.</td>
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<tr>
<td>First Name</td>
<td>Last Name</td>
<td>Comment ID</td>
<td>Type</td>
<td>Comment</td>
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<tr>
<td>David</td>
<td>Bozik</td>
<td>441006</td>
<td>Fed Region</td>
<td>12. Transportation: Here is the present text: 18 Key Message 1: A reliable, safe, and efficient U.S. transportation system is at risk from 19 increases in heavy precipitation, coastal flooding, heat, and other extreme events as well as 20 changes to average precipitation and temperature. Over the coming decades and the rest of 21 the century, climate change will continue to pose a risk to U.S. transportation performance 22 with differences among regions. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. The text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the “quality, objectivity, utility, and integrity of information disseminated by the agency.” This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary); yet they persist. As a result there is no quality or utility. The Key Messages are supported by the content and references in each section.</td>
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</tr>
<tr>
<td>Andrew</td>
<td>Furnish</td>
<td>441015</td>
<td>Figure/Table Number</td>
<td>12. Transportation: In figure 12.1, what's the definition of representative low, intermediate, and extreme level 15 scenarios? Also, what's the definition of the annual vehicle-hours of delay for most major roads caused by sea level rise 16 scenarios? How is the annual vehicle-hours of delay calculated from the simulation? How is the simulation set up? Does the annual vehicle-hours of delay mean the length of time of the annual vehicle-hours in the period of high tide flooding minus the average time in other times? Why not also use decadal average values for 2100? Modify this type of question needed to be addressed for figure 12.1. The definitions of the scenarios were added to the body of the text. The definition of vehicle-hours of delay was added to the figure caption. The remaining requested details appear in the paper’s methods from which the figure was taken and are beyond the scope of this chapter.</td>
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<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>442003</td>
<td>Whole Chapter</td>
<td>12. Transportation: In general, there seems to be a lack of emphasis on the rail transportation plays to causing climate change. Transportation is the leading source of US GHG emissions, and while that fact is mentioned, it’s not one of the key messages. It could work better by tying Key Message 3. The suggestion is outside the scope of this chapter; detailed discussions of mitigation/contributions to climate change belong in the Mitigation chapter.</td>
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<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>442002</td>
<td>Whole Chapter</td>
<td>12. Transportation: In a world of increasingly limited resources, public dollars have to hit multiple socio-objectives. The chapter would do well to point out that in a world of limited resources, our investments can and must advance adaptation to -- and mitigation of -- climate change. Consistent with its Congressional mandate, this assessment is a technical report and does not include policy discussions of climate mitigation or adaptation.</td>
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<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>442003</td>
<td>Fed Region</td>
<td>12. Transportation: Key Message 3 suggests that transportation planners are increasingly interested in addressing climate risks, as evidenced by the frequency of interventions. It’s also worth pointing out that transportation planners - both state and federal - are increasingly interested in measuring and reducing their greenhouse-gas emissions from transportation, as evidenced by the adoption by USDOT/WAPA of the MAP-21 carbon-performance standard in January 2017. The commenter is correct that there has been increased interest from subnational governments and the private sector in climate mitigation. However, due to the size of the topic, the page limit for this chapter, and the overall focus of the NA, focused on adaptation rather than mitigation. There is discussion of mitigation efforts in the dedicated mitigation chapter.</td>
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<tr>
<td>Juanita</td>
<td>Corellie</td>
<td>442004</td>
<td>Fed Region</td>
<td>12. Transportation: The text suggests that the impact of ridersourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced. The comment is outside the scope of this chapter; detailed discussions of mitigation/contributions to climate change belong in the Mitigation chapter.</td>
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<tr>
<td>Vikki</td>
<td>McKernan</td>
<td>443003</td>
<td>Fed Region</td>
<td>12. Transportation: The chapter mentions the fact that urban areas are perhaps more resilient than rural areas because of the many transportation options which offer some redundancy in the system. It would strengthen the chapter to mention that providing more transportation choices not only makes a community more resilient to climate change, but also helps to mitigate greenhouse gas emissions if transiting, carpools, walking or biking are possible. Additionally, the chapter plainly points out that communities such as New York where people can simply walk, are inherently more resilient to climate change. Dense, walkable communities also significantly reduce the need to drive, and therefore the carbon footprint of their residents. For policy makers striving to adapt to climate change, creating walkable communities does double duty, and failing to point this out weakens the chapter.</td>
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<tr>
<td>Ken</td>
<td>Morflow</td>
<td>441198</td>
<td>Fed Region</td>
<td>12. Transportation: The text implies that TOD and increasing multimodal options is “likely to reduce emissions and help build out” in fact, TOD and multi-modal solutions have been repeatedly documented to reduce emissions, likely not strong enough. The text has been revised to incorporate this suggestion.</td>
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<tr>
<td>Ken</td>
<td>Morflow</td>
<td>441199</td>
<td>Fed Region</td>
<td>12. Transportation: In a world of increasing sea-level rise, coastal flooding is an increasing threat. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Ken</td>
<td>Morflow</td>
<td>441200</td>
<td>Fed Region</td>
<td>12. Transportation: The text suggests that the impact of ridersourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Ken</td>
<td>Morflow</td>
<td>441201</td>
<td>Fed Region</td>
<td>12. Transportation: The commenter is correct that there has been increased interest from subnational governments and the private sector in climate mitigation. However, due to the size of the topic, the page limit for this chapter, and the overall focus of the NA, focused on adaptation rather than mitigation. There is discussion of mitigation efforts in the dedicated mitigation chapter.</td>
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<tr>
<td>Tom</td>
<td>Morflow</td>
<td>441202</td>
<td>Fed Region</td>
<td>12. Transportation: The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Tom</td>
<td>Morflow</td>
<td>441203</td>
<td>Fed Region</td>
<td>12. Transportation: The text suggests that the impact of ridersourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Tom</td>
<td>Morflow</td>
<td>441204</td>
<td>Fed Region</td>
<td>12. Transportation: The text suggests that the impact of ridersourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Tom</td>
<td>Morflow</td>
<td>441205</td>
<td>Fed Region</td>
<td>12. Transportation: The text suggests that the impact of ridersourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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<tr>
<td>Martin</td>
<td>Coordinating Committee</td>
<td>441208</td>
<td>Fed Region</td>
<td>12. Transportation: The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. The report does not include policy discussions or recommendations for climate mitigation or adaptation.</td>
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</table>
12. Key Message 1: Climate change is increasing the risk of adverse respiratory and cardiovascular effects, including premature death, due to higher concentrations of air pollutants in many parts of the United States. Increased air pollutant concentrations also have other environmental consequences, including degraded visibility and damage to agricultural crops and forests.

Climate change is promoting weather conditions that more frequently lead to the buildup of 3 ozone and particulate matter and enhance emissions from these pollutants. These adverse impacts of climate change will compromise ongoing efforts to improve air quality by reducing emissions from industrial sources.

13. Air Quality

4. Key Message 1: Climate change is increasing the risk of adverse respiratory and cardiovascular effects, including premature death, due to higher concentrations of air pollutants in many parts of the United States. Increased air pollutant concentrations also have other environmental consequences, including degraded visibility and damage to agricultural crops and forests.

Climate change is promoting weather conditions that more frequently lead to the buildup of 3 ozone and particulate matter and enhance emissions from these pollutants. These adverse impacts of climate change will compromise ongoing efforts to improve air quality by reducing emissions from industrial sources.

5. Climate change will likely force changes to the transportation system, but these changes have yet to be realized in many cases. In this Key Message, we focus on the climate impact to the existing transportation system.

6. Climate change will likely force changes to the transportation system, but these changes have yet to be realized in many cases. In this Key Message, we focus on the climate impact to the existing transportation system.

14. Comment

It seems likely that climate change will not only affect the physical infrastructure of the transportation system, but also the economic and social factors that underlie the system. The need for adaptive measures to address climate change is highlighted here, and the impacts of climate change on transportation systems are discussed in the context of ongoing efforts to improve air quality.

15. Response

The text has been revised to incorporate this suggestion. The word "likely" was replaced with "will." (Repeat of 144385)
Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.

Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. We have therefore deleted this sentence.
This paragraph should mention that the modeled climate impacts on ozone are quantifying the effects of...

We appreciate the suggested additional references. The underlying statement regarding variation in results across models and the associated references have been moved from the caption of the figure to the Traceable counts.

We suggest, the text has been modified to incorporate this suggestion.
We have added the suggested references to the chapter.

After consideration of this point, we have determined that the existing text is clear and accurate. The author team has deliberated and agreed that the existing text is clear and accurate. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.

The text has been modified to incorporate the suggested change.

The text has been modified to incorporate this suggestion.

The text has been modified to incorporate this suggestion.

After consideration of this point, we have determined that the existing text is clear and accurate. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.

We appreciate the suggestion, but Figure 13.1 is already complex. While it is certainly true that people spend the majority of their time indoors and there are important linkages between air pollution, the built environment, and human health, the evidence for a specific and quantifiable impact of climate change on indoor air quality is lacking. Accordingly, the author team has decided not to include a depiction of outdoor air migrating to the indoor environment.

We appreciate the suggestion, but Figure 13.1 is already complex. While it is certainly true that people spend the majority of their time indoors and there are important linkages between air pollution, the built environment, and human health, the evidence for a specific and quantifiable impact of climate change on indoor air quality is lacking. Accordingly, the author team has decided not to include a depiction of outdoor air migrating to the indoor environment.

We have added the suggested references to the chapter.

After consideration of this point, we have determined that the existing text is clear and accurate. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.

We have added the suggested references to the chapter.

The text has been modified to include the key message on ozone formation and to include the suggested references.

We have added the suggested references to the chapter.

We have added the suggested references to the chapter.
Jun Zhang 143622 Text Region 13: Air Quality 493 696 5 1 This section focuses on the impact of climate change on the particulate matter. Since there is a future projection plot in the ozone air quality section, adding a figure of projected change for PM would be more obvious and persuasive to see its future change. If any projections are currently available, we would like to see them in this chapter.

Jun Zhang 143004 Whole Chapter 13: Air Quality 493 596 5 1 This chapter is generally well-structured. It has discussed 4 different aspects of climate change impact on air quality in the United States which includes: increasing Health Risks from Air Pollution; increased impacts of Wildfires; increases in airborne allergen exposure; Air Quality Benefits of Reduced Emissions. However, these four aspects are based on local emissions and changes. The long-range transport of ozone and its precursors influences US air quality. Therefore, we believe that the next section should be focused on the long-range transport of ozone and its precursors.

Jun Zhang 143004 Whole Chapter 13: Air Quality 493 596 5 1 This chapter talks about how emissions and climate change can affect air quality impacts on health, but does not mention how other adaptation policies, e.g., air quality response plans, greater availability of air pollution information, or increased funding for outdoor recreation activities, could help to mitigate air pollution-related health risks. For consistency, we suggest revising the sentence to include an example of improvement, beside the references to supporting sources.

Jun Zhang 143004 Whole Chapter 13: Air Quality 493 596 5 1 This chapter talks about how emissions and climate change can affect air quality impacts on health, but does not mention how other adaptation policies, e.g., air quality response plans, greater availability of air pollution information, or increased funding for outdoor recreation activities, could help to mitigate air pollution-related health risks. For consistency, we suggest revising the sentence to include an example of improvement, beside the references to supporting sources.

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Michael MacCracken 144001 Text Region 13: Air Quality 494 494 4 4 It is just the risk that is increasing, or also the incidence? If that latter, this needs to be made clear.

Michael MacCracken 144002 Text Region 13: Air Quality 494 494 13 14 Does this sentence need to say something about its assumption of future vehicle emissions? If the US goes electric, emissions should go down enough that this statement would not be true. So, should there be a phrase something like: "If US vehicle emissions continue on their current path, there is high confidence ..."?

Michael MacCracken 144003 Text Region 13: Air Quality 496 496 14 14 If I suggest saying: "from 1984 to 2015".

Michael MacCracken 144004 Text Region 13: Air Quality 498 498 14 14 Likely better to say: "concentration categories".

Michael MacCracken 144005 Whole Chapter 13: Air Quality Overall a very well-done chapter. The text has been modified to incorporate this suggestion.

Kabyl Wongler 140074 Figure 14: Human Health 2 318 This is not a very compelling figure to have in the executive summary. First, it talks about hospitals, but nowhere in the text of the summary is there mention of hospitals. So why is the figure on hospitals here? Second, it is from an old source, well before NCA3 came out and of course before the USGCRP health report. This isn’t necessarily bad on it’s own but it certainly doesn’t convey that there is any new information or literature that has come out in the last five years. But of course there has been more recent literature that has come out: there was a presentation at this year’s APHA meeting looking at hospitals across the country in the flood plain. This figure also does not incorporate FEMA’s 2016 proposal to rewrite the 100 year floodplain standard. There is also, of course, all the post-Sandy literature, some of it specific to New York (https://www.ingerenzenmak.com/content/web/2013/600000325/600000311... or https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine...). There is a 2014 report on hospitals in the floodplain in Miami-Dade (with a figure) that would be more recent than this figure (https://statis01.squarespace.com/today/751961254/751961254/751961254...). And a 2017 assessment of climate impacts on hospitals in LA (https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine...).

With so much more recent literature on this topic, showing such an old figure implies that the authors did not review current literature, but just "saw what they knew". Hopefully this is not the case, but it doesn’t present well. Thirdly, this figure does not convey any sense of urgency. The figure shows that there are many many more hospitals in New York that are not in the floodplain and are totally fine. Is the author’s intent to tell us not to worry about hospitals in the floodplains? Furthermore, the few hospitals that have tiny little red dots are primarily in wealthy parts of the city, which seems to go against your key message #1: Overall, it is difficult to understand why the authors chose this, of all figures, to represent their chapter. It seems like a missed opportunity...
Delete this drawing. This is badly done, does not present any information, is not appropriate for the intended audience, and has no valid citation. The figure is not about climate change, but is trying to say something about response to weather. There are no values on the x or y axis. There is no explanation of what disease is being shown. The caption itself says this is a "stylized epidemic curve." It is inappropriate to take up so much space in this chapter with a diagram filled with jargon about public health (obscure concepts in a climate assessment are shown on the left have meaningless text in them and point (randomly?) to other boxes with meaningless text in them. How do those strange boxes "show the opportunity for disease prevention when moving from an approach of surveillance and response to prediction and prevention"? The authors do not explain the meaning of or difference between surveillance, response, prediction, or prevention. What is the meaning of -120 days (the only number in this drawing) and the poorly drawn black marks under the poorly drawn gray arrow? This entire figure could be summed up in a sentence that says "early warnings can improve response times" rather than an entire text box and made-up (stylized) image about prediction in a climate assessment. Furthermore, that simple sentence is all that needs to be conveyed in a chapter on climate impacts to health. Any more details on predictive response would be more appropriate in other publications; here it only opens up the vulnerability of confusing weather and predictions with climate and projections. The authors were buried in warning the literature, but instead this is "stealed to personal communication. This figure is in stark contrast to the well written section on adaptation on page 525 and the first half of 526, and weakens the Key Message 2. This seems to be a figure that the authors created for themseves, rather than for the consumers of the assessment. Delete entirely. There are much better figures available that represent climate impacts on health or economics. Even deleting this figure and instead using the table or pathway figure from the 2013 climate and health assessment in key message 1 section would be an improvement. Also, there are several quantitative evaluations of health related impacts in the mitigation key message (K) that represent new information since the 2016 report, so a figure or maps of those impacts would be more useful in this chapter's audience.

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The authors disagree with the premise and conclusions of this comment. The text and traceable accounts describe specifically the level of certainty in the key messages, and conclusions based on future models are not stated as physical facts but instead qualified appropriately with levels of uncertainty. The peer-reviewed studies and methods supporting this finding can be found in the chapter text and the associated traceable account for this key message. For responses to public comments made by Paul Knappenberger on the Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment, see https://www.globalchange.gov/health-assessment. The transparent process leading to this report is documented on the USGCRP website and includes numerous avenues for the public to engage. All sources were assessed to meet the guidance to authors on Information Quality. This text acknowledges that some conclusions may not align with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. In addition, the entire report has been peer reviewed by the National Academies of Sciences.

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The sentence was split as suggested. The four groups listed are particularly vulnerable, as noted throughout the chapter. Because this chapter builds on the information in the 2016 Climate and Health Assessment, the recommendations for mitigation and adaptation actions from that assessment were very briefly summarized. Readers are encouraged to read that assessment for further details.

The first sentence states that adaptation can effectively reduce the health impacts associated with climate change, and the second sentence notes the opportunities that climate change presents for adaptation in human health infrastructure planning and urban design. The presentation of adaptation and mitigation are equally important. From the perspective of health systems, it is more logical to discuss how to prepare for and manage the risks identified in Key Message 1 than to discuss mitigation, which will not affect the magnitude and pattern of risks until at least mid-century.

Suggest rewording: "In addition to avoiding exposure to climate impacts, there are other factors that increase vulnerability to climate change, such as existing patterns of air, water, food, and environments crucial to human health." Suggest rewording: "These seem like good examples, but they are unorganized. The first three all seem to be related to the verb 'identify,'" Suggest rewording: "What are the benefits of climate change? What do you mean by incorporating increased temperatures into risk modeling?" Adaptation and mitigation are equally important. From the perspective of health systems, it is more logical to discuss how to prepare for and manage the risks identified in Key Message 1 than to discuss mitigation, which will not affect the magnitude and pattern of risks until at least mid-century.

Suggest rewording: "If we're going to talk about mitigation first, as the things people/communities need to adopt to be determined by how much mitigation they do or don't take place. The third key message has many more specific, so I'm guessing there is a lot more literature that the authors assessed to come to this statement. This would further argue that the message more based in the literature come before the message where the literature is less advanced or qualitative.

Suggest rewording: "The key message was added to be more explicit. The NCA focused on the United States and the authors were not mandated to assess the global literature on adaptation. The adaptation chapter does not cover health adaptation, so removing information on health adaptation from this chapter would remove it from the report. Assessment and response systems are an important tool for reducing the translation of the health risks of climate change into impacts.

Suggest including the word "avoided" in this sentence where it talks about mental health impacts. As is, this section makes mental health impacts seem like a benefit of reducing GHDs. Suggest including "avoided" in this sentence where it talks about mental health impacts. As is, this section makes mental health impacts seem like a benefit of reducing GHDs. Avoided" added.

Suggest rewording: "It may be better to not try to list all the groups in the key message and just delete everything after the word 'specific.' It also seemed strange that this was the first sentence of the first key message (it must be important), but the underlying chapter clearly talked about vulnerable population groups beyond two paragraphs at the bottom of page 524. Half of the first paragraph just listed all the vulnerable groups and said they are vulnerable. The rest of this section (pg 524-525) is vague and nearly general statements with no clear point and no specifics. To warrant this is a key message, more specific treatment and references are needed in the chapter. It is not enough to just note that 'these groups are at risk' and 'more research would promote understanding.' Suggested citations have been provided in other comments. This seemed like a missed opportunity to discuss social inequities in a way that other chapters do not have space to do. Suggest reviewing the Coastal chapter, which had more information on social justice than this chapter.

Suggest reversing the order of the adaptation message and the mitigation messages. It would be more intuitive to talk about mitigation first, as the things people/communities need to adopt to be determined by how much mitigation they do or don't take place. The third key message has many more specific, so I'm guessing there is a lot more literature that the authors assessed to come to this statement. This would further argue that the message more based in the literature come before the message where the literature is less advanced or qualitative.

Suggest rewording: "the first sentence states that adaptation can effectively reduce the health impacts associated with climate change, and the second sentence notes the opportunities that climate change presents for adaptation in human health infrastructure planning and urban design. These sections were edited for clarity.

Suggest rewording: "In addition to avoiding exposure to climate impacts, there are other factors that increase vulnerability to climate change, such as existing patterns of air, water, food, and environments crucial to human health." Suggest rewording: "These seem like good examples, but they are unorganized. The first three all seem to be related to the verb 'identify,'" Suggest rewording: "What are the benefits of climate change? What do you mean by incorporating increased temperatures into risk modeling?" Adaptation and mitigation are equally important. From the perspective of health systems, it is more logical to discuss how to prepare for and manage the risks identified in Key Message 1 than to discuss mitigation, which will not affect the magnitude and pattern of risks until at least mid-century.
Since the 2016 report was only on the science of climate and health, the last part of this sentence starting with "...unless additional interventions..." is not actually a conclusion of the 2016 report. It is a harmless enough statement, just not one that was in the 2016 report. For instance, it is not stated in the 2016-report's executive summary.

The authors believe summarizing the findings of the 2016 Climate Health Assessment in the NCA4 is a critical priority, while also conveying new insights from more recent literature. Because of space constraints, not all new literature results can be explained fully within the text, and in some cases, the reader may have to read the original study to get a complete understanding. Where possible, the authors have revised the text, including in this section provided as an example, to provide as much detail or specific examples within space constraints.

The sentence was full of citations that were inappropriate and did not support the claims the authors made. Most did not represent updates since the 2016 Climate and Health Assessment. Furthermore, the authors use "risk" and "vulnerability" at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment had very specific definitions of these terms. This further confuses this paragraph. The citations provided (Lane, Berisha, Gronlund, Klein Rosenthal) do not demonstrate regional variation in risk, but "risk" and "vulnerability" and at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment conclusions: and periods of unusually dry months" from the title. First, it is redundant. Second, you don’t explain what it means by "unusually dry" nor how many months/how long a period is in the box text. Keep it simple for the intended audience.

The adaptation information was reviewed and relevant papers included in the chapter.

It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.

Sentence edited for accuracy.

The sentence was full of citations that were inappropriate and did not support the claims the authors made. Most did not represent updates since the 2016 Climate and Health Assessment. Furthermore, the authors use "risk" and "vulnerability" and at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment had very specific definitions of these terms. This further confuses this paragraph. The citations provided (Lane, Berisha, Gronlund, Klein Rosenthal) do not demonstrate regional variation in risk, but "risk" and "vulnerability" and at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment had very specific definitions of these terms. This further confuses this paragraph. The citations provided (Lane, Berisha, Gronlund, Klein Rosenthal) do not demonstrate regional variation in risk, but "risk" and "vulnerability" and at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment had very specific definitions of these terms. This further confuses this paragraph.
The Khan et al. 2014 reference is a study that takes place in Bangladesh, is published in 2014 and so would have been published in 2016, and therefore would have been assessed by that report. Also, this paper does not discuss climate change—it only mentions climate change once and it is cursory. There is no mention of drought in this paper. While this does talk about food and water security, it is really more of a methodological paper comparing "coping" and behavioral responses, so an odd choice for a citation here. It is also an anthropological essay, not a research article. Delete.

Greater' changed to 'increased'

Sentence deleted.

Sentence deleted.

Reference deleted.

Reference deleted.

Reference deleted.

Reference deleted.

Sentence deleted.

Sentence deleted.

Sentence deleted.

Sentence deleted.

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Sentence deleted.

The section on waterborne disease, which apparently this comment refers to, was revised, references checked, and references from outside the US and other OECD countries removed. The reviewer is correct on the very limited research on waterborne disease in the United States. Though the Eze et al. 2014 reference is relevant, it does take place in Scotland and it was published in 2014, so it is not "additional research" since the 2016 report. With all the other citations for this sentence, this may not be needed.

The Manciocco 2015 reference is a good example of a study that looks at climate impacts on marine aquatic species, and potential subsequent impacts on human health. But it does not discuss extreme precipitation or flooding, impacts on seawar or water infrastructure, or human pathogens, viral or bacteria contamination. Thus, it is not an appropriate reference for this sentence. Move this reference to an appropriate place or delete.

Reference deleted.

Reference deleted.

Reference deleted.

Reference deleted.
The text was extensively edited to shorten and clarify the content.

There is a list of information to cover in this section, but it is few pages long in a chapter meant to be six pages total. The adaptation sections is 5 pages long. It seems that each of these three findings need to be closed to 2 pages space to 6 pages total (assuming there will be no regional roundups), and so requires some difficult cutting. The text under this Key Message #1 is very redundant - both in the 2016 report and itself. Much of the information was presented as "new" since the 2016 report was not, in fact, new but just another restatement of the points found in the 2016 report. Many of the "recent research shows..." statements were using data that were published before the 2016 report, and did not in fact show that some new piece of scientific knowledge had been achieved. Yet, there are many new papers that have been published since 2016 that the authors unfortunately did not find or see. See suggested examples of sources in previous comments.

There are a few options for shortening this section, though I make each would be painful. First, the author could remove all the information that was in the 2016 report and only report actual new findings since that publication- only updates, or where the science has advanced. In this option, rather than making general statements about climate change impacting, say, water or vectorborne disease, there would be room to present specific findings from the author's literature review. Another option would be to create a large figure with the 2016 information. One example may be the table at the beginning of the 2016 report with findings from each chapter. An additional column could be added to note recent research or updates. This could confound some, but it would at least serve as a quick reference guide to the findings of the 2016 report. Or, a table could be created with the link to the appropriate chapter in the 2016 report and only information about new science displayed. Another option for shortening, one that may have to be taken even if one of the earlier options is employed, is to delete one of the text boxes. Both boxes are well-written and helpful, but there just doesn't seem to be room. Another option would be to drastically shorten or cut the adaptation section. There is already an adaptation chapter, so much of that information could be placed there, if it is not there already. Regardless, the Key Message #2 section would need to be shortened by nearly half anyway. That section could be cut to any comprehensive 3-page text box that discusses impacts, adaptation, and social inequities, leaving more room for the text boxes under Key Message #1. The portions of Key Message #2 section that don't have to be cut to only a comprehensive 1-page text box that discusses impacts, adaptation, and social inequities would be beneficial. But in the meantime, it would help readers if the authors of this chapter told us the findings of the citations in lines 33 through line 4 on page 525. What are the new findings? Are some other populations more vulnerable or less vulnerable than we previously thought? Are any other populations identified? Were new characteristics of certain populations recently identified as the source of the vulnerability? Explain how the science on this subject has advanced rather than just repeating the fact that these groups are vulnerable.

The chapter was extensively edited to shorten and clarify the content.
Comment

Struggling suggests dropping this text box (14.3) and accompanying drawing. This seems like a perfect test box for public health documentation. This section provides a very relevant and not climate-related climate assessment. Early warning and response systems are in place to communicate with the public. The authors are adding to the public’s awareness of climate change and are implementing appropriate measures. This topic is an adaptation measure, but this is already captured in the text. Also, the text seems to be somewhat repetitive. Overall, there seems to be a causal chain that has been skipped here. Sentence removed.

Sentence replaced with another example showing how hospitals have faced issues related to climate change during hurricanes.

The sentence "Healthcare facilities... additional climate change is vague and redundant." The text in this paragraph is strong enough without it.

The sentence "Healthcare facilities... affected by climate change is vague and redundant." The text in this paragraph is strong enough without it.

The sentence "Healthcare facilities... affected by climate change is vague and redundant." The text in this paragraph is strong enough without it.

Reference to the climate resilience toolkit removed. Additional information, to the extent it was available, was summarized and included. The suggested references were not included because they are about old data.

Sentence edited for accuracy and clarity.

The section has been revised in a way that reflects input from the commenter.

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The text on hospitals under key message 2 was reduced and the text on healthcare in key messages 2 and 3 were combined.

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<td>14. Human Health</td>
<td>142</td>
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<td>Note: This is the title of the chapter, not the page number.</td>
<td>Figure deleted.</td>
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<td>Note: This is the title of the chapter, not the page number.</td>
<td>The paragraph was deleted.</td>
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<td>Note: This is the title of the chapter, not the page number.</td>
<td>The chapter is an update from the 2016 Climate and Health Assessment, which included this paper.</td>
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<tr>
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<td>25</td>
<td>23</td>
<td>25</td>
<td>Note: This is the title of the chapter, not the page number.</td>
<td>The text was revised to include tribal communities as a vulnerable population.</td>
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Please provide an example of a new strategy for working with children and adolescents in all phases of a disaster. Here and then referring the reader to Chapter 13 would be appropriate. Otherwise, someone reading this section will have trouble understanding the context of the discussion.

Figure 14.2 shows hospitals in the 100-year and 500-year floodplains in NYC not just the 100-year floodplain. And figure and replaced with another focusing on potential inundation following hurricanes of varying strengths.

The beginning of the chapter refers the reader to the air quality chapter. The section edited to refer to lower and higher emission scenarios.

References to the RCPs should be made more clear by describing them as emissions scenarios, since many people are not familiar with the specific of the RCPs. We suggest revising to “RCP 4.5 (low emissions) compared to RCP 8.5 (high emissions).”

In light of the above, you might consider stating directly that heavy rainfall, flooding and high temperatures have been linked to increases in enteric disease. Alternatively, you could add the citations described above, to support the biological plausibility of the above climate-diarrhea associations.

In the extreme temperatures section, please provide text linking to the air quality chapter, which discusses how high temperatures can exacerbate poor air quality and also increase responses to poor air quality.

References reviewed and content added.

This chapter needs to be more explicitly linked to the air quality chapter. Changes in air quality resulting from climate change are one of the larger contributors to health impacts from climate change. Acknowledging here and the referring the reader to Chapter 13 would be appropriate. Otherwise, someone reading this chapter but not the air quality chapter might miss the point that air quality changes are a driver for climate health impacts. The existing sentence does not even acknowledge air quality impacts on health. The first real specific mention of air quality impacts is on page 520, and there it redacts to Chapter 13 without giving any sense of the magnitude of the health impact relative to other health impacts of climate change.

References to Vázquez-Fríguez 2017 was included in the section on vector-borne diseases.

There are many factors at play. Collectively we have only just touched the tip of the iceberg on this issue when it comes to our most vulnerable populations. There are many factors at play.

Sentence edited. Reference to Vázquez-Fríguez 2017 was included in the section on vector-borne diseases.

Sentence edited for clarity.

Sentence added.

Air pollution is not mentioned as a health threat in this paragraph. We suggest revising to “… quality and safety improves, and water…” to capture this important environmental risk factor.

In light of the above, you might consider stating directly that heavy rainfall, flooding and high temperatures have been linked to increases in enteric disease. Alternatively, you could add the citations described above, to support the biological plausibility of the above climate-diarrhea associations.

The acronym “PWMs” is used in the figure legend, but the acronym is not referenced in the figure caption. The acronym “PWMs” is used in the figure legend, but the acronym is not referenced in the figure caption.

Air pollution is an important health threat and is covered in a separate chapter.

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Sentence edited for clarity.

In the extreme temperatures section, please provide text linking to the air quality chapter, which discusses how high temperatures can exacerbate poor air quality and also increase responses to poor air quality.  References to the RCPs should be made more clear by describing them as emissions scenarios, since many people are not familiar with the specific of the RCPs. We suggest revising to “RCP 4.5 (low emissions) compared to RCP 8.5 (high emissions).”

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In light of the above, you might consider stating directly that heavy rainfall, flooding and high temperatures have been linked to increases in enteric disease. Alternatively, you could add the citations described above, to support the biological plausibility of the above climate-diarrhea associations.
14. Human Health

This sentence is good, but could be interpreted as something new—some new finding that was just discovered in... 

The phrase "indicating sensitivity to weather patterns" is very odd. How does sea level rise fit into this? 

of scope. See other chapters for examples.

This traceable account section does not describe the methods used to select authors, nor the decisions made... 

What does "health authors" mean? 

from lines 12-14 up here. But in the section for Key Message #1, older references seems less appropriate for this chapter that were not in the other report (e.g. adaptation, economics). I would suggest moving that point... 

It would also help to define what is meant by "co-benefits associated with reducing... 

This sentence could be worded more clearly. Perhaps "Because some health impacts are difficult to... 

Including the aspect of multiple time scales in this sentence is slightly confusing. It would be helpful to add a... 

The economic benefits of greenhouse gas emissions to the health sector could be on the order of hundreds of billions of dollars annually by the end of the century." A word is missing. The text should be: "The economic benefits of greenhouse gas emissions (reductions) to the health sector..." 

It is very difficult to be explicit given the thousands of health departments across the nation. Vulnerability and adaptation assessments provide the information needed to look at local to state-levels to determine resources required and extent to which health burdens could be reduced by specific adaptation options. 

A word is missing. The text for this line is the following: "The economic benefits of greenhouse gas emissions to the health sector could be on the order of hundreds of billions of dollars annually by the end of the century." A word is missing. The text should be: "The economic benefits of greenhouse gas emissions (reductions) to the health sector..." 

Reference to the air quality chapter added.

Comment added to clarify we interacted with authors in other chapters of the NCA4.

Sentence added for clarity.

Reference added to clarify we interacted with authors in other chapters of the NCA4.

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Reference added to clarify we interacted with authors in other chapters of the NCA4.
The intention of this paragraph is very good, but I did find the part about "creating uncertainty in the magnitude and pattern of projected risks" awkward. First, it makes it sound like uncertainty will increase in the coming decades, when it should decrease with further research. Second, non-climate factors don’t create uncertainty in the uncertainty is already there. And lastly, it was unclear what risks were being discussed. In the last sentence I suggest "Certainty will be higher". The use of the words "will be" imply that uncertainty will decrease in the future, but the reader is left wondering why? Why isn’t uncertainty lower in near-term projections right now? Do the authors mean "Certainty is higher in near-term projections?"...
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<tr>
<td>Sam</td>
<td>Shariff</td>
<td>143772</td>
<td>Whole Chapter</td>
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<td>Whitecap</td>
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All suggested references were included except for the reference from Ziegler that does not add any additional or new information.
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144396</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>Please review and consider citing, if appropriate in either this chapter (section on extremes), or the air quality chapter: these 2016- and newer sources on climate change, health, and health-related outcomes</td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>The health risks of air quality are assessed in Chapter 13.</td>
</tr>
<tr>
<td>Mitch</td>
<td>Knoor</td>
<td>144392</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>Please review and consider citing, if appropriate, these 2016- and newer sources on climate change, hurricanes, and health (mostly mental/behavioral):</td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>Review of the suggested citation indicated it was not appropriate for inclusion in the chapter.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144396</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>Please review and consider citing, if appropriate, these 2016- and newer sources on climate change, extreme weather events, and health:</td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>We reviewed the suggested publications and incorporated the most relevant.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144397</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>Though there may only be a few papers on this topic currently, it would represent a significant advancement if this chapter could talk about overlapping health impacts, or impacts of multiple stressors at the same time. The 2016 report did not do much of that. At best, this could be mentioned as a source of uncertainty in the traceable account for key message 3.</td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>Overlapping health risks is now mentioned in the Traceable Account.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144398</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>This chapter on human health deals largely with the impacts from water and water-related health risks. However, it should also look more closely at the impacts from air quality. Although Chapter 12 deals with air quality, which also could be reinforced with the addition of the impacts on indoor air, this chapter should add that combustion is a major health risk and levels from combustion products can become more concentrated due to occupants’ actions in response to climate change impacts/extreme weather events. For example, a power outage could result in the use of portable generators that burn fossil fuels, emitting carbon monoxide which will further compromise the indoor air quality of that indoor environment.</td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>This chapter includes the health risks of climate change from a wide range of health outcomes, except those covered in Chapter 13. Please refer to Chapter 13 for issues related to air quality.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144399</td>
<td>Whole Chapter</td>
<td>16: Human Health</td>
<td>The recently updated report, Death by Degrees: The Health Crisis of Climate Change in Maine, by Physicians for Social Responsibility (PSR) provides a number of local impacts of climate change on human health and the environment which may be of interest to the Reader: <a href="http://www.psr.org/chapters/maine/resources/death-by-degrees.html">http://www.psr.org/chapters/maine/resources/death-by-degrees.html</a></td>
<td>14. Human Health</td>
<td>886046</td>
<td>15.1</td>
<td>15.1</td>
<td>The chapter focuses on peer-reviewed publications.</td>
</tr>
</tbody>
</table>
Barrett Elizaveta

Michael 144400 Whole Page 14. Human Health

Julie Walsmaaro 144755 Whole Page 14. Human Health

Rebecca Lauren 144756 Whole Page 14. Human Health

Michael 144400 Whole Page 14. Human Health

Lake Walsmaaro 144755 Whole Page 14. Human Health

Michael 144400 Whole Page 14. Human Health

Response

The first sentence in this key message states “Tribal, community, public health departments, healthcare facilities, organizations, and others are taking action to reduce health vulnerability to current climate change and extreme weather to the risks projected in coming decades” to make clear that adaptation is needed from individuals to infrastructure. The information on infrastructure adaptation was moved to a new text box on the front page.

The text box provides a high level assessment, focused on the health risks of climate change. A detailed discussion along the lines suggested is beyond the purvue of this chapter.

We have made this suggested edit.

We have made this suggested edit.

We have made this suggested edit.

We have made this suggested edit.

We have made this suggested edit.

We have made this suggested edit.

We have made this suggested edit.

The text has been edited to incorporate the commenter’s perspective, and the citation suggested by the commenter has been included in the section’s discussion of slow-onset disasters.

The text has been edited to incorporate the commenter’s perspective, and the citation suggested by the commenter has been included in the section’s discussion of slow-onset disasters.

We have made this correction.

We have made this suggested edit.
Allissa Barrett Retropol 140015 Text Region 15: Tribal and Indigenous Communities 561 561 7 7 Suggest adding an additional study on climate resilience. Winder, L. S. 2014. Revisiting the threat of climate change by Indigenous peoples: a review of literature, 2008–2014. Ambio 43 (1): 163–172. doi:10.1007/s13280-014-0418-x. Other studies have indicated that Indigenous peoples are more resilient to climate change than non-Indigenous peoples. However, more research is needed to understand how Indigenous peoples are adapting to climate change and how these adaptations are affecting their health and well-being.


David Wojick Retropol 141017 Text Region 15: Tribal and Indigenous Communities 552 552 3 7 This is the present text: Indigenous communities will be, perhaps more importantly, affected by concurrent sea level rise and eroding shorelines due to lack of storm protection as a result of decreased ice pack. This contradicts other potential benefits from increased sea ice and lead to larger adaptation requirements such as relocation. See references: “The impact of climate change on Arctic communities in the US: displacement, relocation, and human rights” [Ibid.], and “Impacts of climate change on Arctic communities in the US: displacement, relocation, and human rights” [Ibid.]. Sentence should read “This entire message falls within speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.”

Allissa Luttrell Retropol 141051 Text Region 15: Tribal and Indigenous Communities 548 548 18 18 In this section, the term "impacted" should be more clearly defined. "Impacted" by itself does not adequately point to the disproportionate impacts of climate change on Indigenous peoples as compared to non-Indigenous peoples. We have made this suggested edit.

Allissa Luttrell Retropol 141052 Text Region 15: Tribal and Indigenous Communities 548 548 22 22 The text has been edited for clarity and to add additional detail to explain how degraded water quality can affect mental health through impacts on sacred water sources and subsistence practices. The text has been edited for clarity and to add additional detail to explain how degraded water quality can affect mental health through impacts on sacred water sources and subsistence practices.

Allissa Luttrell Retropol 141054 Text Region 15: Tribal and Indigenous Communities 548 548 28 28 Add "and associated socioeconomic effects after "historical trauma" to more fully address the social and economic effects of loss of homeland and traditional ways of life. We have not made this suggested edit because the focus of this sentence is on how mental health impacts of climate change occur on top of existing historical trauma. The reference here to historical trauma in the context of colonialism and not specifically economic effects.

Allissa Luttrell Retropol 141055 Text Region 15: Tribal and Indigenous Communities 530 530 6 6 If this paragraph intentionally repeated unattributed from page 548? Page 548 in the Public Review Draft and the Executive Summary for Chapter 15. The text has been extensively revised since the time of this review; however, the format of the Executive Summary for all the NCAs is intentionally to use in parallel some text and graphics from the underlying chapter in order to summarize the key messages. This chapter that text begins on page 550 of the Public Review Draft.

Allissa Luttrell Retropol 141056 Text Region 15: Tribal and Indigenous Communities 530 530 8 8 Include "and non-federally recognized tribes" in this sentence. We have made edits based on this suggestion.

Allissa Luttrell Retropol 141057 Text Region 15: Tribal and Indigenous Communities 531 531 20 20 Use the word "strongest" in "strongest concentration" indicates a value judgment, replace with "highest concentration." We have made this suggested edit and have also moved the sentence to the capture of Figure 15.1 to clarify the statement is based on a review of the projects identified in the database for Figure 15.1. This citation has been added under the Key Message 3 and Traceable Accounts sections.

Allissa Luttrell Retropol 141058 Text Region 15: Tribal and Indigenous Communities 532 532 20 20 Change “The climate impacts on ... of climate change impacts.” The sentence as it currently reads addresses climate impacts but is referring to climate change impacts. Authors responded to this comment and modified the sentence heavily so the text is now described as “climate change trajectories.” We note that throughout NCAs, "climate impacts" is a shorthand phrase used interchangeability with "impacts of climate change.

Allissa Luttrell Retropol 141099 Text Region 15: Tribal and Indigenous Communities 533 533 20 20 Although declaring sea ice may increase access to coastal flora fauna resources, many of these communities will be, perhaps more importantly, affected by concurrent sea level rise and eroding shorelines due to lack of storm protection as a result of decreased ice pack. This contradicts other potential benefits from increased sea ice and lead to larger adaptation requirements such as relocation. See references: “The impact of climate change on Arctic communities in the US: displacement, relocation, and human rights” [Ibid.], and “Impacts of climate change on Arctic communities in the US: displacement, relocation, and human rights” [Ibid.]. Although declaring sea ice may increase access to coastal flora fauna resources, many of these communities will be, perhaps more importantly, affected by concurrent sea level rise and eroding shorelines due to lack of storm protection as a result of decreased ice pack. This contradicts other potential benefits from increased sea ice and lead to larger adaptation requirements such as relocation. See references: “The impact of climate change on Arctic communities in the US: displacement, relocation, and human rights” [Ibid.].

Allissa Luttrell Retropol 141060 Text Region 15: Tribal and Indigenous Communities 536 536 8 10 Please elaborate on the mental health impacts due to degraded water quality. After consideration, the author team determined that the text references are appropriate and adequate. The suggested study is about Indigenous resilience but not in the context of climate change, so the author team does not have a basis to extrapolate any of its findings to a climate change context.

Allissa Luttrell Retropol 141061 Text Region 15: Tribal and Indigenous Communities 537 537 17 17 This section could benefit from the inclusion of the concept of Traditional Ecological Knowledge (TEK) in order for readers to draw connections to other adaptation options utilizing TEK and identified by that name. After lengthy deliberation and investigation as well as consultation with the authors of the NCAs, the chapter determined that the section pertaining to opportunities be omitted from the chapter. This comment thus no longer applies.
The sentence reads as if the Indigenous people themselves are limited by size and rural context, added the word “lands” or “homelands” or “reservations” or “territories” after Indigenous peoples to accurately describe what is being limited by size and rural context.

We have changed this sentence to incorporate the commenter’s perspective by identifying low population and rural contexts of Indigenous communities rather than as a key component to negative scoring.

The article describes Indigenous health indicators that illustrate Indigenous health is affected by impacts to the environment, cultural relevance, sovereignty, and self-determination and well-being. A way that could strengthen an understanding of climate impacts on mental and physical health.

We have included the citation, related citations, and new text describing how Indigenous definitions of health are more holistic and encompassing of non-physiological health factors such as natural resources security, cultural use, community connection and self-determination.

The sentence reads as if the Indigenous people themselves are limited by size and rural context; add the word “lands” or “homelands” or “reservations” or “territories” after Indigenous peoples to accurately describe what is being limited by size and rural context.

We have changed this sentence to incorporate the commenter’s perspective by identifying low population and rural contexts of Indigenous communities rather than as a key component to negative scoring.

The sentence reads as if the Indigenous people themselves are limited by size and rural context, added the word “lands” or “homelands” or “reservations” or “territories” after Indigenous peoples to accurately describe what is being limited by size and rural context.

We have changed this sentence to incorporate the commenter’s perspective by identifying low population and rural contexts of Indigenous communities rather than as a key component to negative scoring.

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The sentence reads as if the Indigenous people themselves are limited by size and rural context, added the word “lands” or “homelands” or “reservations” or “territories” after Indigenous peoples to accurately describe what is being limited by size and rural context.

We have changed this sentence to incorporate the commenter’s perspective by identifying low population and rural contexts of Indigenous communities rather than as a key component to negative scoring.
The Executive Summary has been heavily edited and no longer contains this language.

We have made edits based on this suggestion.

We have added new text and citations regarding adaptation barriers for tribes that lack federal recognition, and have further explained key differences between federally recognized and non-federally recognized tribes in multiple sections of the chapter (formally the State of the Sector, Key Message 3 and Key Message 4), including those related to federal trust responsibility and authority/access to traditional territory and resources. We have added new text under Key Message 1 that discusses energy infrastructure and economic development that makes reference to current examples of tribes’ climate mitigation efforts, in Key Messages 1.2, 1.3 and 2. We have added more cross-references to other regional chapters of NCA4 and new examples of current tribal adaptation efforts.

After consideration of this point, we have determined that the existing text is appropriate because cultural practices are included throughout this section as they relate directly to economics and livelihoods. Cultural practices are also included in other sections of the chapter.

We have made edits based on this suggestion. The State of the Sector now includes new text on the federal trust responsibility.

Edits have been made based on this suggestion.

Edits have been made based on this suggestion.
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<th>Chapter</th>
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<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
<th>Response</th>
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<tbody>
<tr>
<td>Casey</td>
<td>Thornburgh</td>
<td>14.695</td>
<td>Test Region</td>
<td>15: Triba l and Indigenous Communities</td>
<td>552</td>
<td>32</td>
<td>11</td>
<td>12</td>
<td>Revisit the sentence, &quot;Approximately 1.14 million (22%) of federally recognized Amerindian and Alaska Native peoples live on or near reservation lands. &quot; The sentence referenced by the reviewer has been extensively edited, so that &quot;waterways&quot; is no longer appropriate to add the sentence. Authors decided not to add &quot;Aquaculture&quot; to this sentence because there is no evidence of this to support the statement.</td>
<td>The text has been edited to incorporate this suggestion.</td>
<td></td>
</tr>
<tr>
<td>Casey</td>
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<td>Test Region</td>
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<td>552</td>
<td>30</td>
<td>33</td>
<td>33</td>
<td>Insert &quot;fluvial/aquatic/hydric&quot; and &quot;infill/river/watershed&quot;. The sentence in question has been extensively edited, so that &quot;waterways&quot; is no longer appropriate to add the sentence. Authors decided not to add &quot;Aquaculture&quot; to this sentence because there is no evidence of this to support the statement.</td>
<td>The text has been edited to incorporate this suggestion.</td>
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<td>553</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>Additional explanatory text in the sentence that ends with, &quot;Some are part of indigenous economies, &quot;</td>
<td>The sentence in question has been edited and we have capitalized Indigenous in the revised sentence.</td>
<td></td>
</tr>
<tr>
<td>Casey</td>
<td>Thornburgh</td>
<td>14.698</td>
<td>Test Region</td>
<td>15: Triba l and Indigenous Communities</td>
<td>553</td>
<td>23</td>
<td>28</td>
<td>28</td>
<td>Some limitations are needed for the sentence, &quot;SAAI-recognized barrier to adaptation planning that has significant implications for tribal economies is the capacity of federally recognized tribes to implement water rights. &quot; The sentence in question has been extensively edited, so that &quot;waterways&quot; is no longer appropriate to add the sentence. Authors decided not to add &quot;Aquaculture&quot; to this sentence because there is no evidence of this to support the statement.</td>
<td>The text has been edited to incorporate this suggestion.</td>
<td></td>
</tr>
<tr>
<td>Casey</td>
<td>Thornburgh</td>
<td>14.699</td>
<td>Test Region</td>
<td>15: Triba l and Indigenous Communities</td>
<td>556</td>
<td>19</td>
<td>26</td>
<td>26</td>
<td>For Key Message 4, &quot;TheSAAI-recognized barrier to adaptation planning that has significant implications for tribal economies is the capacity of federally recognized tribes to implement water rights. &quot; The sentence in question has been extensively edited, so that &quot;waterways&quot; is no longer appropriate to add the sentence. Authors decided not to add &quot;Aquaculture&quot; to this sentence because there is no evidence of this to support the statement.</td>
<td>The text has been edited to incorporate this suggestion.</td>
<td></td>
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<tr>
<td>Joel</td>
<td>Socci</td>
<td>16.606</td>
<td>Whole Page</td>
<td>15: Triba l and Indigenous Communities</td>
<td>554</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>The sentence in question has been extensively edited, so that &quot;waterways&quot; is no longer appropriate to add the sentence. Authors decided not to add &quot;Aquaculture&quot; to this sentence because there is no evidence of this to support the statement.</td>
<td>The text has been edited to incorporate this suggestion.</td>
<td></td>
</tr>
<tr>
<td>Todd</td>
<td>Murphy</td>
<td>14.604</td>
<td>Test Region</td>
<td>15: Triba l and Indigenous Communities</td>
<td>550</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>The entire paragraph has already been word-for-word used on page 488, lines 18-22. It is suggested that the whole section be scrapped and begin with a different opening paragraph.</td>
<td>The text has been extensively revised since this time of the review; however, the format of the Executive Summary for the SCA chapters is to intentionally use verbatim same text and graphics from the underlying chapter in order to summarize the key messages in this chapter.</td>
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<tr>
<td>First Name</td>
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<td>Comment ID</td>
<td>Comment Type</td>
<td>Chapter</td>
<td>Figure/Table Number</td>
<td>Start Line</td>
<td>Start Page</td>
<td>End Line</td>
<td>End Page</td>
<td>Comment</td>
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<tr>
<td>Brendan</td>
<td>Murphy</td>
<td>143405</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>315 551 8 9</td>
<td>This figure, 15.1, and its legend are both already used on page 549, lines 3-10. It is recommended that the one on page 549 is omitted, mainly due to the fact that the following paragraph on page 551 is about the figure itself. Additionally, it may appear better when placed after the paragraph on page 551, lines 10-20. This would alleviate the initial confusion by readers regarding why this figure and legend are where it is (versus after, where the reader gains insight and then the opportunity to both observe the map as well as follow the links).</td>
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<tr>
<td>Amber</td>
<td>Ziegler</td>
<td>143837</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>153 553 7 11</td>
<td>The block of text about the possible benefits of climate change against Indigenous people does nothing to further the argument being made in the Key Section 15.1. It is understood that not every change would be bad in the wake of climate change, but to mention it here seems to cast out any argument being made. Suggestions would be to either: Omit the text. - Take time to mention that these benefits come nowhere close to outweighing the detrimental effects that climate change comes with. Overall, though, the most highly recommended action would be to simply omit this section.</td>
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<tr>
<td>Julie</td>
<td>Maldonado</td>
<td>143633</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>148 548 24 31</td>
<td>In addition to physical and mental health, could also include impacts on spiritual health and well-being.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Julie</td>
<td>Maldonado</td>
<td>144042</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>150 550 7 8</td>
<td>In this sentence, could add: including, but not limited to: federally recognized tribes; to self-acknowledge the many non-federally recognized Indigenous peoples and tribes that also practice cultural self-determination, not decided by the US government alone.</td>
<td></td>
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<tr>
<td>Julie</td>
<td>Maldonado</td>
<td>144054</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>154 554 10 18</td>
<td>We had an existing discussion of social and cultural identity that was meant to include spiritual practices, but we have edited the text as suggested by the commenter to more explicitly identify spiritual health, spiritual practices, and spiritual identity. We have also added new references and included tangible cultural heritage under Key Message 2, which could also encompass spirituality. We have not included specific terminology about emotional/health because we believe it to be encompassed by the broad term “mental health.” In terms of health impacts experienced at different levels, while we cannot discuss these issues comprehensively given space constraints, we have included new text and associated citations about Indigenous values-based understandings of health, which include “communitarianism.”</td>
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<tr>
<td>Julie</td>
<td>Maldonado</td>
<td>144060</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>156 556 16 19</td>
<td>For the short title of key message 4, a more accurate depiction of what tribes in the US that are forced into the difficult decision of relocation, could be: “Adaptation, Disaster Management, and Community-led Relocation.” The language of “managed retreat” is a physical/geographically-focused militarized vision that disemboweled the social and cultural losses at risk in relocation. Relocation is more than just managing the physical movement of people and material structures; it also includes maintaining important social, cultural, and livelihood practices, which enable a community to survive and thrive.</td>
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<tr>
<td>Julie</td>
<td>Maldonado</td>
<td>144062</td>
<td>Text Region</td>
<td>15. Tribal and Indigenous Communities</td>
<td>159 559 2 2</td>
<td>Perhaps more accurate to say in nearly every “coastal region” of the United States. We have changed the wording to be more precise, acknowledging both coastal and inland flooding, and permafrost thawing, as contributors to conditions that force Indigenous communities to consider relocation. There are a range of current climate change impact scenarios that are forcing tribes to relocate that aren’t specifically related to “coastal” changes. Relocation examples include Isle de Jean Charles, which is located in Chandeleur Islands of Southern Louisiana. The island is at risk due to coastal changes as well as divorce of Mississippi river sediments, the loss of which is causing land subsidence. Other tribes in Alaska are considering or planning relocation in response to inland flooding, and permafrost thaw. We added citation that documents some of these.</td>
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</table>
After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities and discussion of vessel traffic be omitted from the chapter. This comment thus no longer applies.

The text has been extensively edited in key Message 2 and we have no reference "infrastructure." We now include specific text and a reference for damages to cultural heritage sites. “Sites” is also included now in the Key Message 2 itself at the beginning of the section.

After consideration, the author team determined that both the original modifying term “non-Indigenous” or “Native” was applied to the interactive figure at: https://biamaps.doi.gov/reportview/, which is designed to include specific text and a reference for damages to cultural heritage sites. “Sites” is also included now in the Key Message 2 itself at the beginning of the section.

The authors recognized and appreciate the extensive thought and suggestions of this comment. We have added text and a citation (UNESCO 2018) to bring in the specific terminology of “intangible cultural heritage," and note that the chapter already contained discussion of this concept related to passing down or sharing traditional knowledge to sustain place-based cultural identity, which is foundational for Indigenous physical and mental health.

After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities and discussion of vessel traffic be omitted from the chapter. This comment thus no longer applies.

After consideration, the author team determined that both the original modifying term “non-Indigenous” or “Native” was applied to the interactive figure at: https://biamaps.doi.gov/reportview/, which is designed to include specific text and a reference for damages to cultural heritage sites. “Sites” is also included now in the Key Message 2 itself at the beginning of the section.

Response

The authors disagreed with the statement that these enterprises are irrelevant, because the scope of this chapter is broader than just Alaska. Different subsistence and commercial enterprises are important in different locations. However, “hunting” was added to the list of enterprises throughout Key Message 1.

After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities and discussion of vessel traffic be omitted from the chapter. This comment thus no longer applies.

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The Executive Summary has been heavily edited and no longer contains this exact language from the Public Review Draft. However, the text supporting Key Message 5 has been incorporated to the commenter's perspective on how historical adaptation strategies associated with being highly mobile are largely no longer available to tribes.

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Tribal and Indigenous Communities

The text in Key Message 3 has been edited to incorporate the commenter's perspective on how historical adaptation strategies associated with being highly mobile are largely no longer available to tribes.

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- No need for addressing a new market for the U.S. to enter because they were providing humanitarian aid.

- This section lacks new implementation plans for the response of increased humanitarian aid that will be the resettlement is of a community and not a Tribe. This language should be amended to show the changes in

Regarding the references to the Isle de Jean Charles Resettlement, the State has clearly and publicly stated that—are significant challenges. The author team notes that the text was developed collaboratively and with consensus of all contributing authors, and has added more background description of our chapter development process to the Traceable Account section to clarify the process for readers. The BIA is the administrative lead for the chapter because the National Climate Assessment is a federal report mandated by Congress. The author team disagrees that there were not significant outreach or opportunities for input from Indigenous peoples themselves. Throughout 2016-2018, the Chapter Authors worked with tribal partners to identify and develop content for this chapter. In particular, the BIA worked with the College of Micronesian Nation and Sakhal Island Native to develop and execute an outreach plan for the Chapter. This included wording mini-grants for community meetings in the fall of 2016, attending and presenting at tribally-focused meetings such as Native American Fish and Wildlife Society, National Adaptation Forum (2017), Rising Voices 2016 and 2017, and the BIA Providers Conference in Alaska (November 2017), among many others. Additionally, through these tribal partners, BIA provided travel scholarships to Regional Engagement Workshops (28 requested and provided in early 2017) for interested tribal partners to attend and comment on regional climate concerns and issues. The chapter team also published USGCRP’s formal requests for public comment and participated in public webinars hosted by USGCRP for the purpose of soliciting input from Indigenous peoples. The authors also held or participated in conference calls with regional organizations such as the Northwest Tribal Climate Network. The formal open calls for public comment were published through multiple channels including multiple webinars, website notices on the BIA Tribal Resilience page, and email notices through BIA, EPA, university, and partner email lists. In addition, BIA solicited comments on completeness of the interactive map in Figure 5.1 from multiple tribal partners. Regarding text about Indigenous peoples of Alaska and the island nations, the author team disagrees that the chapter does not address this. Key Message 1 discussed subsistence and commercial activities in Alaska and Key Message 3 provided an Indigenous knowledge example from Alaska and discussed community-led inhalation in Alaska with cross-references to information from the Pacific Islands and the Caribbean regions have been included, and an example from the Marshall Islands has been added to Key Message 2. The author team has made edits throughout the chapter to further clarify and expand on these discussions where possible given space constraints and support from the peer-reviewed literature.

This chapter was very insightful on the impacts climate change has on indigenous populations. Learning about the hardships these populations face in terms of climate impacts is an interesting experience because research on these populations specifically is not as common.

I’m rather ensnared with the chapter (in the Traceable Account section) apparently did not have a significant outreach to the Indigenous Peoples themselves. Back for the first National Assessment, BIA would have nothing to do with it as tribal representatives would not have trusted BIA to be leading the effort to describe their situation--part of the trauma that still exists among some, at least. That this chapter seems mainly to have come from the Federal perspective seems a potentially significant shortcoming to me. I would also note that the main part of the chapter seemed to be largely nothing about the Indigenous Peoples of Alaska and the Island nations, etc.

This section is not intended to discuss new or potential plans, or proposals for new actions. According to the UN,

To the extent that the chapter (in the Traceable Account section) apparently did not have a significant outreach to the Indigenous Peoples themselves. Back for the first National Assessment, BIA would have nothing to do with it as tribal representatives would not have trusted BIA to be leading the effort to describe their situation—part of the trauma that still exists among some, at least. That this chapter seems mainly to have come from the Federal perspective seems a potentially significant shortcoming to me. I would also note that the main part of the chapter seemed to be largely nothing about the Indigenous Peoples of Alaska and the Island nations, etc.

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This section is not intended to discuss new or potential plans, or proposals for new actions. According to the UN,
<table>
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<th>Page</th>
<th>Comment</th>
<th>Response</th>
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<tr>
<td>David</td>
<td>Susanne</td>
<td>140053</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>182</td>
<td>223</td>
<td>12</td>
<td>24</td>
<td>590</td>
<td>This proposal for military intervention, as defined in the National Security Act, is aggressive language. We have revised the language. The word &quot;intervention&quot; has multiple meanings and can be selected intentionally.</td>
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<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141178</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>141</td>
<td>160</td>
<td>17</td>
<td>24</td>
<td>585</td>
<td>Basic economic discussion that the proposal cost is &quot;affordable&quot; businesses abroad, not necessarily U.S. and, if anything, U.S. citizens are more likely to affect them.</td>
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<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141179</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>141</td>
<td>145</td>
<td>17</td>
<td>19</td>
<td>585</td>
<td>The absence of a discussion of the potential for climate change to impact the Syrian conflict is noted here. This literature does exist and is pertinent, it is not mentioned here.</td>
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<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141180</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>141</td>
<td>145</td>
<td>17</td>
<td>24</td>
<td>585</td>
<td>The concept of climate migration advocacy and its prospects, as described by Bertell, has something to add that would be useful here.</td>
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<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141181</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>141</td>
<td>139</td>
<td>24</td>
<td>29</td>
<td>585</td>
<td>The discussion of the Syrian conflict was left out in the main text here, but it is one-sided and does not cite some of the literature arguing for a destabilizing role of climate change in the conflict.</td>
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<tr>
<td>David</td>
<td>Kopp</td>
<td>141182</td>
<td>Text Region</td>
<td>16</td>
<td>Climate Effects on U.S. International Interests</td>
<td>141</td>
<td>139</td>
<td>33</td>
<td>36</td>
<td>585</td>
<td>Almost everything in the document is relevant to a degree—that is why there is formal likelihood and confidence language in the NFR, to express degrees of certainty and uncertainty. Saying that &quot;abatement is uncertain&quot; is fine. A more thoughtful discussion is found in section 3.4 of the CSSR.</td>
<td></td>
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| David     | Kopp      | 141190     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 117     | 17         | 19     | 585 | The present text says this: "the key message is that climate variability and change outside the United States is impacting and will increasingly impact our trade and economy, including U.S. businesses with overseas operations, overseas supply chains, and import and export prices.
Comment: This entire message fails to state specific projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. |
| David     | Kopp      | 141191     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 117     | 17         | 21     | 585 | The present text is this: "the key message is that climate variability and change outside the United States is impacting and will increasingly impact our trade and economy, including U.S. businesses with overseas operations, overseas supply chains, and import and export prices.
Comment: This entire message fails to state specific projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. |
| Laurie     | Moser     | 141003     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 258     | 3          | 12     | 6 | Good use of examples here. A citation or reference to more detail would be helpful in a more thoughtful discussion is found in section 3.4 of the CSSR. |
| Victoria  | Ambrose   | 141013     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 258     | 3          | 12     | 6 | These are good examples. It would be helpful to explain why these expanded affected economies and trade, international development, and humanitarian assistance, national security and/or transboundary resource issues, as far as the UN is concerned, since these are the main talking points of this chapter. |
| Victoria  | Ambrose   | 141014     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 258     | 3          | 12     | 6 | These are good examples of international development efforts within the international development section of the chapter. The first cites a valuation study. The second may be too new to have undergone evaluation on this topic. The impacts listed in this section are not projections, but are examples of impacts that have already been experienced, and which are well documented in the scientific literature. |
| Victoria  | Moser     | 141015     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 276     | 3          | 17     | 590 | This topic is a very important issue; displaced people as a result of climate change. There are some areas that could be expanded. It would be helpful to add. |
| George    | Backian   | 141043     | Text Region  | 16      | Climate Effects on U.S. International Interests | 141        | 276     | 3          | 17     | 590 | In terms of ending soil and food waste both have led to price increases and cascading impacts across many countries and economic sectors. (6) Otherwise the paragraph remains too abstract for the reader to appreciate the implications. Although not peer-reviewed literature, the following news report highlights the issue: https://www.ft.com/content/276e4426-9b31-11e9-bd4b-a4e4b9a2b6. In response to this reviewer's comment the expressions "prone to" and "cascading," have been added to modify the comment about impacts from the 2011 Bangkok flooding. |

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1. Expand on the national security issues associated with this. Namely, addressing the fact that the US might have to take in refugees as a result. This will not only affect the US economy but there are issues with the risk of increased terrorism associated with this.
2. Include predictions of places that will likely have a large population of displaced people with no where to go (like Bangladesh.)
3. Provide direct benefits to Americans, are vulnerable to the impacts of climate variability and change which both had prolonged and cascading impacts across many countries and economic sectors.
4. Mention that the US also has increased terrorism associated with this.
5. Key Message 3: Climate extremes and change, in conjunction with other factors, can exacerbate conflict which has implications for U.S. national security.
6. Key Message 4: Climate variability and change outside the United States is impacting and will increasingly impact our trade and economy, including U.S. businesses with overseas operations, overseas supply chains, and import and export prices.
7. These price changes can affect U.S. businesses involved in overseas operations, overseas supply chains, and import and export prices.
8. Encourage businesses to report risks associated with climate change, with hundreds of businesses currently enlisted as partners.
This brief chapter containing information that can only be completely gleaned through assimilating all the context of the references. A summary section that ties it all together would be useful. Here is some proposed edited text: BEGINNING OF TEXT: The climate effects that lead to concerns for U.S. international interests are many and result from the interactions among the topics discussed in the previous chapters. In general, the climate effects of compounding effects cause economic and societal stress which can lead to migration and conflict. These responses reinforce economic and environmental stress, which can produce humanitarian crises, possible requirements for military intervention, and impacts on the U.S. economy. Figure 16.2 (figure sent to the %USRegion% email address) depicts some of the key relationships described in this chapter and its references. The figure also visually highlights how much of the topics in the previous chapters, in an interaction setting, contribute issues of U.S. concern. The concept of %USRegion% in the diagram is meant to imply that the migration and stress can be associated with neighboring areas. Figure 16.2 Title: The Myriad Climate Effects on U.S. International Interests [figure sent to the %USRegion% email address]. [Figure 16.2 is declared to be public domain with no restriction on use and no requirement for attribution or reference. 68] Caption: This diagram shows several of the relationships noted within the chapters and the literature it references. It is used directed to illustrate the causal interconnections between the topic elements. Elements in red designate climate drivers. Those elements in a green font symbolize chapter topics. Sea-level rise is used to capture the concepts of Chapters 8: Coastal Effects. Sea-level and ocean warming are used as proxies for the concepts of Chapter 9: Ocean and Marine Resources. A black font indicates dependencies among the variables. An orange font denotes U.S. interests. The element %USImport% is a proxy implying the large U.S. economic impacts. The arrow heads show the direction of causality or influence, from-to. The plus (+) or minus (-) sign shown at the arrow heads signify the direction of relationship. A plus implies a positive or reinforcing relationship, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus or a plus sign indicates a negative or countering response, where the more the

We are considering drafting a summary statement for the chapter.

Comment accepted.

We think to fully assess the implications of climate for U.S. national interests it is important to include climate variability and change. We think our analysis is strengthened by including extreme events whether or not they have been completely or partially attributed to anthropogenic climate change. Events such as Hurricane Maria are indicative of impacts of climate and weather on U.S. interests. We contend that even without attribution, such events are useful to indicate because these types of events are projected to become more frequent and severe with climate change. We are intentionally not indicating that all of the changes have harmful impacts to the U.S. economy and trade since some can be negative and some can be positive. For example, an increase in global wheat prices can increase profits for U.S. farmers but can hurt U.S. wheat consumers. Therefore, we prefer the use of the words "impact" and "impacting," which are somewhat neutral with respect to the nature of the effect. The more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus or a plus sign indicates a negative or countering response, where the more the

We think the box is meant to imply changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus or a plus sign indicates a negative or countering response, where the more the
Allison Cronin Comment 424224 Page 16: Climate Effects on U.S. International Interests

178 57B 5 6

I realize this chapter is on international impacts that affect the US, but I think it’s well worth a sentence at the beginning of the executive summary and main text that acknowledges that international impacts have their own worth (outside of what it means for the US), that the impacts incurred affect many people around the world and those people have intrinsic value in and of themselves. Given that, those impacts ALSO affect the US. It is that this chapter is about the “also affects” the US part, but just sounds hollow,404 it not clearly state that other people’s suffering has value outside of what it costs Americans.

Allison Cronin Comment 424225 Page 16: Climate Effects on U.S. International Interests

178 57B 27 27

Some US-US is a bit vague (what does this mean really?), perhaps provide examples or a rough estimate of the percent of companies, etc. and say they are “already” reducing climate risks.

Allison Cronin Comment 424226 Page 16: Climate Effects on U.S. International Interests

179 57F 4 4

I suggest including mention of safety to soldiers/troops in this section, and perhaps more on the subject in the underlying text. The health assessment has a text box on this subject that can be referenced. Highlighting the impacts of climate change on deployed training troops helps bring home the climate change message well with these other audiences.

Allison Cronin Comment 424227 Page 16: Climate Effects on U.S. International Interests

179 57B 7 7

I am a bit awkward and I wonder if some text seems to be missing from the second sentence (between incorporate and climate risk). We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations relevant for this section.

Allison Cronin Comment 424228 Figure 16: Climate Effects on U.S. International Interests

179

This is the only figure in the chapter and I’m afraid it is a little lacking. I really like the icons in the map are examples but they are oddly spaced. If you were only providing one example for each type, that would make more sense. But, for instance, there are two examples of instability (I’m guessing from the symbol this has something to do with water) and those in Ethiopia and Russia, to my best estimate. Why? Why those examples, why not others? It is also nearly impossible to see where some of these icons are placed. Is the demand for humanitarian aid in Somalia? Vietnam? Mexico? Russia? Then some icons are more specific than others – why is just coffee stopped out? Why is just electronics singled out in the World Bank icon? Is the shipping route icon east of Greenland and not north of Alaska?

I am not convinced this is the most compelling figure for this chapter, and I’m not convinced that a map is useful. Showing that there are impacts all over the world doesn’t seem like the main message this chapter is trying to convey. A figure that focuses on just one or two Key Messages may be better. For example, if there was a way to show where military troops are deployed and overlay that with maps of extreme weather impacts or natural disasters or maybe economic impacts, etc. that may more directly relate to the Key Messages. For the current figure, if there are 8 examples of the types of impacts this chapter covers, may be just a tad with the 9 topics and a sentence or two explaining these examples would be more helpful than dropping icons on a map without detail. If the authors wish to keep the map, I would suggest using just one example for each icon and finding a way to include a sentence that explains that example. For example, an interactive map would allow a pop-up box next to each icon that explains in an example sentence what the coffee production loss in Chile/Panama and how that affects the US. There are a lot of good citations in this figure caption, but it makes me curious with the results of those studies are. Also, would fewer fewer icons in the US itself, since this chapter is about international impacts that affect the US. The US is not like the only appropriate example, since it relates to the example.

Allison Cronin Comment 424229 Page 16: Climate Effects on U.S. International Interests

181 561 5 5

I think this sentence has hitches at impacts in other countries, I think this sentence needs to be more explicitly state that 2) climate affects other countries and 2) that’s not what we’re talking about here. This is stated even more quickly. It leaves the reader feeling like the authors are sympathetic to the fact that climate impacts outside the US hurt people outside the US, and that fact is important to own, without telling you it also hurts Americans.

Allison Cronin Comment 424230 Page 16: Climate Effects on U.S. International Interests

181 561 13 13

We have added the Traceable Accounts section a description of the process used to develop and staff the chapter, as well as seek public input. This material has been moved to that section.

Allison Cronin Comment 424231 Page 16: Climate Effects on U.S. International Interests

181 561 20 25

I suggest replacing. "Conversely," with "At the same time" since this sentence does not cancel out the previous sentence.

Allison Cronin Comment 424232 Page 16: Climate Effects on U.S. International Interests

182 562 5 5

I’ve reviewed this chapter and added a sentence clarifying the comment on this issue.

Allison Cronin Comment 424233 Page 16: Climate Effects on U.S. International Interests

182 562 8 8

We added more to the sentence in the Summary. Here is the augmented text in the body: “Some U.S.-led businesses are reducing their climate risks abroad, including through partnerships with environmental groups. For example, Starbucks and Conservation International have partnered to strengthen the capacity of coffee growers and supply chains to manage climate risks (Thorpe and Fennell 2012), while Coca-Cola and the World Wildlife Fund (WWF) are working together to protect foreign water basins that Coca-Cola uses for water supply (WWF 2015). Coca-Cola increased its company-wide water efficiency from 2004 to 2012 by 21.4 percent, which avoided approximately USD $600 million in costs and tended to increase resilience in the face of water shortages (UN Global Compact 2015).”

Allison Cronin Comment 424234 Page 16: Climate Effects on U.S. International Interests

182 562 14 14

2. The references cited here are good, but it may be helpful to provide some context: What is the difference between the President’s work and the Obama administration’s work and how do these references (and any others) relate to this point?

Allison Cronin Comment 424235 Page 16: Climate Effects on U.S. International Interests

182 562 20 30

The points of cluing U.S. policy is that policy is a reflection of U.S. interests, the theme of this chapter. At the time of writing, cited policies are still operational. We have updated as appropriate.

Allison Cronin Comment 424236 Page 16: Climate Effects on U.S. International Interests

182 562 28 28

I suggest deleting “as well as expands the middle class.” I’m sure policy wonks understand why expanding the middle class is important and I think the sentence expands the middle class. We added a sentence clarifying that our focus on the implications of climate for U.S. interests is not meant to minimize the importance of impacts of climate change outside the country. We cite Americans’ international volunteering and contributions to international charities as evidence.
<table>
<thead>
<tr>
<th>First Name</th>
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<th>Comment Type</th>
<th>Chapter</th>
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</thead>
<tbody>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>42: Comment on page 583</td>
<td>582</td>
<td>Start 46</td>
<td>46</td>
<td>Suggest adding sentence to read: “These sectors, and these US investments in them, are sensitive...” Also consider adding sanitation to your list in the previous sentence and providing a citation.</td>
<td>46</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>583</td>
<td>51</td>
<td>“This sentence needs a citation.”</td>
<td>51</td>
<td>The statement has been revised, but we think it is appropriate to use U.S. policy as evidence of the interests of the U.S.</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>583</td>
<td>52</td>
<td>8</td>
<td>Suggest adding the entire last sentence. It is too much promotion of Obama-era programs, sounds too advocacy-like, and does not impart much information to the reader.</td>
<td>52</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>584</td>
<td>28</td>
<td>10</td>
<td>These stats are very confusing. Why would impacts to farmers that self-identify as higher? Wouldn’t those who identify climate risks as a major concern use the drought forecasts (and therefore see their losses cut in half as implied by the next sentence?)?</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>584</td>
<td>32</td>
<td>18</td>
<td>Can you show how this has helped the U.S.? The larger point being made elsewhere in this section (and chapter) is that helping countries manage climate risks can help to reduce costs of humanitarian assistance and the likelihood of regional insecurity, write missions, etc., and it advances US interests.</td>
<td>32</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>19</td>
<td>26</td>
<td>This paragraph is not very helpful. First, lines 19-22 are repetitive to the lines on page 582 line 36-38. Second, there are too many programs listed, making it hard to follow and omit self-congratulatory promotion of federal government programs. Third, the example is very old (2009). And finally, there is no way for readers to know whether the dollar amounts in this paragraph are a list or a little-no context is provided. $100 million doesn’t sound like very much to me, especially given how expensive recent extreme events in the US were. While the following paragraphs are an even older example (there will be readers of this who weren’t even born then), the paragraph is better written and provides more context to the aid amounts.</td>
<td>19</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>21</td>
<td>18</td>
<td>We have made an edit to clarify. This is explained in the referenced paper and in an upcoming book chapter.</td>
<td>21</td>
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<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>22</td>
<td>23</td>
<td>The text lists examples of private foundations, but does not list examples of NGOs or academic institutions. Why? Suggest deleting examples, or providing examples for all of the categories, as this could be seen as federal government endorsement.</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>24</td>
<td>15</td>
<td>We have added a citation in our chapter assessment.</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>25</td>
<td>17</td>
<td>We have included several additional references to accurately capture the ongoing debate.</td>
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<td>Allison</td>
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<td>16: Climate Effects on U.S. International Interests</td>
<td>585</td>
<td>29</td>
<td>35</td>
<td>Authors could mention the marine species indicator here, or even-use the NOAA/EPA figure: <a href="https://www.epa.gov/disaster-ed/drought/disaster-change-indicators-marine">https://www.epa.gov/disaster-ed/drought/disaster-change-indicators-marine</a>...</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>586</td>
<td>3</td>
<td>5</td>
<td>Use the USGCRP 2016 climate and health assessment here, which has an entire box on climate-related health impacts to military personnel.</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>586</td>
<td>23</td>
<td>23</td>
<td>&quot;This is a good point. As intended, we believe that the existing text indicates the partial attribution of the unrest to the climate events. We have made the citation clearer.&quot;</td>
<td>23</td>
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<td>Allison</td>
<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>586</td>
<td>28</td>
<td>38</td>
<td>It can be more specific than “some”? E.g. men? Boys? Farmers?</td>
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<td>Crimmins</td>
<td>16: Climate Effects on U.S. International Interests</td>
<td>586</td>
<td>30</td>
<td>31</td>
<td>We appreciate the reviewer’s comment; however, the author team has deliberated and the chapter has not been restructured in this way.</td>
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16. Climate Effects on U.S. International Interests

A Allison

Comment
142272 Traceable Account 16: Climate Effects on U.S. International Interests 91 592 22 2 The text "high confidence" statements here do not match the description of confidence and likelihood section on page 594, which states medium confidence. Check all these key messages for consistency.

The text has been revised to make the confidence statements more consistent and clearer.

A Allison

Comment 142273 Traceable Account 16: Climate Effects on U.S. International Interests 92 592 20 27 This is very well written, but also very long. Move the text on lines 20-27 to the confidence/likelihood section.

The sections have been rearranged to incorporate your suggestion.

A Allison

Comment 142274 Traceable Account 16: Climate Effects on U.S. International Interests 92 592 29 4 Delete this entire section. It is not needed or appropriate here and makes the TA way too long.

Delete entire section.

A Allison

Comment 142275 Traceable Account 16: Climate Effects on U.S. International Interests 93 592 6 0 Delete "conflicts driven by many factors" That is covered in the text and doesn't need to be explained here. Just keep to the uncertainties.

The text has been revised to reflect this comment.

A Allison

Comment 142276 Traceable Account 16: Climate Effects on U.S. International Interests 93 592 7 0 Suggest "direct causality" and consider using the phrase "attribution and detection" if appropriate.

After consideration of this point, we have revised the text along the lines of the suggestion of "direct causality" and "attribution and detection".

A Allison

Comment 142277 Traceable Account 16: Climate Effects on U.S. International Interests 93 593 14 25 Delete lines 16-17; delete the "Therefor", "on line 17 and "Furthermore" on line 18; delete "these studies examine a "on line 20 and replace with "for"; delete "and" at the beginning of line 21; completely delete the paragraphs beginning on lines 25-35. Especially near the end of this section, you don't need to be putting the entire list of climate uncertainties in this traceable account-those are covered in the CS3R. Delete "Similarly" from the beginning of line 26.

After consideration of this point, we have revisited the text in accordance with several of these suggestions. However in lines 16-17 and the paragraphs beginning on lines 25 and 35 are important in conveying the complexity of the subject, and hence have been retained.

A Allison

Comment 142278 Traceable Account 16: Climate Effects on U.S. International Interests 94 594 15 15 This section needs editing to be consistent with the confidence and statements do not match the rest of this traceable account. Please check carefully.

The text has been revised to reflect this comment.

A Allison

Comment 142279 Traceable Account 16: Climate Effects on U.S. International Interests 94 594 19 21 The confidence and likelihood statements do not match the rest of this traceable account. Please check carefully.

The text in the Traceable Account has been reviewed to ensure consistency throughout the section.

A Allison

Comment 142280 Traceable Account 16: Climate Effects on U.S. International Interests 94 594 23 36 Don't add DESCRIIBE the evidence. Much of this repeats the chapter or is a lack of discussion. Delete "The citations provided to the Transboundary version document the" and then provide the citations here (lines 26-27). Provide citations at the end of line 23. Delete the sentence on line 29.30. Delete the text from lines 30-36, which only repeats the chapter. Provide descriptions of the evidence in there is a lot of info, it is old & new, emerging or established, consistent or controversial context?

Where deemed appropriate, the text has been revised to incorporate this perspective.

A Allison

Comment 142281 Traceable Account 16: Climate Effects on U.S. International Interests 95 595 2 9 Rewrite this section. Delete the first sentence. Move line 2-7 to the previous section. Check the conf/likelihood statements.

The sections identified have been rearranged to incorporate your suggestion. The section has been rewritten for clarity and consistency.

A Allison

Comment 142282 Traceable Account 16: Climate Effects on U.S. International Interests 95 595 14 13 This is not part about expert understanding and past negotiations seems more suited to the description of evidence section.

The text has been revised to incorporate this perspective.

David Kotenov

Comment 142296 Text Region 16: Climate Effects on U.S. International Interests 82 585 3 0 This chapter provides a unique vew of the U.S. leadership in humanitarian aid especially in response to the climate extremes and change adaptation. The section that interest me the most is the key Message 2 U.S. International Development and Humanitarian Assistance=SDG. It is very encouraging to see the collaboration between the U.S. and foreign countries [no matter is private or local] to find solutions to mitigate potential disaster that could save thousands of lives and properties. Based on this, I suggest adding a chart that show the amount of the U.S. expense on humanitarian aids over the decades to compare with 1) future projected humanitarian aids due to climate extremes and change without the mitigation and 2) future projected humanitarian aids but with mitigation in place in order to emphasize the significance of having climate mitigation as national policy.

The suggestion is not feasible for this chapter given its length. We are not familiar with such estimates being published.

Anurag Constible

Comment 142266 Whole Page 16: Climate Effects on U.S. International Interests 82 Key Message 2 does a great job discussing U.S. programs to build climate-resilience abroad and prevent the need for increases to international humanitarian aid due to climate change. The section would benefit from a clearer description of the issue itself. It would also be useful to quantify the potential impact and list the regions where the analysis has been done, and note where additional research is needed but do not repeat the message.

We point to the documentation of expected impacts or likely humanitarian hotspots elsewhere (e.g. IPCC) but do not have space to restate them. We are not able to quantify impact here.

Anurag Constible

Comment 142267 Text Region 16: Climate Effects on U.S. International Interests 84 586 18 23 The section would benefit from clarification of the impacts on Department of Defense assets, perhaps through the value of the assets that are listed in high-risk areas, or the projected economic impact in the recent risk analysis.

We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information to provide. For those readers with an interest, a reference is provided which possesses specific information on value and risk.

Anurag Constible

Comment 142268 Text Region 16: Climate Effects on U.S. International Interests 85 586 9 17 This paragraph explores the impact of climate change on migration. The section would benefit from considerations of the potential impact of climate change on immigration to the U.S.

Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than diving deep or providing such a level of specificity.

Anurag Constible

Comment 142269 Text Region 16: Climate Effects on U.S. International Interests 85 593 31 35 This section explains that increases in extreme weather and climate events are increasingly attributable to climate change, but "attribution uncertainty." It would be useful to provide more detail on the uncertainty of attribution and to quantify the confidence to which the literature links events to climate change.

We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information to provide.

Anurag Constible

Comment 142270 Text Region 16: Climate Effects on U.S. International Interests 84 594 19 21 The statement "Many multilateral frameworks that manage shared resources are increasingly incorporating climate change to prevent transboundary water disputes," is listed in High Confidence. The following paragraph provides evidence for this statement that appears to give it Very High Confidence. This statement would benefit from a description of the uncertainties here.

Thank you for your comments, but in keeping with the standards required of our statements of confidence, we have kept them as "high confidence." Remaining consistent with the format of other sections in this chapter, we have included a description of the uncertainties in the traceable accounts section. See pg 595, line 2-3.

Mckee

Comment 142294 Text Region 16: Climate Effects on U.S. International Interests 84 588 3 8 The section on climate and national security never mentions that the Dept of Defense and the U.S. military provides climate change to be a threat multiplier. It is important to use the term throughout in the section of text and maybe in other places of the chapter to speak the same language as the national security sector. Suggest starting by editing the second part of Key Message 3 to read: Climate change already affects U.S.

Suggest starting by editing the second part of Key Message 3 to read: Climate change already affects U.S. international interests. The statement "Many multinational frameworks that manage shared resources are increasingly incorporating climate change to prevent transboundary water disputes," is listed in High Confidence. The following paragraph provides evidence for this statement that appears to give it Very High Confidence. This statement would benefit from a description of the uncertainties here.

The confidence and likelihood statements do not match the rest of this traceable account. Please check carefully.

The two "high confidence" statements here do not match the description of confidence and likelihood section on page 594, which states medium confidence. Check all these key messages for consistency.

While the authors respect and appreciate the comment, we feel that use of the term "threat multiplier" is not helpful for the discussion. The chapter lays out the actions that DoD has taken regarding climate change and its impacts to DoD in clear language. Notwithstanding, that for a short time the term was used in the context of climate change and the military, the term "threat multiplier" is an indefinite word or phrase derived from a military term of art whose meaning in this context would be unclear and not sufficiently specific.
It was surprising that there was very little mentioned about the climate change analysis and planning coating as part of the Columbia River Treaty between Canada and the U.S. The chapter should mention the climate studies developed by the Regional Management Joint Operating Committee (RMJOC), both phase I and II. RMJOC has used state of the art modeling and a large stakeholder process to assess climate effects to Columbia River hydrology and hydropower. Contact Eric Pytlak at Bonneville Power Administration in Portland, Oregon for more information and references.

We appreciate this very good suggestion, but with limited space, we are only able to provide a couple of examples to support this key message, which you will find in the Troubleshooting section, beginning on pg. 185.

Example of collaboration with prominent meteorological service begins to provide multi-level quantification that updates climate risks to federal systems. Could be enhanced by discussion that move beyond economic impacts to societal risks. Why did some farmers use the system and some did not? Social barriers? What were the impacts to those who did not use the system? Is the system still in use?

With limited space, it is difficult to cover these questions. The referenced paper covers some of these issues. Issues related to social systems. Could be enhanced by discussion that move beyond economic impacts to societal risks. Why did some farmers use the system and some did not? Social barriers? What were the impacts to those who did not use the system? Is the system still in use?

We added the following example: “An example is the demanding effect that a series of short-term climate extremes in 2002-2003 had on global wheat production. These extremes included drought in Russia, Ukraine, and the United States and damaging precipitation in Australia. A corresponding reduction in wheat production, in combination with high demand, low stocks, trade policies, and other factors, contributed to a spike in global wheat prices (Trodle et al., 2011). This benefitted U.S. wheat exports while increasing the cost of flour and bread in the United States (Vocke, 2012).”

We have clarified that “support” refers to both financial and technical support. This is a statement of fact, not a policy recommendation.

This sentence sounds like it is conveying a U.S. foreign policy position (which may be a wording choice issue, because past extreme events, even if their occurrence has not be clearly attributed to climate change, can increase agricultural commodity prices worldwide.

We have clarified that “support” refers to both financial and technical support. This is a statement of fact, not a policy recommendation.

We think the proposed statement oversimplifies the relationship between climate outside the U.S. and U.S. interests. We have tried to carefully state what relationships we think the literature supports.

It seems like what the authors are trying to say in their high-level findings is that climate change is likely to serve as a destabilizing force in many regions, which could compromise U.S. national security. It seems like that could be a helpful way to frame the main findings.

We agree, text is amended.

We think the review comments oversimplify the relationship between climate outside the U.S. and U.S. interests. We have tried to carefully state what relationships we think the literature supports.

We appreciate the reviewer’s comment.

The national security benefits of being able to predict food insecurity and political instability are expected to be mutually beneficial to the development and security sectors. Currently, the development sector prioritizes its efforts on preventing or redressing issues of food insecurity, while the security sector prioritizes its efforts on the purposes of preventing or redressing political instability. The two are growing in overlap. However, to justify the use of technological and human assets to investigate an emerging area of concern outside of known areas of environmental degradation, famine, political destabilization, and conflict, several obstacles need to be overcome. Such obstacles include: differing taxonomies, languages, and acronyms; overly restricted information access; and cultural reservations and perceptions.

While the climate change support for a correlation between food insecurity as a driver for political instability that might be expected to have a national security impact, and security support on the overall scale is not currently needed. Deploying security and defense assets towards development goals, beyond existing post conflict stabilization requirements and humanitarian assistance and disaster response in emergency requires defense-related decision making, and therefore a proof of concept. This is also increasingly necessary for responding to hybrid or grey zone threats or incidents.

We are not sure what opportunity exists to re-envision food security’s domain to more definitively include the defense and security enterprise. Due to the convergence of myriad trends and emerging challenges, more comprehensive collaboration beyond humanitarian assistance and disaster response should occur between the development and defense and security sectors, respectively. Doing so will likely enhance situational awareness and lay the foundation for better integrated information sharing and decision-making that will prove invaluable in any future conflict environment.

We appreciate the reviewer’s comment.

We appreciate this review comment, and we have very limited space for this chapter to address complex issues such as food security. We have attempted to address these issues at best we can with the limited space available.

We appreciate the reviewer stating that this sentence is the most clearly worded of the entire report. We are very grateful that you have identified this as a positive aspect of our writing.

I think it might be helpful to also make the point that this is something occurring in addition to climate variability and change affecting the U.S economy itself, and our trade with others. That is, the point works each way—and indeed events such as impacts or grain production can have adverse impacts overseas. Also, on the sentence here, I urge saying “Climate change and extremes outside ...” and note that need to change to “are impacting” I think framing climate vulnerability is not really as serious as extremes an change.

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Laying "can exacerbate" is an indication it is possible, whereas this is already happening (in the Middle East), with one of the Arctic, shifts in fishing, and so on. Also, DOD is not only responding by planning-the Navy, with issue is the natural environment. I'd also suggest that is not just conflicts that are exacerbated, but phenomena that can manifest in terrorism. The comment provides a hypothesis, "conflicts are exacerbated, but phenomena that can become manifest in terrorism" whereas the author's view is that they are already happening. As a result, the comment does not raise any new issues, but rather emphasizes the existing threats. Regarding the timing of impacts, the term "can exacerbate" applies to both current observed phenomena and future phenomena observed in the future. The authors have decided that in this case the possible existence of a relationship is better understood than its particular. The formulation that "climate extremes and change can exacerbate conflict" best conveys the existing levels of certainty and uncertainty.

This text seems to be quite obscure; providing some specific examples here would be helpful/titles, migrating species, water resources-not to mention the atmosphere and oceans generally. And are not the issues in the second sentence about more than just trans-boundary issues? I think this point really does not adequately encompass our shared interests with other nations.

I appreciate this suggestion, but with limited space, we are only able to provide a couple of examples to support this key message, which you will find in the Transboundary section, beginning on page 581.

There are no changes to the chapter. The figure has been removed from the chapter, as it does not reflect accurately the complexity of topics addressed in this chapter.

The phrase "transboundary resources" is too vague—please give some examples for the reader.

The term "transboundary resources" refers to physical and biological resources that transcend across political boundaries. In the case of this chapter, we refer to those resources that are shared across political boundaries between the U.S. and other nations. Due to limited space, we only provide examples in water (Ethereal and fisheries (Canada), but many other issues along our international borders are also of interest. These include trade, health, infrastructure, energy, food security, human migration, and cultural resources, among others.

For example, has already been moving to refocus attention to coastal regions (to provide assistance in response to disasters, etc.) from the deep sea. I'd also suggest that is not just conflicts that are exacerbated, but phenomena that can manifest in terrorism.

The phrase "global impacts" seems quite vague—does this mean impacts on the US from global climate change?

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If not clear here why, "variability" is featured here rather than extremes, as it would elsewhere. What climate change itself is doing is increasing the likelihood and intensity of climate variations (the shifting of the belt curve distribution); so that the US is having to respond more and more often to a variety of climate change and the enhancement of extremes (e.g., variability matters, but climate change and the induced disproportionate increase in climate extremes is what the main issue would seem to be). Also, subject is plural, so this needs to be addressed in the US interests and the interests of the other nations with respect to the US, but then the chapter title is about US interests and not, more broadly, interactions with other nations.

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Another example might be the Arctic Council agreements regarding responsibility for the increasingly ice-free birds, ducks, butterflies, etc. Overall, pretty limited coverage.

"Migration" is the right word--the boundaries of the fishery shifted. And there is no mention here of migrating serious given the population increase and the increasing dryness. The Great Lakes are another example on migration, both in response to original direct effects and then further migration because the economies of the region and peoples in the involved countries. I'd urge some modification to show a bit of empathy.

It seems to me that some examples from overseas are needed, and a critical one is air bases established on low-lying islands, etc.--and if such a base is inundated (as can be expected in the future, this could change the whole regional presence of the US.)

We feel that health is adequately addressed in the international chapter through this box. In addition, Health has already been the case--the next sentence indicates.

The Arctic Council is a multinational framework covering the Arctic. It does promote the welfare of those countries, as promote the welfare of those countries.
The text has been corrected to reflect this comment.

The text has been corrected to reflect this comment.

The text has been corrected to reflect this comment.

The text has been revised to incorporate this perspective.

The reference has been updated throughout the chapter.

Thank you for your comment. The conclusions about climate impacts in today’s US are not necessarily based on models. They are based on observations of physical or ecological impacts that can be demonstrated to be related to change and variability in the physical climate system, mediated by other factors in many cases. The science of climate attribution has advanced considerably since the last NCA [referencing the NAS report on attribution of extreme events here], which demonstrates that even for some singular events, the probability that these events would happen in a “natural” climate system unfurled by human factors is very low. In any case, we know and can demonstrate through careful analysis of observations that many features of recent climate variability and the direct result of human forcing, and in some cases are essentially outside the range of natural variability for many thousands of years. Details vary on a year-by-year basis of course. The focus throughout this chapter is risk because there are important impacts for which the probabilities of their occurrence vary and can be hard-to-quantify. Projectors along with other modes of analysis are an essential basis for risk analysis and assessment. Different types of uncertainties that are relevant—quantifiable and not—are inherent to the focus of this chapter.
The use of complex systems concept is interesting and appropriate to locate in the chapter, but it is not useful to the general reader. The most insightful and insightful element for readers is the way the chapter ties together the topics of the other chapters. It enables readers to understand the interdependencies, say among water, agriculture, forests, human health, energy production, as well as to understand spill-over impacts to/from other regions and sectors, and the need for integrated adaptation planning. Focusing on one aspect in isolation could lead to significant counterproductive outcomes. Within the other chapters and even this chapter, the use of the word %COMPLEX% often implies %COMPLEX% or more precisely the complications associated with managing highly interconnected systems underpinning multiple stressors. Therefore, emphasizing the importance to the reader rather than the over-simplification of the science, I think the chapter would be better titled %COMPLEX% or %INTERDEP%. Multiple stressors, and highly interconnected systems %COMPLEX% Further, the use of the words %COMPLEX% to denote this chapter in other chapters should be changed to simply %INTERDEP%. I believe this chapter does employ both the formal mathematical use of the term %COMPLEX% to denote the entire set of complex systems, and the informal %COMPLEX% usage. I think precise language usage is needed, for example, use %COMPLEX% or %INTERDEP% %COMPLEX% etc. when noting many parts connected in an intricate way, and save the term %COMPLEX% for only the discussion related to emergent behavior or self-organization.

This chapter could be the most useful one for non-scientist readers. It furnishes the cross-disciplinary perspective for tying the seemingly disparate chapter topics and concepts into an integrated, comprehensible whole that can be utilized for decision-making.

The make a great point about the vernacular use of %COMPLEX%, and %INTERDEP%, which the authors have discussed. We decided to reserve %INTERDEP% for specific cases, and use %INTERDEP% for the broader meaning. In my view, complexity remains a central theme to the chapter because the interactions among these systems make their behavior hard to predict. We agree with the reviewer’s feedback about the accessibility of the notion of complex systems science and the way in which this more positive use of the word %COMPLEX% might confuse readers. We have made several revisions to the complex systems science to Key Message #1 where it more clearly fits within the flow of the logic of the chapter.

Thank you for your helpful suggestions. We have revised the introduction to the chapter to make it more effectively give the reader the necessary context to read the remainder of the chapter. We have also included a new conceptual diagram to the chapter that is inspired by the comment.

BEGINNING OF TEXT: Although it is not yet possible to establish the combined consequences of climate conditions, interdependencies, and human behaviors, or the ultimate outcomes, it is possible to describe the direction of influence among the factors. These interacting influences are important to recognize when considering migration or adaptation interventions. Due to the interdependencies, a change in one part of the system will most likely have spill-over effects on other parts. Or these other parts can make interventions less likely to have the desired outcome. Figure 17.3 [Figure sent to the %Reviewers% email address.] depicts some of the key relationships described in this chapter and its references. The figure also visually highlights how each of the topics in the previous chapters experience multiple stresses in a highly interconnected manner. Figure 17.3 Tittel: %INTERDEP% [Figure sent to the %Reviewers% email address.]

Caption: This diagram shows several of the relationships noted within the chapter and the literature it references. It uses directed arcs to illustrate the causal interconnections between the topic elements. Elements are designated in white, while elements in a green font symbolize chapter topic. See level set to use to capture the concepts of Chapters B: Coastal Ecosystems. Saltwater and stress complexes in general for the concepts of Chapter I: Ocean and Maritime Resources. A black font indicates dependencies among the variables. The arrow heads show the direction of causality or influence, from the top. The plus (+) or minus (-) sign at the arrow head signify the relationship. A plus implies a positive or reinforcing relationship, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus sign indicates a negative or countering response, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the opposite direction. This applies whether it is a more-the-less, or a less-the-more response. If the directed arcs (paths) can be traced around a set of elements and return to the same place, there is a feedback relationship. If the number of minus signs is an even number (including the case where there are no, i.e., zero, minus signs) the overall feedback is reinforcing, which causes the variables to change toward an equilibrium state (this is known as %COMPLEX%).

Thank you for your suggestions. A station has been added.
Thank you for the suggestion. We have decided to update the box to include only the California example, and we have substantially reworded KM1, KM2 and KM3 to reduce redundancy among them and to make their emphasis clearer.

While we appreciate the suggestion to include more examples of complexity analysis in a range of disciplines, doing so is a more extended way to be beyond the scope of this chapter. In the revised draft, the topic of complex systems science is discussed explicitly now in KM3. In that section, we include a sentence that makes clear that complex systems science has a long history but not the topics being discussed in this chapter. And in that discussion, we have included new citations to several additional fields, including paleontology and meteorology.

We believe that these citations are sufficient to support the point that is being made in that section.

We have removed this box and placed some of the material in KM1.

We have decided to keep the box because it illustrates the unpredictability of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.

We have looked for other opportunities in KM3 to emphasize this point.

Sentence was inserted to acknowledge that shifting from recognizing complex, multidisciplinary goals to designing policies and practices that deal effectively with these risks is a non-trivial undertaking.

Yes, social vulnerability certainly affects public health outcomes during extreme events such as this. The first paragraph of box text has been updated to acknowledge other determinants of health outcomes such as inequalities of income and education as well as human behavior and choice.

Yes, the text has been revised, streamlining which modeling frameworks deal with individual systems and which incorporate key human systems (without being encyclopedic). The suggested references have been added.

Additional discussion has been added to KM3 regarding the potential short-term and long-term costs vs. benefits of expanding flexibility and robustness of systems. Supporting material has also been added to the accessible account for KM4.

The authors engaged in an extensive discussion over the title of the chapter. We have weighted two competing goals: being descriptive of the content of the chapter, on the one hand, and simplicity, on the other. As a basis of this discussion, the authors have chosen to retain the basic structure of the title, which we believe is an accurate description of the contents of the chapter. We have, however, simplified the first phrase. And in addition, we have made a wide range of changes throughout the chapter to reduce jargon and make the exposition easier to understand. We believe that these changes are more important for the readability in the chapter.

We strongly recommend changing the title of this chapter. It is long, filled with buzzwords, and extremely confusing. Most readers of this report will not know what is meant by "societal interdependencies" (if they do! It is one of the most important, it doesn't convey what the content of this chapter is. This chapter title could be changed to something much simpler, and more appropriate like "Complex Interactions" or "Complex climate risks".

Yes, social vulnerability certainly affects public health outcomes during extreme events such as this. First, the last sentence in this paragraph, it is not just infrastructure failures that affect public health; it is also an outcome of stresses on complex systems. Social vulnerabilities emphasise just-in-time delivery, for example, which reduces storage costs but increases sensitivity of transportation systems to disruptive weather events or supply chain issues. Increasing storage capacity in some places might increase robustness, but at what cost? How will costs be justified in an economic system that emphasizes shareholder value and cost reduction?

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Add a reference to the Climate and Health Assessment on cascading failures.

The authors have considered this change and determined that the text should flow from the general (interactions between energy and other systems) to the specific (the consequences arising from the 2003 Blackout). No cross-references have been added to other chapters in the NCA. Note, however, that this text box contains a more extensive discussion of the blackout than other references in other chapters.

Thank you for the recommendation. We have included a reference to the Climate and Health Assessment on cascading failures.

The authors have decided to keep the box because it illustrates the unpredictably of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.

We have decided to keep the box for the same reason. It illustrates the unpredictably of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.

Drop this entire box. This topic is covered in the International chapter and there isn’t room for it in this chapter. Plus there are zero citations in it, so it is unclear what literature the authors assessed in writing this. This is a nice story, but completely irrelevant.

We have removed this box and placed some of the material into KM#16.

Page 619 lines 3-11 to key message 3. Choosing fewer examples will help convey the message of this box better.

References may have been added to other chapters in the NCA that discuss the blackout. Note, however, that this text box contains a more extensive discussion of the blackout than other references in other chapters.

Drop this entire box. This reference has been added.

Drop this paragraph as it is vague and repetitive.

Consider dropping this paragraph as it is vague and repetitive.

Citation added.

This reference has been added.

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Consider dropping this paragraph as it is vague and repetitive.

Citation needed. The US climate and health assessment had a text box on this exact example.

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The authors have decided to keep the box because it illustrates the unpredictably of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.

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than 3x the global average over this time period (1.9 mm/yr from 1951-2010 per Hay et al 2015).

about declines in Long Island Sound and increases in Gulf of Maine. Increasing without any explanation in the above text (p.655) may be confusing. Suggest adding a sentence that the reference to KMA in this traceable account is not intended to support the uncertainty assessment of KMA, but to support the uncertainty assessment of KMA. It is important to understand what these strong evidence regarding the linkages between systems and many historical examples of the importance of these linkages, but we do not have tools today to identify or predict all the multivariate dynamics that might emerge in the future. This area does not seem to me to be the “Southwest”—it seems to me to be the “western US”. Also, line 5.

Need to use lexicon instead of “may”—that word is just far too vague.

I’m surprised that agriculture and the food system is not mentioned. I’d urge adding it. Also, that health is not mentioned seems surprising, and also the economic system. The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.

The issue is whether the uncertainties can be reduced sufficiently for useful insights to be derived from them—and would venture that for quite a number of aspects of what is being examined and assessed, the uncertainties are smaller than the uncertainties due to non-climate related factors, so further refining the analysis would be unlikely to really assist in the assessment. I’d suggest a bit more discussion to provide further context.

It seems to me saying “exactly” sets up an improperly ambitious goal for the effort. We will never be able to predict the future due to aspects that are only partly due to physics—with a bit due to societal choices now and in the future. The issue is whether the uncertainties can be reduced sufficiently for useful insights to be derived from them—and would venture that for quite a number of aspects of what is being examined and assessed, the uncertainties are smaller than the uncertainties due to non-climate related factors, so further refining the analysis would be unlikely to really assist in the assessment. I’d suggest a bit more discussion to provide further context.

The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.

We have added agriculture and two examples of social systems (financial systems and social networking). Unfortunately, we cannot include all the different systems or sectors that are relevant in this one sentence. The sectors or systems herefore are examples, but not exhaustive.

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participation-study/References:

A more recent figure could be derived from Burakowski and Magnusson (2012) by summing state-level (2006), Reiling (1998), and Snowmobile Association of Massachusetts (2005). Note this figure may include (2017). The number was generated in Scott et al. (2008) and comes from several sources summed together.


Please include Scott et al. 2008 and Dawson and Scott, 2013 in the discussion of economic viability of ski resorts in the Northeastern United States. Both of these studies note that one metric for economic viability is a 100-day ski season length in addition to being open during the Christmas holiday break and maintaining winter temperatures cold enough for snowmaking. The Wobus et al. (2017) study’s present-day modeled ski season length in the Northeast U.S is about 40-50 days (including snowmaking, see Figure 2 in Wobus et al. 2017). The typical northeastern U.S. ski season length is closer to 100 days (see Dawson and Scott, 2013; National Ski Areas Association Kottke End of Season Reports - nsaa.org). Thus, the model bias in the Wobus et al. (2017) potentially overestimates impacts to ski season length in the Northeastern U.S.


We have added the suggested citations in the chapter assessment.

Elizabeth Burakowski - Chapter 12: RECAP - I would suggest "could" rather than "would".

Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing a more thorough discussion of the effects of climate change on forest cover. At the very least, provide a list of key points or conclusions from the studies to highlight the overall impacts. And please provide an N/A cell for the US Midwest region (for which data were not available). We have added the suggested citations in the chapter assessment.

Elizabeth Burakowski - Chapter 12: RECAP - I would suggest "could" rather than "would".

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have negative impacts has yet to be determined and appears increasingly unlikely. These projections appear to be based primarily on the use of questionable computer models. That climate change will 9 and will become more common with a changing climate.

The present text says this:

- These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The text has been revised as suggested.

This typographical error has been corrected.

The citation should be Tebaldi et al. 2012, not Tebauldi et al. 2012.

The authors have considered this comment and revised the text where appropriate.

This comment has been incorporated into the chapter.

This comment is inconsistent with the current state of the science on this topic.

This typographical error has been corrected.

The authors have considered this comment and revised the text where appropriate.

This comment has been incorporated into the chapter.
<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment (ID)</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414171</td>
<td>Whole Chapter</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>62</td>
<td>20</td>
<td>21</td>
<td></td>
<td>This chapter is a challenge. It is not very well organized/edited nor is it written at the appropriate level for the NCA. The challenges begin with the key messages, which do not follow any particular logical structure. Because these are the whole structure of the chapter, it means that the chapter does not follow a logical structure. There are some really interesting stories in the chapter that could make for stronger key messages. For example, there is a powerful section on the increase in Lyme disease and West Nile virus. Here is a &quot;people value being healthy and climate change is making that challenging in the Northeast&quot; not a key message? Another unique aspect of this region is that it is completely absent in the story of the Regional Greenhouse Gas Initiative. RGII spans most of the chapter domain and has reduced CO2 emissions from the energy sector while keeping costs down. This is an incredible success story from this region that is highly relevant to the NCA.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414172</td>
<td>Whole Page</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>62</td>
<td>10</td>
<td>16</td>
<td></td>
<td>These key messages are a bit of a mess. They feel like they were written by 5 (or more) different people and that there was very little effort to make them work together in any way. First, the chapter talks about seasons, then seasons &amp; colors, then rural, urban, then a non-key message that contradicts a point in the seasons key message. The entire chapter would benefit from restructuring these key messages to really focus on the unique aspects of the region. One potential reorganization: instead of all seasons, pick one. The Northeast is known for its harsh winter, so why not talk about them? You could then bring in recreation, and maple sugaring. There is solid science, a strong climate connection, ecosystem impacts, and economic impacts. An alternative would be to focus on hydrology and extreme precipitation as a unique driver recognized in this region. Urban. Since urban is so much about infrastructure, you could bring in carbon reductions through Regional Greenhouse Gas Initiative and also bring in some of the ideas from KM4 (which isn't written as a KM) here. Coastal and oases. Considering motivating this with coastal communities (both urban and rural) depends on services. Disease. This is one of the strongest points in the entire chapter. Consider elevating it to a KM.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414173</td>
<td>Test Region</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>62</td>
<td>1</td>
<td>7</td>
<td></td>
<td>the logic of this KM is unclear to this reviewer. It seems like you want to talk about phenology in the spring of the seasons (early spring, later formation), but it is written in an absolute sense (earlier, colder). This makes it seem like a generic climate change catch all rather than something really unique. While this region has some major metropolitan areas (Boston, New York, Newark, Philadelphia, Baltimore, DC, Pittsburgh, etc.). These cities here were selected as a proxy for a KM on ecosystems.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414174</td>
<td>Test Region</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>62</td>
<td>16</td>
<td>24</td>
<td></td>
<td>Essential in what sense? Culturally, perhaps, but the economic activity in the rural parts of any area, especially the Northeast is going to be dwarfed by the cities, and this region has some huge cities (Boston, New York, Newark, Philadelphia, Baltimore, DC, Pittsburgh, etc.) that really shine here when we're thinking about a KM on ecosystems.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414175</td>
<td>Test Region</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>62</td>
<td>29</td>
<td>32</td>
<td></td>
<td>This paragraph is written in the same format as the other KMs in the style used by NCA. It is not very interesting and could possibly be merged with the urban one.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Pershing</td>
<td>414176</td>
<td>Test Region</td>
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<td>18-2</td>
<td>63</td>
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<td>414177</td>
<td>Figure</td>
<td>Northeast</td>
<td>18-1</td>
<td>64</td>
<td>19</td>
<td>15</td>
<td>16</td>
<td></td>
<td>This second half of this paragraph restates the points from the first, but with references. Relevant example references have been incorporated throughout this paragraph. More detailed citations are provided in the body of key message 2.</td>
</tr>
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<td></td>
<td>18-2</td>
<td>65</td>
<td>26</td>
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<td></td>
<td>This paragraph includes a statement that &quot;Northeast and intensively urban&quot; is a strategy. &quot;Intensively urban makes sense...&quot; in the text is not very interesting and could possibly be merged with the urban one.</td>
</tr>
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<td>Test Region</td>
<td>Northeast</td>
<td></td>
<td>18-2</td>
<td>65</td>
<td>11</td>
<td>15</td>
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<td>Figure</td>
<td>Northeast</td>
<td>18-2</td>
<td>68</td>
<td>20</td>
<td>9</td>
<td>16</td>
<td></td>
<td>There are a number of precise statements there that need references. Adjustments to the text were made.</td>
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<td>Test Region</td>
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<td>Figure/Table Number</td>
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<tr>
<td>Andrew</td>
<td>Fernling</td>
<td>241808</td>
<td>Text Region</td>
<td>18. Northeast</td>
<td>652</td>
<td>G03</td>
<td>14</td>
<td>21</td>
<td>651</td>
<td>This box is really interesting. It adds a lot to the key message about unusual marine impacts in this region. It is also very well written and the figure is cool.</td>
<td>We appreciate the reviewer's comment.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Fernling</td>
<td>241809</td>
<td>Text Region</td>
<td>18. Northeast</td>
<td>654</td>
<td>G05</td>
<td>1</td>
<td>14</td>
<td>653</td>
<td>One of the unique stories out of this region is the impact of coastal acidification (primarily runoff) on shellfish hatcheries and the development of technology to monitor water chemistry in real-time. Monk &amp; Sablikoff, 2012. Ocean Acidification: A Global Issue Affecting a Maine Dyer's Farm. Earthtide Internet. Available from: <a href="https://earthtide.org/2015/05/06/ocean-acidification-a-global-issue-affecting-a-maine-dyer-s-farm">https://earthtide.org/2015/05/06/ocean-acidification-a-global-issue-affecting-a-maine-dyer-s-farm</a>.</td>
<td>We appreciate this suggestion and have incorporated it into key Message 2.</td>
</tr>
<tr>
<td>Andrew</td>
<td>Fernling</td>
<td>241900</td>
<td>Text Region</td>
<td>18. Northeast</td>
<td>651</td>
<td>G01</td>
<td>14</td>
<td>18</td>
<td>650</td>
<td>The organization of the supporting text for the KM could use some work. There is a big chunk of repeated text and ocean acidification is stuck in between temperature. The sea level rise discussion is also really long even mentioning the repeating text.</td>
<td>The duplication of the text on this page has been removed, and the section on sea level rise has been shortened where possible.</td>
</tr>
<tr>
<td>Niyah</td>
<td>Sang</td>
<td>241901</td>
<td>Text Region</td>
<td>18. Northeast</td>
<td>655</td>
<td>G05</td>
<td>11</td>
<td>17</td>
<td>654</td>
<td>This paragraph seems to be about fisheries, but there is no mention of fisheries management. The slow response of management was highlighted in the Fernling et al. paper as a contributing factor to the collapse of cod. There is also a new paper by Le Bes et al. (<a href="http://www.pnas.org/cgi/doi/10.1073/pnas.1512134112">www.pnas.org/cgi/doi/10.1073/pnas.1512134112</a>) that discusses temperature as a driver of the decline of lobster in the south, the rise in the north, and projects future declines in both regions. A major component of this story is the role of management, with protections for large lobsters in Maine conferring climate resilience. It would also be good to get the economic and social impact of fisheries declines in these areas. The box describing the 2032 story and its impact on lobster is good. Is anything talking about the economic or social challenges due to cod? On the flip side, there are opportunities for management to mitigate the impact of climate on fisheries. The NMFS Climate Science Strategy sets up a high level goal, and below there is a Regional Action Plan that the Northeast Fisheries Science Center (NFFS) puts together. The fishery management councils in this region organized a workshop in 2014 to discuss how to handle shifting stocks.</td>
<td>Most of these comments have been incorporated into the chapter in Key Messages 2 and 5. Discussions by fishery management councils of governance and management implications of shifting stocks have not been documented in publications suitable for coding in this document.</td>
</tr>
<tr>
<td>Kristie</td>
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<td>The Northeast Chapter covers the NAPA 2 Chapter text was changed to reflect the proposed suggestion.</td>
<td>Chapter text was changed to reflect the proposed suggestion.</td>
</tr>
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<td>It would be helpful to also provide regional projections comparing the difference between RCP 4.5 and B.5. Through the end of the study period (e.g. 100 years), to explore the difference between these two scenarios. If regional projections are not available, a general explanation of what to expect based on national or global projections would be helpful.</td>
<td>The new health key message projects to 2050. The authors have also referenced CSIR.</td>
</tr>
<tr>
<td>Sarah</td>
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<td>In the sentence (&quot;These physical changes...&quot;, please clarify to identify the last items that without occurs under intentional action and investment. It should be clear that resilience can probably assume there will be some damaged infrastructure but should not assume that they will receive support if they need to rebuild. An alternative could be something like: &quot;These physical changes may lead to large numbers of evacuated and displaced populations and damaged infrastructure, and sustaining communities may require significant investment and planning to provide emergency response efforts...&quot;.</td>
<td>Chapter text was changed to reflect the proposed suggestion.</td>
</tr>
<tr>
<td>Sarah</td>
<td>Davidson</td>
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<td>648</td>
<td>In addition to silica and selenium, Philadelphia has many programs related to green stormwater infrastructure, for example providing free street trees and rain barrels on qualified residential properties, incentives for large developments, and adding new green stormwater infrastructure as part of completing other maintenance projects. See p. 41 of &quot;Toward a Climate Ready Philadelphia&quot;, cited earlier in this chapter, and <a href="http://www.phila.gov/water/wu/stormwater/Pages/Grants.aspx">www.phila.gov/water/wu/stormwater/Pages/Grants.aspx</a> for more information. The new health key message projects to 2050. The authors have also referenced CSIR.</td>
<td>Thank you for pointing this out. We have added Philadelphia to this section on green infrastructure and flooding and referenced the &quot;Toward a climate-ready Philadelphia&quot; report.</td>
</tr>
<tr>
<td>Tori</td>
<td>Cest</td>
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<td>G03</td>
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<td>43</td>
<td>642</td>
<td>The summary overview is constructed from five paragraphs taken verbatim from the introduction. The overview text is also qualitative without any quantitative points. This section would be more effective if written as a concise synthesis with specific values on, for example, expected warming (and seasonal), percentage increase in extreme precipitation, change in growing season length, habitat decline, and so on.</td>
<td>Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.</td>
</tr>
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<td>Leavens</td>
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<td>642</td>
<td>The chapter would benefit from a concise figure relating historical (1800-present) monthly mean temperature and precipitation. Temperature could be shown as anomalies for annual and seasonal (or at least the important and members, Giff and uk). Precipitation annual total would likely suffice. The precipitation 1800-present could also be supplemented with a figure showing the mean temperature annual cycle for different time intervals (e.g., 1800, 1900, 2000 and projected 2070). One benefit of the latter is that it provides a visual of how the seasons are changing with respect to, say, a 32 deg F datum. This or similar figure could be used in conjunction with discussion on the growing season length and also changes in the snow season.</td>
<td>Please refer to the NCA4 Volume 1.</td>
</tr>
<tr>
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<td>The statement about irreversible changes seems extreme. And &quot;irreversible&quot; needs to be defined in this context. For example, distribution and abundance of tree species and animal species may change, but without any loss of functionality.</td>
<td>The sentence was reworded and the term &quot;irreversible&quot; removed to incorporate this perspective.</td>
</tr>
<tr>
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<td>242006</td>
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<td>9</td>
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<td>There is also a new paper by Le Bes et al. (<a href="http://www.pnas.org/cgi/doi/10.1073/pnas.1512134112">www.pnas.org/cgi/doi/10.1073/pnas.1512134112</a>) that discusses temperature as a driver of the decline of lobster in the south, the rise in the north, and projects future declines in both regions.</td>
<td>The National Climate Assessment draws upon a variety of sources. All sources were assessed to ensure that they comply with information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. This is a federal agency report that incorporates multiple rounds of public, government and peer review.</td>
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<td>This is a confusing section. First, it says that low-elevation forests are most vulnerable, then it says that spruce-fir are most vulnerable. Then it says that spruce-fir is generally considered to be occupied by relic species that survive in cooler relief landscapes, so it would not take much additional heat to reduce their distribution and abundance. Furthermore, insects are also significant stressors. In addition, Staudinger et al. (2015) is not an authoritative reference for this information 44&quot; better to use the primary literature.</td>
<td>The text has been revised to incorporate this suggestion and a new reference (Balsdon et al. 2015) used.</td>
</tr>
<tr>
<td>Laura</td>
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<td>The chapter has seven large passages that are repeated verbatim. While repetition of major points is useful, repeating entire sections is redundant and tedious; please rephrase judiciously.</td>
<td>We have reduced repetition of major points for more judicious use of space and less redundancy.</td>
</tr>
</tbody>
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The chapter is a bit uneven in its level of detail for a general audience. It would benefit greatly from a more consistent level of detail throughout. Recommending add more in-text citations in sections now without any at all and translating some of the technical jargon for the general reader.

We have reviewed the chapter text for the evenness of the overall "voice", added in-text citations, and used non-technical language in place of the technical jargon.

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<td>The text has been revised as suggested.</td>
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</table>

**Note:** The text has been revised to incorporate these suggestions. Examples of the negative impacts of changing seasonality on forests, wildlife and industry are moved directly to follow this statement.
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<td>Note that this sentence actually continues on p. 655, line 2 The cumulative effects of climate change, and the fact that we don’t have a strong sense of the overall picture of what those cumulative effects could be, seems to be a very important worthy of amplification. The studies cited in the chapter mostly dealt with one impact at a time, but what could the interactive, synergistic effects on health of the Northeast be, for example when a storm arrives and floods out power for extended periods, only to be followed by a heat wave, infectious diseases, food system disruption which limits food supply productivity and access, and compromised drinking water quality and access to healthcare? The U.S. has already experienced some extreme weather events like Hurricane Katrina, Superstorm Sandy, Hurricanes Harvey and Maria, among others, that had these cascading effects and caused multiple systems failures. It seems like estimating and projecting cumulative, interactive health impacts is important, needed information.</td>
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<td>667</td>
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<td>In le 4, please explain how is a “uncomfortably hot weather” defined (as days over 80 degrees Fahrenheit, please say so). Many people would not find temperatures in the 80s uncomfortable. They might also wonder, do people quickly become acclimated to temperatures in 80s? Please provide information to address these concerns.</td>
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<td>“Supporting evidence” to clarify... “1,000 fewer annual excess heat-related ER visits” because “fewer” and “excess” seems confusing when stated together.</td>
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<td>We agree that a definition would be helpful and have added a footnote that cites Appendix 5 for the definition. For example, by adding, “which occurs as maximum outdoor or indoor ambient heat.”</td>
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<td>Please provide a bit more explanation for key players in the general public of what we mean by “factors that drive vulnerability, perhaps substituting...” all socio-economic factors that can increase people’s health vulnerability to the harmful effects of heat.</td>
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<td>After consideration of this point, we have determined that the existing text is clear and accurate. The text has been revised to incorporate this suggestion.</td>
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<td>This section on climate-health impacts in the Northeast has omitted mention of several important health effects. We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information to include and therefore have not revised the chapter. The past Assessment reports are human health-focused. However, the 2022 update of the US Billion-Dollar Weather and Climate Events dataset (2018) provides a view of the full range of impacts. This section has been removed to provide more discussion on human health.</td>
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<td>This is a long first page; perhaps, important ideas, but providing a source citation would help readers who need some sense for these findings; or read more.</td>
</tr>
<tr>
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<td>Some questions and suggestions in this example of the piping plover. One, please explain why is this a “species of concern” – is that because of the population numbers, or because of its ecosystem importance? Two, who uses the “Plover” smartphone application – only researchers or citizens too? Three, none of the text box examples used to describe key languages within human community adaptation coping, which is a major concern of most readers of the Northeast chapter. Suggest including one or more dedicated box of how human communication and neighborhoods are adapting to climate change.</td>
</tr>
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<td>“Supporting evidence” to clarify... “traffic and injury.”</td>
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The text has been revised to incorporate the additional clarification requested for the piping plover case. Examples of this adaptation have already been highlighted in the chapter text. A human community example was added to Box 18.4.
**First Name** | **Last Name** | **Comment ID** | **Comment Type** | **Chapter** | **Figure/Table Number** | **Start Page** | **Start Line** | **End Page** | **End Line** | **Comment** | **Response**
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
Juanita | Constible | 142045 | Traceable Account | 18: Northeast | 178 | 1 13 | Please provide in this chapter either a description, or a note on where to find a description, of the distinction between "likelihood" and "confidence" as applied in the Traceable Accounts. | The information is provided in the front matter of the NCA.
Juanita | Constible | 142045 | Traceable Account | 18: Northeast | 178 | 7 16 | 26 | Please, please, please!! Notice word count of comment "...minimum rise expected in other region?" Please. | The suggestion has been incorporated.
Juanita | Constible | 142056 | Traceable Account | 18: Northeast | 178 | 7 16 | 17 | For clarity, please use "southern" instead "southern and movement," which makes modern warmer if this is something about tectonic movement. | After consideration of this point, we have determined that the existing terminology is accurate. Vertical movement includes subsidence from both tectonic and non-tectonic effects, both of which are factors in the NE.
Juanita | Constible | 142077 | Traceable Account | 18: Northeast | 179 | 7 16 | 18 | For clarity, please substitute "model fit" rather than "require." | The comment has been incorporated.
Juanita | Constible | 142028 | Traceable Account | 18: Northeast | 180 | 681 11 | 11 Consider adding "and involved in" after "largely supported by," since rural communities are a part of these systems as well. | The key messages have been revised to provide consistency, more specificity, and reflect the content in the narrative. The traceable accounts have been updated to reflect these changes.
Juanita | Constible | 142029 | Traceable Account | 18: Northeast | 180 | 681 11 | 11 Please consider adding "tourism" to the list, as that is quite important to rural economies. | The key messages have been revised to provide consistency, more specificity, and reflect the content in the narrative. The traceable accounts have been updated to reflect these changes.
Juanita | Constible | 142060 | Traceable Account | 18: Northeast | 181 | 681 11 | 11 US DEGREES Fahrenheit translates to 55 degrees Celsius, please re-check your conversations here and fix. | This sentence has been removed. All conversions have been checked and revised if necessary.
Juanita | Constible | 142061 | Traceable Account | 18: Northeast | 181 | 681 10 | 10 Please specify what the "recent three-year period" was. | The text has been revised to provide the 3-year period.
Juanita | Constible | 142062 | Traceable Account | 18: Northeast | 183 | 681 14 | 19 The information in these two sentences would be good to amplify, as they describe the scope of Northeast climate health impacts. Some more specificity in the geographic range of the cities affected would be helpful. | The cited report by the EPA (EPA 2.0) provides estimates of excess deaths for the entire region rather than city-specific results. See the report for additional details about how these estimates are generated. The Estada (2017) paper provides global rather than local or regional estimates. As suggested, the text has been revised to fully highlight both of these points.
Juanita | Constible | 142063 | Traceable Account | 18: Northeast | 184 | 684 6 | 6 Please check the conversion between Celsius and Fahrenheit (an increase of 8 deg C is 14 deg F, and an increase of 1 deg C is 1.8 deg F); and delete the negative sign "-" from in front of "13 deg C." | The chapter text has been revised to reflect this comment.
Juanita | Constible | 142064 | Traceable Account | 18: Northeast | 184 | 684 7 | 7 Remove punctuated ending or at end sentence and replace with period. | The chapter text has been revised to reflect this comment.
Juanita | Constible | 142085 | Traceable Account | 18: Northeast | 191 | 691 12 | 12 In the reference list, should all the US EPA citations be together? Presently, some are under "EPA" and others under "US EPA." | The text has been revised to reflect this comment.
McFeely | 142066 | Text Region | 18: Northeast | 147 | 647 10 | 20 I am concerned about the use of the word "irreversible." This can be viewed as a statement that we have passed a tipping point and that emission reductions implemented now in the future will have no impact. To what extent have models actually been used to evaluate what happens after decades of reduced greenhouse gas emissions? I think you need to be careful about the use of irreversible. Also note that on page 677, it says that there is very high confidence in this statement regarding irreversible changes. I believe that there is very high confidence that the changes described will occur. But is there also very high confidence in the irreversible nature of these changes? | The sentence was revised and the term "irreversible" removed to incorporate this perspective.
McFeely | 142067 | Figure | 18: Northeast | 148 | 148 Depreciating 18.2. There are 7 symbols to represent the range, but only of the 7 appear on the figure. Why not maintain the range of the 7? Also, why is there no results for the central and southeastern portion of the region? | The symbology used in the legend has been updated and the southern part of the region removed as no results exist in the study from which this figure was derived. This eliminates large geographic areas for which there are no results.
McFeely | 142068 | Text Region | 18: Northeast | 149 | 649 9 | 6 What is the direction of the shift? | Directability of shifts are varied for the ecosystem components mentioned in this sentence, and due to space constraints, we have not detailed the directability of specific timing shifts. For phytoplankton, we have also modified the phrasing to include more just plain timing, but also broader characteristics of the bloom.
McFeely | 142069 | Text Region | 18: Northeast | 149 | 649 19 | 21 Replace annual lowest streamflows with annual minimum streamflows, if that is what is meant. Same on line 20. | The text has been revised to replace "annual lowest streamflows" with "annual minimum streamflows" as suggested.
McFeely | 142070 | Text Region | 18: Northeast | 150 | 650 1 | 1 Does less predictable mean more variability in the model predictions, or just more uncertainty? | The text has been revised to say "increasing variability."
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<td>If not key messages, language about vulnerable populations should be highlighted in the summary overview. This comment is related to a previous comment: The NE has many vulnerable populations (elderly, children, indigenous, poor, etc.) which large cities (Boston, Philadelphia, Baltimore) and rural communities. As climate change is superimposed on existing vulnerabilities, we suggest including language that specifically mentions vulnerable populations in these key messages.</td>
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<td>We updated this introductory text to include the potential for increased flooding on urban areas. We believe that the present text on coastal flooding is inclusive of storm surge.</td>
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<td>We appreciate this suggestion, but space and references specific to the regions that meet IQA standards are not well established. When possible, we have included some additional statements as to the impact of saltwater intrusion on drinking supplies.</td>
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<td>The text on pg. 657 and 654 is repeated verbatim. Generally speaking, the layout of some of these sections is repetitive and a bit confusing.</td>
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<td>We have added the following reference: Davis, J. A., R. Hoag, and D. A. Cayan (2015), with respect to current sea level (Sella et al. 2009; Karegar et al. 2016; Love et al. 2016; Sweet et al., 2017). We have added the following reference: Valle-Levinson, A. (2017), have been connected to these recent accelerations in the SLR rate in the region. &quot;North of Cape Hatteras, NC, several decades of tide-gage data through 2009 along the mid-Atlantic Coast have shown sea level rise rates were those to four times higher than the global average rate (Keller et al. 2012; Bost et al. 2012; Ezer et al. 2012) (figure 1A.6). The region's sea level rise rates are increased by land subsidence (sinking)—largely due to vertical land movement related to the melting of glaciers from the last ice age—which leaves much of the land sinking with respect to current sea level (Sella et al. 2009). Kamargo et al. 2016; Love et al. 2016; Sweet et al., 2017). Additionally, shorter-term fluctuations in the variability of ocean currents (Kopp 2012; Rahmstorf et al., 2013; atmosphere shifts (Zali-Lecointre et al., 2015), and/or mass loss from Greenland and Antarctica (Larsen and Vinogradova, 2017) have been connected to these recent accelerations in the SLR rate in the region. &quot;</td>
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<td>We have added the following reference: Bost et al. 2012; Ezer et al. 2012; Valle-Levinson (2017) have been connected to these recent accelerations in the SLR rate in the region. &quot;</td>
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<td>We greatly appreciate the reviewer's comment about the report and hope that the content is useful. Please note that interdisciplinarity is also discussed in other part of the report including Chapters 11 and 17.</td>
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<td>We have added additional language about saltwater intrusion in the key messages.</td>
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<td>This comment has been incorporated into the key message 2 using Atlantic sturgeon, Atlantic salmon, and right whales as examples.</td>
<td></td>
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</tbody>
</table>

Note: The text has been edited to provide clarification as potential contributors to the recent trend: "North of Cape Hatteras, NC, several decades of tide-gage data through 2009 along the mid-Atlantic Coast have shown sea level rise rates were those to four times higher than the global average rate (Keller et al. 2012; Bost et al. 2012; Ezer et al. 2012) (figure 1A.6). The region's sea level rise rates are increased by land subsidence (sinking)—largely due to vertical land movement related to the melting of glaciers from the last ice age—which leaves much of the land sinking with respect to current sea level (Sella et al. 2009). Kamargo et al. 2016; Love et al. 2016; Sweet et al., 2017). Additionally, shorter-term fluctuations in the variability of ocean currents (Kopp 2012; Rahmstorf et al., 2013; atmosphere shifts (Zali-Lecointre et al., 2015), and/or mass loss from Greenland and Antarctica (Larsen and Vinogradova, 2017) have been connected to these recent accelerations in the SLR rate in the region. "
The section discusses some of the issues that climate change poses to water systems (supply and wastewater) and the resulting health impacts. In addition to everything mentioned, we highly suggest that this section includes language about the great risk of inundation to wastewater infrastructure given the location of these assets. Water infrastructure including infrastructure like outfalls or wastewater or water treatment plants, is often located in current or future floodplains and may be vulnerable to flooding and damage associated with storm surge. Another potential natural areas to make this point could be on page 687, lines 28 to 30.

The authors considered this comment and agree that this sentence is constructed as written.

We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information to include and therefore have not revised the chapter.

This sentence is implying that planting trees lead to an increase in VOCs. This wording is unclear. If trees can be a source of VOCs, this should be explained further.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

The text was revised to incorporate the additional clarification requested for the plover case study. Examples of such adaptation have already been highlighted in the chapter text (Box 18.6).

Example of the text has been revised to highlight the fact that all paper residents are vulnerable.

The revised Figure 18.1 is a locational map of the states in the Northeast region, that includes population densities. Detailed regional geographic information is not within the context of this report. Heavy precipitation is a cross-cutting issue that is covered in several Key Messages.

We have broadened this statement to indicate a range of nutrient sources, but for sparsely reasons we could not fit in all.

The revised figure 18.1 is a locational map of the states in the Northeast region, that includes population densities. Detailed regional geographic information is not within the context of this report. Heavy precipitation is a cross-cutting issue that is covered in several Key Messages.

The revised figure 18.1 is a locational map of the states in the Northeast region, that includes population densities. Detailed regional geographic information is not within the context of this report. Heavy precipitation is a cross-cutting issue that is covered in several Key Messages.

We have broadened this statement to indicate a range of nutrient sources, but for sparsely reasons we could not fit in all.


We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

Revise the sentence, “Implementing resiliency planning and climate change adaptation in order to preserve the cultural, economic, and natural heritage of the Northeast would require ongoing collaboration among tribal, rural, and urban communities as well as municipal, state, and federal agencies.”

We would be helpful to add a list of the states that are in the Region, how many people live in the Region and their key demographics, housing stock information and that the Region has the highest increase in heavy or more consecutive hours.

As there are multiple reasons for the exacerbation at the coastal margin, the following language additions are suggested. “At the coastal margins, acidification is exacerbated due to nutrients from sources including fertilizer runoff, sewage treatment plants, septic systems, stormwater runoff, and atmospheric deposition during heavy wet events.” Some of the other coastal nutrient sources are more significant than fertilizer runoff.

The revised Figure 18.1 is a locational map of the states in the Northeast region, that includes population densities. Detailed regional geographic information is not within the context of this report. Heavy precipitation is a cross-cutting issue that is covered in several Key Messages.

We have broadened this statement to indicate a range of nutrient sources, but for sparsely reasons we could not fit in all.

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<td>Michael</td>
<td>Authors</td>
<td>143185</td>
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<td>NE</td>
<td>18</td>
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<td>26</td>
<td>Uncertainties discussed regarding air quality in this chapter seem to be contradicted by the conclusion in Chapter 13 Air Quality. Several studies to date have examined the expected air quality impacts from climate change in the U.S., with consistent concluditions that increasing temperatures associated with climate change are a driver to increase ozone and PM levels, exposure, and health impacts. The magnitude and regional allocation of these air quality impacts is still uncertain. See: Fernando Garcia-Almeida, Rebecca E. East, Enesan Monire, andcalculate E. Selin (2015). U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation. Environ. Sci. Technol., 49 (10), pp 7560–7568, DOI: 10.1021/acs.est.5b03134</td>
<td>Our expressions of uncertainties are consistent with those in the traceable accounts for Chapter 13.</td>
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<tr>
<td>David</td>
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<td>16</td>
<td>The Union of Scientists Concerned is a collection and categorised over 200 New England community adaptation plans in an effort to understand how communities that are starting their resilience planning, <a href="http://www.epa.gov/climate">www.epa.gov/climate</a></td>
<td>The author thanks you for this reference. It is referenced in Key Message 5.</td>
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<td>This was particularly strong in addressing in going activities communities are taking to reduce risk that demonstrate the value of workable adaptation solutions with early adoption</td>
<td>Authors appreciate the reviewer's comment.</td>
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<td>This test has been incorporated into KB 2, primarily as an impact of warming temperatures and future projections. Ecological-social linkages associated with changing species are also discussed in KB5.</td>
<td>This text was revised to incorporate this perspective. The text has been updated by identifying the historic sites as &quot;nationally significant.&quot;</td>
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<td>Added clarification regarding action items. Additional text regarding barriers to action have been added.</td>
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There is no mention here that what is a hot going up in the wet bulb temperature. The increase in the absolute humidity will make overall temperatures feel a lot warmer—that is, the discomfort index goes up more than the temperature. This increase in absolute humidity will have very important implications for the air conditioning load as it takes of order 20 times as much energy to pull the temperature of moist air down a degree as it takes for dry air. Keeping absolute humidity down in buildings will require tightening up of the buildings, and this will have health effects; indeed, frequently going in and out of air-conditioned buildings would seem likely to cause health problems.

The call out box has been re-named to better represent the content and the focus on historical sites and cultural landscapes.

Thank you for your comment. The author team agreed that the current text is appropriate as written.

The call out box has been re-named to better represent the content and the focus on historical sites and cultural landscapes.

Thank you for your comment. The creation of a public access anthropogenic climate risk register is outside the scope of this report. The National Climate Assessment summarizes the state of the climate and does not make policy prescriptions.

We agree that adding R 8.5 would be helpful, and have made the addition.

We appreciate the suggestion and have determined that the current figure illustrates what one Southeast coastal city, Charleston, has done to address sea level rise. Our sea level rise strategy came out before the Slang et al., 2017 and NCA4 OSIA, thus used previously available federal scenarios (e.g., USADE and NOAA - NCA4). We think it important to show existing work on this. The City of Charleston is discussing possibly updating their guidance to include the NCA4 scenarios.

The value added by using a sea-level rise projection figure that is not based on the scenarios developed for the NCA is unclear.

We appreciate the support that adding R 8.5 would be helpful, and have made the addition.

The value added by using a sea-level rise projection figure that is not based on the scenarios developed for the NCA is unclear. We think that the issue needs to be mentioned, etc.

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climate change will have negative impacts has yet to be determined and appears increasingly unlikely. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. The award was not provided to the Tribe but to the State to implement a voluntary resettlement program of all residents of the island, whether they are affiliated with the Tribe or not. Due to Fair Housing Act, the option to resettlement must be provided to any resident, and may not be exclusive to members of the Tribe. Suggest clarifying this fact in the summary. Correct, the HUD/NDRC Award was given to the State of Louisiana. "State of Louisiana" has been added to the text. The HUD publication, "NDRC Grantee Profiles, State of Louisiana, 2016," page 10 states that one of the projects awarded to the State of Louisiana is for relocation of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe. Correct, the HUD/NDRC Award was given to the State of Louisiana. "State of Louisiana" has been added to the text. The HUD publication, "NDRC Grantee Profiles, State of Louisiana, 2016," page 10 states that one of the projects awarded to the State of Louisiana is for relocation of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe. There is no "Isle de Jean Charles Tribe." Many residents of Isle de Jean Charles identify with the Isle de Jean Charles Band of Biloxi-Chitimacha-Chicotais Tribe, which is the accurate title for the Tribe. Suggest clarifying this in the following way: "The relocation plan . . . will include several community facilities at the relocation site, including a tribal center and health facility." The full name of the Tribe has been included. Comment noted regarding the importance of federal agencies, in particular the Fair Housing Act. This sentence does not imply exclusion to anyone. Only that climate migration/evacuation at a community level will take some flexibility. Under the Extreme Rainfall Events Are Contributing to Increased Inland and Coastal Flooding section (page 733 line 6) the flooding in south Louisiana in August 2016 is highlighted (page 734 lines 1-12). This event was preceded by flooding in north Louisiana in March 8-11, 2016 where some areas received upwards of 20 inches of rain in about a two-day span. This event was also unusually damaging to the region and could be mentioned to further illustrate that extreme events are becoming more commonplace. A sentence has been added to communicate that Isle de Jean Charles is not the only community experiencing effects from sea level rise. ADDED: Coastal communities in the Southeast are already experiencing impacts from higher temperatures and sea level rise (UGCCRP 2014, Hauer et al., Nature Climate Change 2016).
The present text says this: 1) Increasingly frequent extreme heat episodes and changing seasonal climates will increase exposure-related health impacts and economic vulnerabilities in the agricultural, timber, and manufacturing sectors. 2) By the end of the century, one or more billion labor hours could be lost from extreme heat-related impacts.

Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these health claims are highly questionable has already pointed out to the USGCRP. See for example: "2017: The “traceable accounts” section also emphasizes that the Southeast has multiple large coastal cities. We thank the reviewer for this comment, while a detailed accounting of such cross regional impacts is beyond the scope of this chapter there are two such impacts mentioned: regional infrastructure impacts can have a number one, as it contains several examples of how cities across the southeast are planning for and adapting to climate change; 2) the affects of altered prescribed fire activities from changing prescription windows (KM4)."

We added that reference to the following statement: "Coral elevation and volume in the Florida Keys have been declining in recent decades (Yates et al. 2017)."

We thank you for your comment. This statement is inconsistent with the state of the science, and references a non-peer-reviewed source. Please see the health chapter of this report, or USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Drewnoski, A.; Balbus, L.; Gomby, C.B.; Beane, J.F.; Bell, D.; Bogden, R.J.; Eison, N.; Farm, M.C.; Hawkins, S.E.; Herring, L.; Iantosca, D.M.; Milbs, S.; Nackers, M.C.; Satelis, J.; Trieg, L. and Ziska, L.B. U.S. Global Change Research Program, Washington, DC, 312 pp. https://doi.org/10.7930/T3XHVAPX"
It's great that the report will reflect on the recent extreme events that affected the region. For this specific topic, there is an opportunity to also reflect on the social vulnerability and what may have driven climate impacts, and how vulnerability and resilience outcomes may vary across community and population groups, and why. One point that should be made is how adaptive capacity varies across community and population groups, which may have determined the outcome. Taking the case of Hurricane Harvey and Irma, with similar baseline levels, the outcomes were very different - cities in FL, for example, had learned from past experience and implemented policies (such as building code, land use planning) to enhance resilience and infrastructure and the cities, whereas in regions affected by Hurricane Harvey in Texas, land use planning did not take into consideration the future risks of extreme weather events and the area displayed significant vulnerabilities and resulting damages from extreme events.

The Coordinating Committee moved the text to the bottom of KM2, which deals with coastal issues. It was also moved to the bottom of the Southeast section, as it was felt that the narrative flows better as written. The chapter has not been revised to incorporate this perspective.

The text was revised to incorporate this change.

This case study was intended to illustrate that plants of cultural significance are threatened by climate change and existing stressors. The text was revised to incorporate this change.

The case study was moved to the bottom of KM2, which deals with coastal issues. The text was revised to incorporate this change.

The text was revised to incorporate this change.
A fire case study is mentioned, yet there is no fire case study. The paragraph should also mention the health risks from wildfire smoke: https://www.nws.noaa.gov/om/wildfire_info/2016.pdf.

We have changed KM2 to be more specific about what is covered in this section and believe this addresses the comments on page 21. We have added more specific examples of how cities are adapting. Providing a comprehensive list would take too much space.

We greatly appreciate the reviewer's comment. We have changed KM2 to be more specific about what is covered in this section and believe this addresses the comments on page 21. We have added more specific examples of how cities are adapting. Providing a comprehensive list would take too much space.

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climate change will have negative impacts has yet to be determined and appears increasingly unlikely. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are “questionable”. All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states “That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.” This comment is not consistent with consensus of the scientific community.

David Wojick 141712 Test Region 20. US Caribbean 795 799 12 12 Here is the present text: 6 Key Message 1: Freshwater is critical to life throughout the Caribbean. Increasing global 1 carbon emissions could lead to a steep reduction in rainfall by the end of the century, 2 constraining freshwater availability. Rainforests could experience a permanent supply deficit by 2025. Subterranean intrusion associated with sea level rise will reduce the quantity and 3 quality of freshwater in coastal aquifers. Increasing variability in rainfall events and 4 increasing temperatures will likely exacerbate existing problems in water management, 5 planning, and infrastructure capacity. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are “questionable”. All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states “That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.” This comment is not consistent with consensus of the scientific community.

David Wojick 141714 Test Region 20. US Caribbean 798 798 20 20 The present text says: 39 Key Message 3: Marine ecological systems provide key ecosystem services such as commercial 44 and recreational fisheries and coastal protection. These systems are threatened by changes 48 in ocean temperature and acidity, sea level rise, and changes in the frequency and 49 intensity of storm events. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are “questionable”. All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states “That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.” This comment is not consistent with consensus of the scientific community.

David Wojick 141715 Test Region 20. US Caribbean 802 802 15 15 Here is the present text: 53 Key Message 4: Island economies, critical infrastructure, property, cultural heritage, and 56 natural ecological systems are all threatened by sea level rise, coastal erosion, and extreme 58 weather. Stronger waves and higher storm surges will worsen coastal flooding and 59 increase coastal erosion, leading to diminished beach area, loss of coastal protection, 60 decreased tourism revenue, impairment of public services, and negative effects on 62 communities’ livelihoods and well-being. The U.S. Caribbean could experience a near 3-foot 63 rise in sea level by 2050 and about 10 feet by 2100. Puerto Rico and the U.S. Virgin Islands 64 could lose up to 3.5% and 4.6% of total coastal land area respectively under a 6.5 feet sea 65 level rise scenario. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are “questionable”. All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states “That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.” This comment is not consistent with consensus of the scientific community.

David Wojick 141716 Test Region 20. US Caribbean 805 805 23 23 Here is the present text: 73 Key Message 4: Social well-being, terrestrial ecosystems, agricultural services and socio 74 ecological and technological systems are threatened by rising temperatures. Increased 75 temperatures are likely to lead to decreases in agricultural productivity, changes in habitat 76 functionality and wildlife distributions, and increased risk to human health in vulnerable 77 populations. As maximum and minimum temperatures increase, there is likely to be fewer 78 cool nights and more frequent hot days that will affect the quality of life in the U.S. 79 Caribbean. Comment: This entire message falsly states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are “questionable”. All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states “That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.” This comment is not consistent with consensus of the scientific community.
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<td>Michael</td>
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<td>144490</td>
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<td>20: US Caribbean</td>
<td>894</td>
<td>894</td>
<td>4</td>
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<td>The present text says this: &quot;24 Key Message 5: Decreasing frequency of extreme events threatens US, property, and economy in 25 the Caribbean. The frequency and intensity of extreme events such as hurricanes, tropical 26 storms, flooding, heat waves, and droughts are expected to increase, affecting human 27 and well-being, economic development, conservation, and agriculture. Resilience will 28 depend on collaboration and integrated planning, preparedness, and responses across the 29 region. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. The fact that the CMIP5 models run thus is well known. See just as an example &quot;FakeScience: The New Climate Science That Changes Everything,&quot; Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. [<a href="http://store.cato.org/book/fakescience">http://store.cato.org/book/fakescience</a>] The USGCRP was informed of these deficiencies after 493. Apparently they have now chosen to ignore this information. See for example [<a href="https://www.cato.org/publications/the-missing-science-from-the-third-national-assessment">https://www.cato.org/publications/the-missing-science-from-the-third-national-assessment</a>, April 2013].</td>
<td>The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are &quot;speculative&quot;. All models produce results with inherent uncertainty; nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states &quot;That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.&quot; This comment is not consistent with consensus of the scientific community.</td>
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<td>Chang</td>
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<td>7</td>
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<td>The present text says this: &quot;In Chap. 20 p 600 lines 2-7 (cf sentence beginning with &quot;When considering&quot;): Please note that this statement appears to stand as the only reference to Indigenous and traditional communities for this region and that these populations may be underestimated for this assessment, given that they have not yet been included in previous assessments to date. Given the emphasis for inclusion of local, traditional and indigenous forms of knowledge in the most recent IPCC working group II [5] and recognition of the need for further inclusion of indigenous peoples for NCA4 [2], chapter authors for this regional chapter could benefit from including additional data regarding unique impacts, considerations, and sources of knowledge for these communities. Are there any current or past case studies for this region addressing these concerns that the authors could consider including? Authors may also want to consider shifting to Key Message II: Adaptive Capacity and Building Resilience, especially in regards to &quot;shared knowledge, collaborative research and monitoring&quot; References: [1] Field CB, Barros VR, Dokken DJ et al. (2014) Technical summary. In: Climate change 2014: Impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Field, CB, et al (Eds), Cambridge, United Kingdom and New York: NY, Cambridge University Press, pp. 35-84. [2] Malloson A, Bull Bennett TM, Chief F, Cochran P, Cossentino K, Gough B, Hal Reddick M, Lynx L, Maynard N, Vaggesen G (2012) Engagement with indigenous peoples and forming traditional knowledge systems. Clim Chang, doi: 10.1007/s10584-013-0957-7</td>
<td>This appreciation the suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.</td>
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<td>Winter</td>
<td>Armstrong</td>
<td>144398</td>
<td>Figure</td>
<td>20: US Caribbean</td>
<td>293</td>
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<td>2</td>
<td>5</td>
<td>For the Figure, it would be good to indicate where these measurements are being taken exactly.</td>
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<tr>
<td>Winter</td>
<td>Armstrong</td>
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<td>Text Region</td>
<td>20: US Caribbean</td>
<td>293</td>
<td>293</td>
<td>5</td>
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<td>A description of QA already exists in Chapter 9, p 244, doesn't make sense to repeat it again here.</td>
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<td>785</td>
<td>6</td>
<td>6</td>
<td>Resilience doesn't just reduce the need for disaster relief, but also improves the speed with which a place can rebound from a disaster. Places like Puerto Rico, with very poor reliability will be impacted for much longer, with significant impacts to the economy.</td>
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<tr>
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<td>White Page</td>
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<td>812</td>
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<td>It is unclear if this is considering the impacts of the storm damages from U.S. Caribbean Islands to the mainland.</td>
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<td>Brown</td>
<td>March</td>
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<td>Text Region</td>
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<td>893</td>
<td>893</td>
<td>7</td>
<td>7</td>
<td>We thank you for this important comment. We have developed an extensive cal-out box on the 2017 Hurricane season to address this.</td>
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<td>Arantina</td>
<td>Lascurin</td>
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<td>Text Region</td>
<td>20: US Caribbean</td>
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<td>Please add a citation to sentences referring to traditional/knowledge being an important source of information for climate resilience that should be respected and incorporated. Please seek out additional references which exist in the peer-reviewed literature (additionally through ethnography, Museum of the American Indian). A statement should also be included regarding rural communities as integral to the Caribbean cultural heritage and the climate agricultural and forest products industries across the islands.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144490</td>
<td>Text Region</td>
<td>20: US Caribbean</td>
<td>894</td>
<td>894</td>
<td>4</td>
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<td>In this global rainfall will increase, I recommend changing &quot;in rainfal&quot; to &quot;in rainfall in this region&quot; or &quot;in this region's rainfall&quot; in order to make clear the point about this region. It is that report also talks about extreme rainfall going up, might be helpful to the reader to say &quot;yearly hurricane rainfall&quot;</td>
<td>Thank you for your comment. The text has been revised to incorporate your suggestion. &quot;In rainfal&quot; is replaced with &quot;in rainfall in the region&quot;. We also made the distinction between the projected declines in rainfall in this region and increases in the extreme rainfall events: &quot;while extreme rainfall events are expected to increase in intensity (such as rainfall associated within hurricanes), which can increase freshwater flooding impacts. &quot;</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144491</td>
<td>Text Region</td>
<td>20: US Caribbean</td>
<td>894</td>
<td>894</td>
<td>12</td>
<td>12</td>
<td>If suggest changing &quot;stability&quot; to &quot;adaptability&quot; as the pH will still be above 7</td>
<td>Changed to &quot;adaptability&quot; as suggested.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144492</td>
<td>Text Region</td>
<td>20: US Caribbean</td>
<td>894</td>
<td>894</td>
<td>24</td>
<td>24</td>
<td>&quot;Need species&quot; seems like too much jargon. If it is only or mainly fish, then perhaps just say fish and then in the text better clarify what the term means as the sentence does not now read very clearly. And don't think &quot;loss of coral&quot; is a very clear term either- with coral listed as a key marine habitat at the start of the sentence, why not a know issue?</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144493</td>
<td>Text Region</td>
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<td>Regarding &quot;decreased tourism/revenue&quot; - I think it would be hard to assign at the revenue aspect given there are many considerations. How about saying &quot;decreased tourism appeal&quot; or something to indicate what the cause of the change is that is the main driver.</td>
<td>Thank you for your comment. The Key Message text has been revised to incorporate your suggestion, &quot;decreased tourism appeal&quot;.</td>
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<td>20. US Caribbean</td>
<td>20. US Caribbean</td>
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<td>144502</td>
<td>120</td>
<td>144499</td>
<td>It seems to me that putting in the worst-case level rise scenario here will make it seem very alarming. Yes, this “could” happen–basically anything “could” happen. Using the words “could” and “may” are really poor practice in assessments because they give no sense of likelihood. The sentence needs to be revised using the lexicon for likelihood. What also bothers me here is the focus on dates as if they really matter—what really perhaps matters is the commitment to future increase in sea level and not so much the exact decade it occurs, so the type of sentence that I would suggest is something like: “Unless the rise in the CO2 concentration is soon stopped, sea level rise over the 21st and 22nd centuries is likely to be by at least 5 to 10 feet or more, causing significant inundation of many Caribbean islands. For example, Puerto Rico—... just that they list the indicated amounts of rise to the specific dates will be criticized as alarmist, whereas it seems to me much harder to challenge the scenario. We have more confidence in how much the coastal area will rise with sea level than in exactly when the rise will occur, so after the sentence does one can say the “likely” from the decade and just be looser on the dates. Indeed, does it really matter if my son or my grandson or we will experience the rise (and not I am using “will” here as a second person) is virtually impossible to answer, whether the concerns that I have are high.</td>
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<td>Field Region</td>
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<td>With less precipitation, it will mean a lower humidity and what might that mean? If the boundary layer stays warm, then the absolute humidity is also rising, thus easing the comfort index even more than the temperature. Given that key Message 5 focuses on extremes, I wonder if it would help Key Message 4 to mention that this point is about the average change—as my first reaction was to wonder in this message where mention of extremes was. Indeed, maybe put key Message 5 a number 5 and then have this message as number 5 and say something like “Even in the absence of extreme storms, just the increase in the average temperatures will adversely impact social well-being.”</td>
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<td>Michael</td>
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<td>Field Region</td>
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<td>I’d suggest starting the sentence by saying “Increasing resiliency...” is to total resiliency really possible?</td>
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<td>Michael</td>
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<td>Field Region</td>
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<td>It suggest somehow rephrase the phrase “reduce the need for disaster relief” when it is pretty clear that the levels now being provided have been so inadequate, especially as the destruction of any severe storms is increasing. I would suggest that the storms will just tear apart the natural vegetation even if the buildings were made much stronger. I’d suggest it might be better to say: “have the potential to reduce the loss of life and speed recovery”–but I’d note that having more knowledge, doing research and monitoring and having better institutional adaptive capacity really does not say anything about helping to strengthen homes and buildings and only potentially imply that the electric, water, transportation systems will be more resilient. It seems to me that a terrible situation that has exist in the past months could be made somewhat less bad, but I don’t see how can ever say that this would reduce the need for normal disaster relief, so I’ll urge caution in the statement here. If Marine were to return, what would be needed is more aid that has yet been provided, even more island systems made more resilient. If one looks at Texas, which presumably was somewhat more resilient and the aid provided and time needed for recovery are very high and are overwhelming the present legal limits of responding so I’ll urge avoiding a statement suggesting that these actions would reduce the need for aid. Our whole country needs to know that lots more present commitments are going to be needed to deal with the impacts of climate change-induced extremes.</td>
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<td>Michael</td>
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<td>Field Region</td>
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<td>I’d suggest somehow rephrase the phrase “reduce the need for disaster relief” to something like “has the potential to strengthen the region’s collective ability to prepare for extreme storms and recovery efforts.” I don’t understand how this otherwise reduces vulnerability or reduces risks in associated with climate change uncertainties, this might help spread knowledge about how to better prepare, but that is not really a practical action. It seems to me that this might be a dangerous idea. It seems to me that we would involve preparation and recovery.</td>
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<td>Michael</td>
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<td>It might be fair to say that climate change project that future conditions will be increasingly variable but we have these conditions now, so they are not future scenarios, but scenarios of the future.</td>
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<td>Michael</td>
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<td>20. US Caribbean</td>
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<td>We eliminated “low-lying” as the statement is true regardless of topography.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
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<td>Field Region</td>
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<td>We focus on the charm of the places mentioned. It’s relationship to resilience and adaptive capacity is complex and difficult to talk about in a concrete manner with the amount of space available. All environments have their challenges and we would not characterize the tropics as “more simple” than temperate places.</td>
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<td>The premise of the comment is that tourism dominates the economy at the expense of adaptive capacity. Addressing this issue full would require more discussion than space permits.</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144504</td>
<td>Field Region</td>
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<td>20. US Caribbean</td>
<td>33</td>
<td>144502</td>
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<td>Not only is present infrastructure vulnerable, but it is pretty hard to envision how any cost efficient infrastructure would be made fully resilient to the extreme storms the region is and will experience.</td>
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<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144505</td>
<td>Figure</td>
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<td>20. US Caribbean</td>
<td>33</td>
<td>144502</td>
<td>120</td>
<td>144501</td>
<td>Precise numbers I think is neither justified nor really all that helpful.</td>
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Thank you for your comment. The Key Message text has been revised and no longer contains this scenario information. Thank you for your comment. The chapter text has been revised to remove the sentence “climate change scenarios project that future conditions will be increasingly variable” but still contain the sentence “has the potential to strengthen the region’s collective ability to prepare for extreme storms and recovery efforts.” Thank you for your comment. The chapter text has been revised to incorporate your suggestion. The statements now read: “Shared knowledge, collaborative research and monitoring, and building institutional adaptive capacity could help support and speed up disaster recovery, reduce the loss of life, enhance food security, and improve economic opportunity in the U.S. Caribbean. 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<td>144007</td>
<td>Figure</td>
<td>20- US Caribbean</td>
<td>793</td>
<td>18</td>
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<td>In the article, the term &quot;institutions that are at risk...other had in Puerto Rico considering the regional impacts?&quot; and &quot;other had...or the Caribbean as a whole...&quot; were altered to be more specific. The revised text is: &quot;...and what they mean for the Caribbean as a whole...&quot;.</td>
<td>Thank you for your comment. The chapter text has been revised to include this suggestion.</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144008</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>89-100</td>
<td>9-22</td>
<td>1</td>
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<td>Are there factors not just pose risks? Are they not already having an effect?</td>
<td>Yes, these factors are already having an effect. The risks will continue to grow. We have changed the sentence to reflect the ongoing changes: &quot;Changing climate and weather patterns, interacting with human activities, are affecting land use, air quality and resource management, posing growing risks to food security, the economy, culture, and ecosystems services.&quot;</td>
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<td>Michael</td>
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<td>Text Region</td>
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<td>89-100</td>
<td>20-20</td>
<td>1</td>
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<td>I'd suggest changing &quot;predictions&quot; to &quot;predictions...&quot;</td>
<td>Thank you for your comment. The chapter text has been revised to include this suggestion.</td>
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<td>Michael</td>
<td>MacCracken</td>
<td>144010</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>89-100</td>
<td>22-22</td>
<td>1</td>
<td></td>
<td>I suggest changing &quot;subject to climate change...&quot; or &quot;something like that...&quot;</td>
<td>Thank you for your comment. The chapter text has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144011</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>89-100</td>
<td>23-23</td>
<td>1</td>
<td></td>
<td>I suggest changing &quot;patterns&quot; to &quot;predictions...&quot;</td>
<td>Thank you for your comment. The chapter text has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144012</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>790</td>
<td>1-1</td>
<td>1</td>
<td></td>
<td>Need to replace &quot;may&quot; by choice from the lexicon.</td>
<td>We have replaced &quot;may&quot; with &quot;should be&quot; based on uncertainty guidance.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144013</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>790</td>
<td>8-9</td>
<td>1</td>
<td></td>
<td>I'm curious, what is the percentage for Puerto Rico and is really high compared to the whole area of the island, maybe the question is: what does &quot;low-lying&quot; mean?</td>
<td>We have replaced &quot;low&quot; with &quot;less&quot; in the text.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144014</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>790</td>
<td>14-18</td>
<td>1</td>
<td></td>
<td>I suggest...be less...</td>
<td>Thank you for your comment. The paragraph has been updated to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144015</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>790</td>
<td>37-38</td>
<td>1</td>
<td></td>
<td>We have detected...the evidence indicates...</td>
<td>Thank you for your comment. The paragraph has been updated to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144016</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>791</td>
<td>1-1</td>
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<td>I suggest...be less...</td>
<td>Thank you for your comment. The paragraph has been updated to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
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<td>Text Region</td>
<td>20- US Caribbean</td>
<td>791</td>
<td>21-21</td>
<td>1</td>
<td></td>
<td>I think it might be useful to say that average rainfall goes down, but hurricane-related rainfall amounts can go up. The sentence on lines 19-20 was kept, thinking it would help to clarify the situation.</td>
<td>Thank you for your comment. The paragraph has been updated to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144018</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>791</td>
<td>6-9</td>
<td>1</td>
<td></td>
<td>The spelling has been corrected.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
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<td>Text Region</td>
<td>20- US Caribbean</td>
<td>793</td>
<td>1-1</td>
<td>1</td>
<td></td>
<td>The paragraph was deleted from this section since a description of OA is not the focus of this chapter.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144020</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>793</td>
<td>18-18</td>
<td>1</td>
<td></td>
<td>We removed the word &quot;mobile&quot; from this paragraph to reflect the ongoing changes: &quot;Changing climate and weather patterns, interacting with human activities, are affecting land use, air quality and resource management, posing growing risks to food security, the economy, culture, and ecosystems services.&quot;</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
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<td>Text Region</td>
<td>20- US Caribbean</td>
<td>793</td>
<td>19-19</td>
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<td></td>
<td>We have added &quot;are likely to be...&quot; based on uncertainty guidance.</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144022</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>795</td>
<td>7-8</td>
<td>1</td>
<td></td>
<td>The word &quot;likely&quot; is a synonym for &quot;probably&quot;, which is very...</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144023</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
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<td>14-14</td>
<td>1</td>
<td></td>
<td>We replaced &quot;likely&quot; with &quot;are likely to be...&quot; based on uncertainty guidance.</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
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<td>144024</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>799</td>
<td>15-15</td>
<td>1</td>
<td></td>
<td>No, there is no real definition here of what &quot;mobile species&quot; means...</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144025</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>801</td>
<td>14-14</td>
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<td></td>
<td>We removed the word &quot;mobile&quot; from this paragraph to reflect the ongoing changes: &quot;Changing climate and weather patterns, interacting with human activities, are affecting land use, air quality and resource management, posing growing risks to food security, the economy, culture, and ecosystems services.&quot;</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144026</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>801</td>
<td>26-27</td>
<td>1</td>
<td></td>
<td>The paragraph has been revised to include this suggestion with some edits.</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144027</td>
<td>Text Region</td>
<td>20- US Caribbean</td>
<td>803</td>
<td>8-8</td>
<td>1</td>
<td></td>
<td>We have removed the word &quot;mobile&quot; from this paragraph to reflect the ongoing changes: &quot;Changing climate and weather patterns, interacting with human activities, are affecting land use, air quality and resource management, posing growing risks to food security, the economy, culture, and ecosystems services.&quot;</td>
<td>Thank you for your comment. The paragraph has been revised to include this suggestion.</td>
</tr>
</tbody>
</table>
It would help to give an indication of how long it takes for the area to get into drought—in something that happens in a few months or a year or more or what? And it would help to know if a hurricane alleviates a period, or does it take ongoing periods of rain—that is, does the drought occur due to a shortage of groundwater that has to be recharged or due to a persistent loss of soil-moisture?

Drought is an ambiguous phenomenon and the onset and end of a drought is hard to define in time and space (Emanuel, 2000). In the case of the meteorological droughts from 2000 to 2005, abnormally dry conditions before declaring a drought ranged from 3 weeks to 15 weeks as reported by the US Drought Monitor. In the US Caribbean, a period of heavy rainfalls can alleviate a drought by refilling reservoir levels diminished during the period of rainfall deficits and replenish the soils. This was the case for the 2014-2015 drought. There are different variables taken into consideration to declare a drought—while shortage of groundwater and soil moisture are two of the variables considered, but not the least refer to meteorological drought. We have added the following sentence: While the onset and end of a drought is hard to determine, records of the US Drought Monitor suggest that it takes only weeks of abnormally dry conditions before the declaration of a meteorological drought in Puerto Rico.

Does the Hatfield reference address the role of moisture concomitant with high temperatures? It seems that "Wet conditions at the end of the growing season can create elevated levels of mold, fungus, and toxins more common by late century in both scenarios" cite figure here as I didn’t know which scenarios until reading additional 380 premature deaths per year" I assume this is for Midwest only?

It would be appropriate to clarify that these values reflect estimates for 2090 (“end of century”) revised to: “By 2050, increased temperatures under a higher scenario will cost around $9.8 billion due to lost productivity and $170,000 in cost of care are the upper bounds of those estimates. We have decided to report the projected additional 380 premature deaths per year due to extreme heat (RCP8.5) estimated to be $10 billion.

Invasive species. It would be appropriate to highlight Great Lakes: A major freshwater resource, the Great Lakes are a very important ecological resource, and they should be mentioned in this key message. Since there were overlapping components of the suggested edit and the existing text, and because the key message was already pretty long, we added the Great Lakes in without quite the words “by” 2090” have been added to the sentence in question.

It is the style of the Executive Summary to not include specific references and figures are meant to stand one on their own. We removed “wild” from the key message. We did not insert “natives,” in part because the idea of “natives” is a bit more in flux given the potential for species from areas farther south (but from the central U.S) to move in to our region can be considered an invasion of “natives” or “non-natives” species, depending on your perspective. The concept of invasive species is addressed as a stressor, so we felt that not using “native” in the key message was appropriate. We agree that the Great Lakes are a very important ecological resource, and they should be mentioned in this key message. Since there were overlapping components of the suggested edit and the existing text, and because the key message was already pretty long, we added the Great Lakes in without quite as much detail.

It would help to give an indication of how long it takes for the area to get into drought—in something that happens in a few months or a year or more or what? And it would help to know if a hurricane alleviates a period, or does it take ongoing periods of rain—that is, does the drought occur due to a shortage of groundwater that has to be recharged or due to a persistent loss of soil-moisture?

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I don’t believe the Goring paper is really stating this. Yes, there are “lost” forests compared to FIA data but there is no evidence of particular species being lost, just mass changing. Diversity may not be less with trees, but certainly structurally denser changes. Positive feedbacks (e.g. Flato et al. 2013).”

Climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The Climate Science Special Report (NCA4 Volume 1, Chapter 4) addressed the confidence of use of climate model projections. They state, “Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability, and to reproducing their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g. Fato et al. 2013).”

I think ‘interspersed droughts’ should be added to this sentence, as it is not only excessive rain but also the longer intervals between rains on occasion that are detrimental to crops.

To the best of the authors’ knowledge, no newer data has been published. The lead author of the cited study was contacted and has not further updated those estimates. The citation was corrected to reflect that this report was published in 2005, not 1999. This correction was also made in the References sections of the chapter. The original value was provided in 1996 dollars, but has been revised to reflect 2015 dollars.

I don’t believe the Goring paper is really stating this. Yes, there are ‘lost’ forests compared to FIA data but there is no evidence of particular species being lost, just mass changing. Diversity may not be less with trees, but certainly structurally denser changes. Positive feedbacks (e.g. Flato et al. 2013).”

David Woipik 141719

Response

I think ‘interspersed droughts’ should be added to this sentence, as it is not only excessive rain but also the longer intervals between rains on occasion that are detrimental to crops.

To the best of the authors’ knowledge, no newer data has been published. The lead author of the cited study was contacted and has not further updated those estimates. The citation was corrected to reflect that this report was published in 2005, not 1999. This correction was also made in the References sections of the chapter. The original value was provided in 1996 dollars, but has been revised to reflect 2015 dollars.

I don’t believe the Goring paper is really stating this. Yes, there are ‘lost’ forests compared to FIA data but there is no evidence of particular species being lost, just mass changing. Diversity may not be less with trees, but certainly structurally denser changes. Positive feedbacks (e.g. Flato et al. 2013).”

David Woipik 141720

Here is the present text:

Climate change will cause extreme weather events and heat waves to become more frequent and more intense, with consequences including increased risk of heat-related deaths, crop yield reductions, increased water stress, and increased occurrence of insect and disease outbreaks. These changes will be most pronounced in the Midwest, where it is expected that temperatures will increase by 2-4°C by 2050. This will have significant impacts on agriculture, with potential for yield losses and increased costs. Despite the potential for negative impacts, there are also opportunities to adapt to these changes and reduce vulnerability. For example, improved irrigation systems and crop varieties can help mitigate the effects of increased water stress, while diversification of crops and livestock can help reduce the risk of crop failure. Overall, the key message is that it is possible to adapt to climate change and reduce vulnerability, but it will require significant investment and efforts.
<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>Peterson</td>
<td>142913</td>
<td>Whole Chapter</td>
<td>21</td>
<td>Midwest</td>
<td>21</td>
<td>26</td>
<td>22</td>
<td>29</td>
<td>The forests component of this chapter [Key Message 2] projects due consequences for hardwood forests, based primarily on statistical modeling, which has low credibility because it does not concern multilevel processes and competition, and is also uncorrelated to show big changes. There is not much information about causation or mechanisms. Including the results of relevant process models would provide a broader scientific perspective and provide more meaningful insight on the potential effects of climate change. Most Midwest forests have high species diversity, which suggests that there should be options for persistence of hardwood forests and maintenance of functionality, even though species distribution and abundance may change.</td>
</tr>
<tr>
<td>Juanita</td>
<td>Constible</td>
<td>142973</td>
<td>Whole Chapter</td>
<td>21</td>
<td>Midwest</td>
<td>7</td>
<td>14</td>
<td>8</td>
<td>16</td>
<td>For any reference to the RCPs, please consider adding &quot;emissions&quot; to lower convos and &quot;higher convos,&quot; for consistency.</td>
</tr>
<tr>
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<td>Test Region</td>
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<td>Midwest</td>
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<td>845</td>
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<td>74</td>
<td>This is a strong Key Message and should be retained in the Final Report.</td>
</tr>
<tr>
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<td>Constible</td>
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<td>Test Region</td>
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<td>25</td>
<td>Page 643-646 were the &quot;Executive Summary&quot; of the chapter which includes two graphics selected from the full chapter text, not necessarily in the same order.</td>
</tr>
<tr>
<td>Juanita</td>
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<td>Page 643-646 were the &quot;Executive Summary&quot; of the chapter which includes two graphics selected from the full chapter text, not necessarily in the same order.</td>
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<td>Page 643-646 were the &quot;Executive Summary&quot; of the chapter which includes two graphics selected from the full chapter text, not necessarily in the same order.</td>
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<td>21</td>
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<td>146</td>
<td>146</td>
<td>146</td>
<td>Why does Figure 21.1 appear after Figure 21.17?</td>
</tr>
<tr>
<td>Juanita</td>
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<td>142979</td>
<td>Test Region</td>
<td>21</td>
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<td>26</td>
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<td>Page 643-646 were the &quot;Executive Summary&quot; of the chapter which includes two graphics selected from the full chapter text, not necessarily in the same order.</td>
</tr>
<tr>
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<td>Constible</td>
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<td>Test Region</td>
<td>21</td>
<td>Midwest</td>
<td>848</td>
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<td>39</td>
<td>40</td>
<td>Thank you for this suggestion. We have added some text that refers to energy insecurity in the Midwest, as well as the citation provided.</td>
</tr>
<tr>
<td>Juanita</td>
<td>Constible</td>
<td>142981</td>
<td>Test Region</td>
<td>21</td>
<td>Midwest</td>
<td>870</td>
<td>870</td>
<td>12</td>
<td>13</td>
<td>Thank you for this suggestion. We have added some language and a citation (Abel et al. 2019) that addresses the potential consequences of air pollution reduction by replacing electricity generation with solar photovoltaics.</td>
</tr>
<tr>
<td>Juanita</td>
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<td>Test Paragraph</td>
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<td>15</td>
<td>Thank you for this suggestion. We have added some language and a citation (Abel et al. 2019) that addresses the potential consequences of air pollution reduction by replacing electricity generation with solar photovoltaics.</td>
</tr>
<tr>
<td>Juanita</td>
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<td>Test Paragraph</td>
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<td>Thank you for this suggestion. We have added some language and a citation (Abel et al. 2019) that addresses the potential consequences of air pollution reduction by replacing electricity generation with solar photovoltaics.</td>
</tr>
<tr>
<td>Ben</td>
<td>Johnson</td>
<td>143085</td>
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<td>21</td>
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<td>1</td>
<td>Thank you for this suggestion. We have added some language and a citation (Abel et al. 2019) that addresses the potential consequences of air pollution reduction by replacing electricity generation with solar photovoltaics.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>14532</td>
<td>Test Region</td>
<td>21</td>
<td>Midwest</td>
<td>843</td>
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<td>16</td>
<td>17</td>
<td>We encourage the reviewer to read the cited literature to gain an accurate understanding of the kinds of models used in the forestry Key Message. In particular, discussion in the forestry Key Message drew heavily from four process models and one species distribution model used in the following publications: Brandt et al. 2014; 2017; Headley et al. 2014b; 2016; Headley et al. 2016; and Smolander et al. 2017. The Brandt, Headley, and Smolander models, and harvest and forested landscapes provide detailed discussion of the relative structure and assumptions of the species distribution and process models; the combined results of these models were used in considered assessments of species and ecosystem vulnerability. As an example, the UMDGAM and LANDIS Prox models work together using traits such as growing degree days, photosynthetically active radiation, and precipitation and temperature values (and many others) to simulate climate interactions with establishment, growth, mortality, competition, and succession. We appreciate the suggestion to include more discussion of ecological mechanisms and relative model structure in the forestry Key Message, but space is limited. We refer those interested in a deeper treatment of statistical or simulated modeling of ecosystem function to the provided citations. The authors emphasize that the cultural and economic interactions of people with Midwestern forests extends beyond viewing them simply as &quot;hardwood&quot;; in fact, there are numerous forest types and communities that people value highly with the current species abundance and structure, and would consider to be a loss if the identities of those forest communities were to change. We encourage the reviewer to explore how many Midwesterners consider forest vulnerability and adaptation and the following citations also provide in the Key Message: Brandt et al. 2017; Jarnow et al. 2014 and Ortin et al. 2014.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>14533</td>
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<td>19</td>
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<td>I don't understand what &quot;central&quot; applies to--is this just the center of Lake Michigan, or also Ontario? And is it to the centers of these lakes that, at present as opposed to in the past, rarely have ice cover? This is just not very clear.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>14534</td>
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<td>21</td>
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<td>846</td>
<td>846</td>
<td>9</td>
<td>9</td>
<td>We greatly appreciate the reviewer's comment. This topic was discussed on page 863, lines 7 through 11. I'm not sure if more references are needed. Kim? One reply--I agree these risks should come in again--I added a few lines as suggested in a previous comment--in the beginning of the biodiversity section to highlight the Great Lakes as an ecosystem, and added a sentence on options in the Great Lakes box.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>14535</td>
<td>Test Region</td>
<td>21</td>
<td>Midwest</td>
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<td>7</td>
<td>This is a strong Key Message and should be retained in the final report.</td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>14536</td>
<td>Test Region</td>
<td>21</td>
<td>Midwest</td>
<td>847</td>
<td>847</td>
<td>1</td>
<td>2</td>
<td>This is a strong Key Message and should be retained in the final report.</td>
</tr>
</tbody>
</table>

The text has been revised as suggested.
The data in the figure are correct, but the legend was incorrect. This is being corrected.

The text was altered as suggested by the reviewer.

First Name Last Name Comment ID Comment Type Chapter Figure/Table Number End Page Start Page Start Line End Line Comment Response
Michael MacCracken 144537 End Region 21 Midwest 847 847 13 13 Quite amazing that mining/silting (of coal) has not mentioned given it would have been huge back a few decades. Does it not merit mention now? Got thank the reviewer for the comment. While these industries are still important in the Midwest, the direct climate change impacts on them are not as significant as the ones already identified here. They would likely be affected by policy decisions but discussion of policy is beyond the defined scope of the National Climate Assessment.
Michael MacCracken 144538 End Region 21 Midwest 850 850 4 6 Really lost to stick to the likelihood branch and escape test of meaningless words like "may" (and could) That gives no sense at all of likelihood. Overall chapter seems to be doing well on avoiding use of these words - should do a similar test of them all. hiked "may" with "is expected to", linking the loss of tree species to forest type conversion. Additionally, the text describing forest ecosystem loss in the region was changed by adding "while other forests are at risk of conversion to non-native ecosystems by the end of the century," as uncertainty of forest loss in the region cannot be determined probabilistically from observations or modelled results. These changes were made on both pages 847 and 850.
Michael MacCracken 144539 End Region 21 Midwest 851 851 19 19 Hikes, another "may" to escape - so also back on page 847, line 13
Michael MacCracken 144541 End Region 21 Midwest 854 854 26 26 Three more uses of "may" that need to be replaced by choice from the branch. Please do a search through the chapter (and I'll stop identifying specific pages) as it really is more informative if words like "may" can be avoided, even if one has to say "it is possible" it also generally helps to add some qualifying phrase or have sentence of from " unlucky this... then it is likely that..." - on similar...
Michael MacCracken 144542 End Region 21 Midwest 862 862 3 9 From the first of the first assessment, I thought the model results projected that it was very likely that climate change would reduce lake levels (the increase in evaporation loss due to higher temperatures and reduction in ice extent) being larger than the effect of any additional precipitation on the watershed, which is not much larger than the lakes themselves. That level of confidence was questioned in government review process (sender Bath 2) and I had to explain that something like 11 of 12 modeling results showed this. Is this indication of sign now in doubt (indicated by using "may") and if so how is it currently wrong meaning?
"May" is now changed to "will more likely than not" and citation of Lofgren and Rouhana (2016) is added at this point. Lofgren and Rouhana (2016) addressed the method that had nearly universally been used to project Great Lakes levels under climate change between 1989 and 2010, with the formulation of the land in the basin, the lakes themselves, being the main source of the problem. The most extreme result found by Lofgren and Rouhana was that, using one particular GCM's results as input to the original Cirney method, the potential evapotranspiration in the Lake Superior basin's land increased by an amount equivalent to having 565 suns in the sky. Problematic assumptions in the original Cirney method include: 1. The assumption that increased air temperature causes increased evapotranspiration was taken for granted, leading even the effect of day length that is included in other simplified calculations of potential evapotranspiration. 2. Evapotranspiration extracted directly from GCM output is to be categorically ignored, even for the sake of comparison, despite significant advancements in that aspect of GCMs between 1989 and even better. 3. Extreme and unconfirmed calibration that minimizes error in runoff during the historical period of calibration will lead to a model that can be extended to other climatic regimes. 4. A simple energy constraint based on annualized averaged solar radiation applied only during the calibration period will ensure energy conservation in whatever time and climate regime the model is applied, so an explicit conservation of energy constraint is not required. The 565 sun problem strongly suggests that this last one is wrong, and GCMs since the 1980s have had schemes that explicitly conserve energy at the surface. To illustrate problems with temperature-based calculation of potential ET, see also Milly and Dave (2016, Nature) and others that they research group and beyond, although none of their results show problems as extreme as those in the Cirney method here, what happened with the 11 out of 12 cases. Each of those cases used data from a different GCM model, but each of those datasets was funneled through the same off-line hydrologic models used in the Cirney method, which was where the problem lay. Contrary to the way this was often described at that time, the GCMs themselves never projected lake levels, but required the intermediary of the Cirney method. During the Bath 2 era was when these increased became an internal NOAA struggle between Dr. Cirney (more senior scientist) and Dr. Lofgren (junior scientist). It didn’t hit the literature until Lofgren et al. (2011, J. Great Lakes Res.), but was still taken lightly enough in such secondary literature as NOAA that the more thorough treatment of Lofgren and Rouhana (2010) was deemed unnecessary. It is nearly impossible to overstate the problems with the Cirney method, and it is a chapter (and I’ll stop identifying specific places) as it really is more informative if words like “may” can be avoided, even if one has to say “it is possible”. It also generally helps to add some qualifying phrase or have sentence of from “unlucky this... then it is likely that...” - on similar...
Michael MacCracken 144543 End Region 21 Midwest 862 862 13 15 Is, why did lake levels rise so much? The rest of the paragraph also needs explanation - levels of some lakes can be controlled, but is there enough water for the whole system to be so little changed? If so, how, come and will not withdraws from the lakes be going up as warming occurs?
There is no literature source that gives a good explanation of why not only how during 2013-14. Gronewold (personal communication) likes to say that the cold period in early 2014 popularly called “the polar vortex” caused or, more carefully phrased, “cooled off”. There has been no real test of this, and the very rapid rise in lake levels began before that time. As for the much smaller drop in lake levels than previous projections, see Lofgren and Rouhana (2016) and the response to the previous comment. In short, saying that increased air temperature causes increased evapotranspiration is a vast oversimplification in this case, but you are correct. Sci-ents seriously over. Water withdrawal may go up somewhat, but results from Lofgren, Milly, and others show that this effect has been overestimated, also the effect was not calculated and does not enter into the cited Jacksons.
Michael MacCracken 144544 End Region 21 Midwest 863 863 40 40 Rather a complicated sentence.
This is a simple two sentences, with some wording of the second
Michael MacCracken 144545 End Region 21 Midwest 864 864 30 30 I think spelling is “publicly”
Michael MacCracken 144546 End Region 21 Midwest 866 866 3 11 Does it need to be said that quality will be a problem unless there is a conversion to vehicles that are not emitting CO2, NOx, etc., or is it that even with just natural emissions from the vegetation there would be a problem. Thus, in reducing use of fossil fuels a win for both climate and air quality, or not? If it really would be a win-win strategy, likely would be more clearly mentioning specifically.
The cobenefits of reducing use of fossil fuels for vehicles is addressed in the last paragraph - challenges and importance of the health sector. We have added a station that highlights the potential air quality benefits of moving to solar-generated electricity (Met, et al, 2010).
Michael MacCracken 144547 Whole Chapter 21 Midwest 868 868 14 14.Didly appreciate the reviewer’s comment.
This text has been revised as suggested.
This is a very well-done and well illustrated chapter. Nice job

Jerry Miller 141352 Figure 22 Northern Great Plains 22.1 123 Number of days over what time period? Summer? Summer? A decade? And is a truly change on the new prediction of the number of days that will be in this category? I’m seeing things like 60-90 days for Ro in Montana at the lower 2PC value and given the short summer, that seems incredible due to me if that really is meant to represent the change.
The text has been adjusted accordingly. Data on pollen are now included.
Jerry Miller 141353 Table 22 Northern Great Plains 22.2 126 Pulse crops beyond dry edible beans (i.e. dry pea, lentil, chickpea) should be included here since the northern Prairies is such a dominant source for their production in the USA. Acreage in Montana alone was 1.5 million in 1997 the acreage of these crops was near zero.
The impacts of climate change on crop yields will vary geographically and temporally because of differences in dryland cropping systems. Consequently, wheat yields were projected to decrease to some extent in all of the 22. Northern Great Plains. Enhanced temperatures would dominate over the positive impacts of atmospheric CO2 increases on crops in the 22. Northern Great Plains. This bullet point states that climate change is expected to increase crop yields, citing Ko et al. 2012. However, Ko et al. 2012 found that climate change will have negative impacts that have yet to be determined and appear increasingly unlikely. After consideration of this point, we have determined that the existing text is clear and accurate. We thank the reviewer for the comment. The chapter text has been revised to include mention of CRP expansion.

We thank the reviewer for the comment. The chapter text has been revised to make it clear that forecasts are uncertain. After consideration of this point, we have determined that the existing text is clear and accurate. We thank the reviewer for the comment. The chapter text has been revised to include mention of CRP expansion.

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The section assigns a "high confidence" level to the statement "The energy sector is also a significant source of greenhouse gases." There is strong evidence and high consensus that the energy sector is a significant source of greenhouse gases, which should be followed by the "very high confidence" level.

The text has been adjusted accordingly.

The section assigns a "high confidence" level to the statement "There is strong evidence and high consensus that climate change and ozone pollution are linked to greenhouse gases and volatile organic compounds, which should be followed by the "very high confidence" level.

The text has been adjusted accordingly.

The chapter does a good job demonstrating what’s at stake for agriculture under climate change. The agriculture section includes a lengthy description of the role of agriculture in the economy, breaking up the various components of Northern Plains agriculture and their role in the national food economy. The chapter also includes a reasonable description of the magnitude of the issues that Indigenous peoples in the region face. The chapter does not do as well demonstrating what’s at stake for water resources, recreation, and energy. The chapter would benefit from a more in-depth description of the role of water resources, recreation, and energy in the economy of the region and the nation as a whole.

We think the reviewer for the positive response to the agricultural section of our chapter. We have not substantially revised language related to water resources to explicitly assess the economic value of water. Rather, we have tried to make it clear that water resources are fundamental—important for all of the other sections of the report. We now link to these. We have added links to the rec/raaion section on the magnitude of impacts (including $ values). We have revised the language in the energy section to make the importance of the impacts more clear.

The text has been adjusted accordingly.

The sentence has been rephrased to clarify.

The text has been adjusted accordingly. The text now states the observation period.

The points the commentator raises are beyond the scope of this chapter/report and we have not reviewed the text.

Best to replace "Climate models" with "Climate model projections".

We greatly appreciate the reviewer's comment. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text.

We greatly appreciate the reviewer's comment. The text has been adjusted accordingly.

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likely to mean for the future. We get dry periods. I'd suggest that instead of always talking about the climate, we go back a bit to thinking summer to pour over the Appalachians and then trigger thunderstorms in the humid air that is present—and so likely to be) that the weaker cool fronts out of Canada are no longer deep and strong enough in mid-to late-warming, no longer as cool and massive. Here on the Atlantic coastal plains, I sense (however inaccurate that is) that summertime air masses coming out of Canada that in the past have triggered thunderstorms are, due to global warming, no longer so frequent. Here, I sense that the Gulf of Mexico's moister and warming air can thus be a threat during much more of the year forms. But "may" is really a useless word (e.g., telling one's daughter she may go out is not really very useful sometimes requires rephrasing to say something like "If ... this is not done, then ..., this is likely" and similar useful information about likelihood. The likelihood lexicon really needs to be used in place of these words. This statement is problematic. The curiousness that is cited to the information in lines 10-13 is not scientific or factual data, but drawn from an interview with an individual from the Department of Commerce and refers to one community. Recommend deleting.

The data used in the Batdour 2014 reference are from the USGS National Agricultural Statistics Service. The reference for the statistics on rice crops has been changed to reflect the source of the data. This is a statement for now or in the future? And I think it would be helpful to mention why relative sea level rise than just during the hurricane season. Mentioning that the Gulf of Mexico's moister and warming air can thus be a threat during much more of the year. This comment was directed at the executive summary. The authors have chosen to incorporate this addition into the rest of the report, rather than in the executive summary. This perspective has been incorporated by the authors and modifications were made throughout the chapter. The text in this box has been modified to clarify the concerns of the reviewer. This comment was directed at the executive summary. The authors have chosen to incorporate this addition into the text of the report, rather than in the executive summary. This perspective has been incorporated by the authors and modifications were made throughout the chapter. Therefore, we have not changed the original text.
climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.
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<td>Northwest</td>
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<td>16</td>
<td>Present text: The way this sentence is phrased is confusing, making it seem like decades in a Snowpack are reducing the risk. Recommended edits in all CAPS: &quot;Warmer winters have led to reductions in mountain snowpack that has historically blanketed the region’s mountains, reduced wildlife risk, and provided a slow release of water for communities, agriculture, rivers, and soils.&quot;</td>
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<tr>
<td>Rebecca</td>
<td>Ambrosch</td>
<td>241869</td>
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<td>We appreciate your comments, we have revised the caption and the photo selected for the Box.</td>
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<td>We appreciate your comment. We have added a cross-reference to Chapter 9.</td>
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<td>022</td>
<td>2</td>
<td>3</td>
<td>We appreciate your comment. We have simplified this paragraph and deleted this citation.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
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<td>Awhite</td>
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<td>12</td>
<td>14</td>
<td>There are a lot of references to tribal issues related to climate change, and several membe of Washington Tribes and one for the Nez Perce Tribe in Idaho, but no case studies or references to Oregon Tribes. On pg. 1045, there is a discussion of the impacts of climate change on fire and drought. This might be a good place to refer to the work that the Confederated Tribes of the Umatilla Indian Reservation has done on fire and drought (see example here: <a href="http://greatnorthfresh.org/sites/default/files/documents/tnrc_summer_2011_newsletter.pdf">http://greatnorthfresh.org/sites/default/files/documents/tnrc_summer_2011_newsletter.pdf</a>).</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242092</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>013</td>
<td>018</td>
<td>14</td>
<td>18</td>
<td>Thank you for your comment. We have revised this text to reflect the correct number of jobs.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242093</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>013</td>
<td>019</td>
<td>24</td>
<td>26</td>
<td>Thank you for this comment. A citation has been added for Bond et al (2015).</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242094</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>012</td>
<td>015</td>
<td>13</td>
<td>17</td>
<td>Thank you for this comment. We are requesting the reviewer to provide a citation for the sentence in the box that shows the evidence of increased preparedness across all stakeholders is evidenced by the presentations at the 6th and 7th Annual National Climate Conference. A citation was added for the conference.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242095</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>013</td>
<td>016</td>
<td>15</td>
<td>18</td>
<td>Thank you for this comment. A citation has been added for Hicke et al (2013).</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242096</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>015</td>
<td>018</td>
<td>15</td>
<td>18</td>
<td>Thank you for this comment. The text has been revised as suggested.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242097</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>015</td>
<td>018</td>
<td>11</td>
<td>13</td>
<td>Thank you for this comment. A citation has been added for Bond et al (2015).</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242098</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>015</td>
<td>018</td>
<td>13</td>
<td>16</td>
<td>Thank you for this comment. A citation has been added for Bond et al (2015).</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242099</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>016</td>
<td>018</td>
<td>20</td>
<td>23</td>
<td>Thank you for this comment. There was an error in the creation of the table. The job numbers for Washington should have been 303,321, as reflected in the narrative text. A new column was added to the table for the number of people affected across all three states as opposed to the number for Washington. The table has been corrected to reflect the correct number of jobs.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242100</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>017</td>
<td>017</td>
<td>24</td>
<td>24</td>
<td>Thank you for this comment. Citations have been added to this sentence.</td>
</tr>
<tr>
<td>Austen</td>
<td>Corbitt</td>
<td>242101</td>
<td>Field Region</td>
<td>24</td>
<td>Northwest</td>
<td>017</td>
<td>017</td>
<td>24</td>
<td>27</td>
<td>We appreciate your comment. We have added additional citations to this paragraph, and added NOAA Fisheries 2016 to the reference list.</td>
</tr>
</tbody>
</table>
It seems that "shifts in planting dates" should be listed as one of the potential reasons for improved/STORY/STORY yields, given this passage in Karimi et al. 2017: "Much of the favorable SW response to climate change in our simulation was due to shifts in planting dates to account for shifts in climate. "Adaptations to new climate norms, such as adjusted planting dates and better adapted cultivars, will be a critical component of future risk reduction in the region." Thank you for this comment, the text has been edited to reflect this important addition.

We appreciate the comment. Clarification and detail were added to the sentence. In particular, this sentence addressed potential long-term growth, and did not address changes in disturbance (that is the rest of the paragraph discussed these. This was clarified and some explanation was added to the paragraph. Textflow of the potential changes is quite complex, so spatial details are not listed. Detailed coverage of these topics is beyond the scope of this report, and there are other reports that cover this topic in more detail.

Thank you for this comment and for the suggested reference. We have made an edit to the zone citations which were incorrectly cited in 2010 when it was intended to be 2004. We have also added the referenced Diffenbaugh et al. 2015 as appropriate context for the projections for the region.

We appreciate your comment. We have revised the text for clarity. We agree that the main-point of the paragraph is that crop and livestock producers will need to change how they do business if they want to maintain their livelihoods.

it makes the text more clear for the reader. This sentence was also modified in response to other public comments.

We appreciate this comment. Clarification and detail were added to the sentence. In particular, this sentence expands on the potential long-term growth, and did not address changes in disturbance (that is the rest of the paragraph discussed these. This was clarified and some detail was added to the paragraph. Textflow of the potential changes is quite complex, so spatial details are not listed. Detailed coverage of these topics is beyond the scope of this report, and there are other reports that cover this topic in more detail. Please consider expanding the idea that some forests may increase in productivity whereas others may decrease. Our simulation was due to shifts in planting dates to account for shifts in climate. Adaptations to new climate norms, such as adjusted planting dates and better adapted cultivars, will be a critical component of future risk reduction in the region.

We appreciate this comment. The text was revised for clarity to address the comment.

By "climate position," do you mean a staffer to do this kind of work? This paragraph was also modified in response to other public comments. We disagree with the comment about the need for additional clarity related to the idea "climate position." We have added a citation and additional detail (does the "network" have a name, or is it an unofficial group?). An example of a trend that has been reversed, and citations.

We appreciate your comment. We have revised the text and added the citation suggested.

We appreciate this comment. The revised text was due to shifts in planting dates to account for shifts in climate. Adaptations to new climate norms, such as adjusted planting dates and better adapted cultivars, will be a critical component of future risk reduction in the region. We agree that this topic is one that can be explored in greater depth, but given the limited space, our analysis has focused on 5 key messages that the Northwest faces, and each key message has been supported by 3-4 references. We have added a citation to Vogel et al (2015) and noted some of the leadership roles of municipal water systems like the Portland Water Bureau and Seattle Public Utilities who have worked in collaboration with regional scientists to assess climate impacts to the region. This information will also be available in the figure’s metadata, maintained by USGCRP.

Where does this information come from? From which tribe is the quoted elder? What is the vintage of the quote? Please add citations, if available.

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intensity and duration of heat waves. The only significant trend was in the frequency of nighttime high
The reference to Bumbaco et al. (2013) is misquoted here. They did NOT find significant increasing trends in the
The point about barriers to climate adaptation for Tribes is vague. Can some examples of these challenges be
Please replace the "in" with "among". So: "Oregon, Washington, and Idaho are all ranked among the top 10
and can effect fruit quality as well as yield. Additionally, summer heat stress...".
This is a rather long sentence. Please separate into two sentences. So: "Earlier higher spring temperatures....
A reference to this figure in the text is missing.
The "severe winter storm" phrase can come across as referring to a snow storm. It may be better to word it as
That paper’s main finding is that one of the main components for heat waves in the coastal Northwest - offshore
Brooks, K., Behar, D. 2015. Actionable Science in Practice: Co producing Climate Change Information for Water
illnesses as the runoff introduces contaminants and pathogens (such as Cryptosporidium, Giardia and viruses)
pathogens defined by the Safe Drinking Water Act that could increase waterborne illness risk. Suggest changing
This text section doesn’t recognize that contaminants to drinking water may be a problem for smaller systems
Northwest really stands out in this approach to actionable science.
adaptation across multiple sectors within the City and County, including water systems, natural and built
another key feature and success story of this plan is the incorporation of strategies to address preparation and
While this section notes the incorporation of equity into the Portland and Multnomah County climate action plan,
(a key commercial trucking route) and the parallel railroad for several weeks, along with a closure of Columbia
available for viniculture due to changing hydrologic regimes in the region.
Idaho may have some graphic or reference that could be used to support the increase in wildfire area burned.
2016. 2015 Drought Response Summary
beyond the scope of this report, and there are other reports that cover this topic in more detail.
addressed potential ring growth, and did not address changes in disturbance that the rest of the paragraph
We appreciate this comment. Clarification and detail were added to the sentence. In particular, this sentence
Thank you for this comment. We have revised this paragraph to address this comment, as well as other
Thank you for this comment. We have added a new section to this chapter, titled "Emerging Themes and Considerations for Climate Adaptation in the Northwest Region.
We appreciate the reviewer’s attention to detail. The text was revised to correctly cite the Bumbaco et al. 2013 Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, 2016].
We agree that additional examples of existing barriers would be helpful, and have made those additions.
Thank you for the comment. The text has been revised as suggested.
broader themes, and support the key messages.
Thank you for this comment. We have re-written the Executive Summary to better highlight the chapter, its themes, and the key messages.
The sentence “some federal could increase in productivity needs a little bit like an offhand comment. Could some examples be provided here for a little more context?”
We appreciate the comment. After consideration of this point, we have determined that the existing text is more accurate and reflective of the situation. In general, severe storms only occur during the winter. The suggested change may cause confusion regarding the prevalence of storms in other seasons.
Thank you for this comment. We have re-written the Executive Summary and are no longer including this figure.
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We appreciate the comment. Some specific examples of existing problems could be added where appropriate in the Executive Summary, and later in this chapter, related to wildfire areas and forest management practices.
We appreciate this comment. We have revised the text to accurately reflect the extent of the wildfires. Acknowledgment of the broad range of wildfires in the region is important.
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Thank you for this comment. The reference has been added to the list of references for this chapter.
We appreciate the comment. We have added the reference to Bumbaco et al. 2016. The text has been revised as suggested.
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We appreciate the comment. The text has been revised as suggested. This is a good suggestion and the text has been revised.
These two paragraphs focus heavily on Oregon impacts. Are there water and fish impacts that can be highlighted for Washington and Idaho as well?

We have added statements to highlight recreation and fish impacts of the 2015 drought experience in Washington and Idaho.

This paragraph discusses the 2015 El Niño. While this is relevant for the point of illustrating evidence, it’s a little confusing since the section was framed as a discussion of the 2015 drought (and now the discussion shifted to heavy snow). Perhaps a transitional sentence is needed to explicitly say that now the next section is being referred to (not the drought you write).

We appreciate your comment. We have moved this discussion to Section 3 regarding impacts to fish/vegetation that occurred during the extreme El Niño winter of 2015-2016.

These are some evidence (Flacke et al. and Darnis 2015) based on model simulations that the ocean’s productivity is likely to increase in a narrow strip along the US West Coast. The impacts are likely to impact through the entire food web with one negative consequence being hypoxic becoming more prevalent. My recommendation would be to include a general statement that the marine ecosystem will evolve as the climate changes, with both winners and losers.


We appreciate your comment and the citation. We have added a statement to this paragraph that highlights that there will be both consequences and opportunities to the marine ecosystem responds to climate change. A cross-reference was also added to Chapter 3 as this chapter provides additional detail on the larger marine ecosystem and the shifting species trends that may occur.

We are grateful for your comment. We have updated the text to include the additional information you provided.

The ocean warming event of 2015 is likely to be a once-in-a generation event, either because it is more intense or because it is part of a series of similar events. It is urgent that studies be undertaken to assess the environmental impacts of this event and to learn from it.

We appreciate your comment. In response to this comment, as well as other comments, we have revised this paragraph and eliminated reference to the Cascadia Subduction-Zone and tectonic uplift. Although this is an important topic, it cannot be treated sufficiently within the limited space in this chapter.

We appreciate your comment. We have mentioned the expert’s name and tribal affiliation.

I recommend substituting “bolster” for “save”.

We have changed the word “save” to “bolster” as suggested.

This type of events appear to have greater impacts on human health.

Bumbaco et al. (2013) showed that it was the “hot night” type heat waves that are increasing in frequency.

We appreciate the reviewer’s attention to detail. The text was revised to correctly sight the Bumbaco et al 2013 work and include additional citations for the broader national projections of increasing frequency and intensity of heatwaves and the influence of nighttime temperatures on human health.

This hour described the role of the Klamath River in providing a signal of increasing trend. J. Climate, 22, 6181–6203.

These type of events appear to have greater impacts on human health.


I think there should be recognition of the work by Yoder and others that water markets provide a means for drought risk reduction.

We have expanded the sentence to reflect the additional information you provided.


We have updated the text to reflect the citations accordingly.

The warming ocean will also result in range shifts…shifting as far north as the Bering Sea; yet these

We appreciate the reviewer’s attention to detail. The text was revised to correctly sight the Bumbaco et al 2013 work and include additional citations for the broader national projections of increasing frequency and intensity of heatwaves and the influence of nighttime temperatures on human health.

Regarding the conclusion that “range shifts… may also open up new fishing opportunities in the Northwest waters is immediately equivalent to new fishing opportunities. However, this ignores the nuances of simplification of this issue may produce an inappropriate optimism that the movement of fish into Pacific

We have revised the sentence to more sufficiently capture the complexity of this issue in light of the conclusions stated.

The redistribution of the Klamath River is location dependent, and that this mitigating factor cannot be relied upon everywhere across the Pacific NW, especially in the Puget Sound region.

We have revised the sentence to appropriately reflect this.


We have added statements to highlight recreation and fish impacts of the 2015 drought experience in Washington and Idaho.

We appreciate your comment. We have updated the citation and the detailed example provided. However, within the space limitation, this level of detail and speculation about changes in management/regulations is not appropriate. We have modified the text to highlight this as a potential area of concern, and we provided an additional reference to this possible outcome in the Challenges, Opportunities, and Success Stories section.
This chapter was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were named: Mary Fisher, Annie Crawley, Michelle Tigchelaar, Dr. Ronda Strach, Dr. Cecilia WU, Dr. Richard Gammon.

On the whole we think Chapter 24 has organized the key messages well and provided a substantial compendium of evidence to back the key messages. However, we hope for more synthesis so that business owners or policy makers in the Northwest could use Chapter 24 as a guide for impacts planning or creating adaptation legislation. Similarly, the text provides little quantification of the magnitude of the projected climate impacts, or their relative importance compared to each other or non-climate risks and vulnerabilities. The visual graphics in Figures 24.2 and 24.3 are examples of helpful synthetic information. We would be interested in seeing additional graphics. Visual representations of the content could be helpful to add the reader in assessing how the impacts interact, and which of them to prioritize or prepare for. For example, a map showing locations of businesses that support similar activities that have reported changes so far (in a more useful, or maps of coral health maps). We appreciate this comment; however, this comment is outside the scope of the document. The aim of the National Climate Assessment (NCA) is assessing the state of understanding of climate change, the science of the likelihood of the identified climate impacts occurring based on the current state of the science. However, we would be interested in seeing additional graphics. We appreciate this comment; however, we are not aiming at the creation of adaptation legislation, or with promoting specific ideas for integrating or adapting to climate change.

Michele Tigchelaar 14.8001 Whole Chapter 24. Northwest

This chapter was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were named: Mary Fisher, Annie Crawley, Michelle Tigchelaar, Dr. Ronda Strach, Dr. Cecilia WU, Dr. Richard Gammon.

Repeating the Figure Overview would work for word found in the background is unnecessary and confusing to the reader. Also Figure 24.2 appears before Figure 24.3.

Thank you for your comment. We have re-written the Executive Summary to better highlight the chapter, the broader themes, and support the key messages.

Michele Tigchelaar 14.8068 Text Region 24. Northwest 2027 1000 6 23

This chapter was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following were named: Mary Fisher, Annie Crawley, Michelle Tigchelaar, Dr. Ronda Strach, Dr. Cecilia WU, Dr. Richard Gammon.

General comment for pages 2027-2028 and 2048-2049. The text emphasizing Key Message 3 in infrastructure has few supporting citations, especially key citations addressing the topic in the NW. It would be helpful to begin by defining infrastructure, and perhaps break down into several types. One of the most critical implications of linksages of climate to infrastructure is the cost and interconnectedness of infrastructure. Without electricity, water cannot be treated, and sewer and hospital generators eventually run out of fuel. If trees and powerlines are down on the road, then emergency response is hampered and supply routes are off. This highlights the impact of wind and a series of storms that may be tied to more extreme weather. This section could be strengthened by tying infrastructure to health and safety. When a severe storm knocks out power and roads, the first issues are health and safety, not the economy. Infrastructure was designed to handle historical climate, but also the environmental conditions resulting from that climate, such as the hydrology or the fire hazard.

Additional citations to consider:

We agree with the interconnectedness of infrastructure systems, and the importance of health impacts that follow from disruptions to damage to infrastructure systems. Your point is supported by our examples from flooding in Tumwater County, the important of "Waffles" in the Washington DOT analysis, and the map of shellfish groundwater wells (Fig. 24.3). Notably, two of these examples were found in Bentonite or data produced by the Departments of Health for Oregon and Washington, respectively.

We have added references to Strach et al (2015). A reference to Wilhere et al (2017) already appears on p. 3011, line 2. We chose not to cite the Douglas et al paper since it only considered infrastructure risks and adaptation at the national level, and lacks any regional examples.

Harriet Baedanr 14.9036 Figure 24. Northwest 24.3 1031

Since risk and vulnerability of drinking water systems is complex and relates to many factors besides well depth, we suggest using a cooler color scheme instead of "yellow/red". (we noted the caption to denote well depth)

We would like to assist in using Sentry data to develop a visualized figure that would more accurately convey a summary information about these particular two factors (single source and well depth).

Thank you for the comment, and for providing an alternate figure. We will insert the new figure with the cooler color scheme


In Figure 24.7, the "groundwater supply from NW" is too small to be read. That phrasing may imply that the groundwater itself is at risk, which is not the main message being expressed with this figure. Rather, the figure is about describing the location of different depths with a single source of water. The focus is about systems that lack a backup supply source. We would recommend the more accurate title "distribution of water systems with 3 different supply sources".

We agree - we have edited the caption to better explain the relationship between single-source systems and climate risk.


Since risk and vulnerability of drinking water systems is complex and relates to many factors besides well depth, we suggest using a cooler color scheme instead of "yellow/red". (we noted the caption to denote well depth)

We would like to assist in using Sentry data to develop a visualized figure that would more accurately convey a summary information about these particular two factors (single source and well depth).

Thank you for your comment. We agree, and we have updated the figure title. We have chosen to explain the meaning of "Group A" within the caption text.


We have added references to Strauch et al (2015). A reference to Wilhere et al (2017) already appears on p. 3011, line 2. We chose not to cite the Douglas et al paper since it only considered infrastructure risks and adaptation at the national level, and lacks any regional examples.

Michael MacCluder 140473 Figure 24. Northwest 2018

To see discussion of the public health/water sector and newly climate change capacity and actions in the northwest - thank you for including this. There are a few other examples of resilience actions that may be of interest. The Department of Health Office of Drinking Water's State Resilience Fund was made possible for water system managers / utilities to apply for low interest loans that support resilience projects. As well, the OH Marine Biofuels Program operates an early warning system in partnership with academics, organizations and citizen scientists to increase the geographic breadth and frequency of sampling for harmful algal blooms that could compromise the safety of shellfish. More information about these activities could be provided analogous to the "opportunities and success stories" section.

Thank you for sharing these examples, we have added them to the "opportunities and success stories" section.

Michael MacCluder 140473 Figure 24. Northwest 2018 1016 16 36

Just a note that use of the word "May" should be avoided as it really provides no indication of likelihood (nor does the word "could"). Proper practice is to choose phrasing related to the likelihood lesson, even if one needs to add a qualifying phrase to do so. On the northwest shift, do note that climate change will very likely continue after 2100, so a further shift would seem likely, although ocean acidification would eventually limit that. As a precautionary warning for the fish, it is quite possible that fisheries might eventually no longer work. So, in this paragraph, we would see some time reference point is needed, etc.

Thank you for this comment. This sentence was modified for clarity, but the word "may" was retained. There are many factors beyond the range shift that will impact whether or not new fishing opportunities open up (the changing rights currently allocated to tribes or fishermen in the oligotrophic area would/would be to the benefit of the tribes or fisherman in the new geographic area). Additional information was also added for clarity to help address the topic in the NW. Among those who participated in discussions, the following were named: Mary Fisher, Annie Crawley, Michelle Tigchelaar, Dr. Ronda Strach, Dr. Cecilia WU, Dr. Richard Gammon.
increasingly unlikely. Computer models. That climate change will have negative impacts has yet to be determined and appears to be in the future. We appreciate your comment. The text has been revised as appropriate to be more precise.

23 reductions, fire management, and other actions can help address future vulnerabilities of
This is a very well written chapter pertaining to climate impacts in the Southwest. There is a plethora of information concerning issues within California while not much discussion or other parts of the southwest. We greatly appreciate the reviewer's comment.

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The text has been modified as suggested.

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The text has been modified as suggested. Thank you for your comment. Figure 6.1 was rescaled and the color ramp adjusted for the SW to create the figure. The adaptation is noted in the caption. The text has been modified as suggested.

The text has been modified as suggested.

The text has been modified as suggested.

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<table>
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<th>Last Name</th>
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<th>Comment Type</th>
<th>Page</th>
<th>Figure/Table Number</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>Peterson</td>
<td>142417</td>
<td>Text Region</td>
<td>115</td>
<td>11</td>
<td>25</td>
<td>Attrubuting the observed changes in subpine forest to climate change is inappropriate. As stated in Millar et al. (2004), complex interactions of environmental variables, including climatic variation (e.g., PDO) were the neural causes.</td>
<td></td>
</tr>
<tr>
<td>Juvenal</td>
<td>Fogle</td>
<td>142418</td>
<td>Text Region</td>
<td>115</td>
<td>11</td>
<td>26</td>
<td>The notion of tripling area burned is mostly conceptual, because if that were true, the negative feedback of existing burned areas would eventually reduce the extent of wildfires as fuels are reduced.</td>
<td></td>
</tr>
<tr>
<td>David</td>
<td>Peterson</td>
<td>142419</td>
<td>Text Region</td>
<td>116</td>
<td>1</td>
<td>10</td>
<td>If you like this, then you also need to cite the published response to it, which demonstrated errors in the original analysis.</td>
<td></td>
</tr>
<tr>
<td>Avustina</td>
<td>Constible</td>
<td>142716</td>
<td>Text Region</td>
<td>1085</td>
<td>1085</td>
<td>13-17</td>
<td>The first sentence of key message 3 is confusing, largely because the worst &quot;hit&quot; makes it seem like things like reduced oxygen have affected people's homes. Recommended edit: Multiple manifestations of human and climate change, including sea level rise, ocean heating, ocean acidification, and reduced ocean have affected the Southwest's coastline and coastal resources. Marine plants and wildlife, people who depend on fishing, and coastular neighborhoods, businesses, and infrastructure face increased risks as the climate changes.</td>
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<tr>
<td>Avustina</td>
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<td>142717</td>
<td>Text Region</td>
<td>1086</td>
<td>1086</td>
<td>18</td>
<td>Recommend starting a new paragraph with the movie heat wave section.</td>
<td></td>
</tr>
<tr>
<td>Avustina</td>
<td>Constible</td>
<td>142718</td>
<td>Text Region</td>
<td>1086</td>
<td>1086</td>
<td>18</td>
<td>Visiting the second sentence in this paragraph with &quot;If&quot; makes it seem like tribes are developing adaptation and mitigation actions despite the increased drought and heat, instead of in reaction to the change.</td>
<td></td>
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<tr>
<td>Avustina</td>
<td>Constible</td>
<td>142719</td>
<td>Figure</td>
<td>25</td>
<td>25</td>
<td>1</td>
<td>Please consider adding more information to the &quot;x&quot; vs. label, e.g., &quot;Estimated cumulative forest fire area (million hectares).&quot;</td>
<td></td>
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<tr>
<td>Avustina</td>
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<td>142720</td>
<td>Figure</td>
<td>25</td>
<td>25</td>
<td>1</td>
<td>Please consider adding more information to the &quot;y&quot; vs. label, e.g., &quot;Estimated cumulative forest fire area (million hectares).&quot;</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142721</td>
<td>Text Region</td>
<td>1089</td>
<td>1089</td>
<td>7-8</td>
<td>The sentence about transferring water seems out of place. Is there a connection between installation of renewables and water transfers?</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142722</td>
<td>Text Region</td>
<td>1089</td>
<td>1089</td>
<td>7-11</td>
<td>Please provide citations for the latter half of this paragraph.</td>
<td></td>
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<td>Avustina</td>
<td>Constible</td>
<td>142723</td>
<td>Text Region</td>
<td>1092</td>
<td>1092</td>
<td>25-31</td>
<td>Some of the new techniques in use would be helpful here.</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142724</td>
<td>Text Region</td>
<td>1093</td>
<td>1093</td>
<td>13-16</td>
<td>This sentence sounds like it is only &quot;essential&quot; because it's beneficial. &quot;Wildfires, which can facilitate germination and kill pests, is a natural part of many ecosystems in the Southwest.&quot;</td>
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<td>Avustina</td>
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<td>Text Region</td>
<td>1093</td>
<td>1093</td>
<td>18-28</td>
<td>The sentence starting &quot;Furthermore&quot; is confusing. Recommended edit: &quot;Furthermore, climate change made a significant contribution to burned area in the western United States from 1980 to 2000 than the suppression, local fire management, or other non-climate factors.&quot;</td>
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<td>Avustina</td>
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<td>142726</td>
<td>Text Region</td>
<td>1094</td>
<td>1094</td>
<td>12-22</td>
<td>The sentence starting &quot;Whitebark pine...&quot; is confusing. Recommended edit: &quot;Although ecosystem-specific changes in climate and change by standing forest, recent wildfires have made California ecosystems and forested areas net carbon emitters.&quot;</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142727</td>
<td>Text Region</td>
<td>1095</td>
<td>1095</td>
<td>14-16</td>
<td>It's tough also thought to be an important driver of dark-brown outbreak? E.g., <a href="http://online.library.wiley.com/doi/10.1002/wrc.1639/full">http://online.library.wiley.com/doi/10.1002/wrc.1639/full</a></td>
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<td>Text Region</td>
<td>1100</td>
<td>1100</td>
<td>19-21</td>
<td>To what time frame are the elders referring?</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142729</td>
<td>Text Region</td>
<td>1101</td>
<td>1101</td>
<td>27-29</td>
<td>Starting the 2nd sentence in this paragraph with &quot;Yet&quot; makes it seem like tribes are developing adaptation and mitigation actions despite the increased drought and heat, instead of in reaction to the change.</td>
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<td>Avustina</td>
<td>Constible</td>
<td>142731</td>
<td>Text Region</td>
<td>1101</td>
<td>1101</td>
<td>34-36</td>
<td>Is the currently being used as a climate adaptation tool? That's not clear from the paragraph.</td>
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<td>Avustina</td>
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<td>Text Region</td>
<td>1102</td>
<td>1102</td>
<td>8-13</td>
<td>The water supply section of this paragraph feels out of place in a paragraph that starts with climate adaptation plans. Recommend moving it earlier in the section, to group it with the other climate impact statements.</td>
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<td>Avustina</td>
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<td>142733</td>
<td>Text Region</td>
<td>1103</td>
<td>1103</td>
<td>15-17</td>
<td>The sentence about the growth of resilience is confusing in the middle of information about drought and hydropower. Recommend moving to page 1104, the paragraph starting on page 16.</td>
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<td>Avustina</td>
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<td>142734</td>
<td>Text Region</td>
<td>1104</td>
<td>1104</td>
<td>8-10</td>
<td>Which is the biggest water source of &quot;water supply other&quot;. Agriculture, energy? The 1st sentences of this paragraph seems to contradict each other. Also, by &quot;energy&quot;, do you specifically mean electricity production, census of oil and gas extraction or other activities in the energy sector?</td>
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<td>Text Region</td>
<td>1105</td>
<td>1105</td>
<td>17-22</td>
<td>This paragraph ignores the fact that transportation electrification provides a net reduction in fossil-fuel use and emissions compared to driving on gasoline. Furthermore, electric vehicle bad can be aligned with intermittent generation to improve its capacity factor and help the economics in a way that can accelerate their deployment. For more information: <a href="https://www.epa.gov/efg/jpages/product/20020688/">https://www.epa.gov/efg/jpages/product/20020688/</a>; <a href="https://www.nrdb.org/resources/america-clean-energy-frontier-pathway-us">https://www.nrdb.org/resources/america-clean-energy-frontier-pathway-us</a>... and <a href="https://www.nrdc.org/resources/driving-out-pollution-how-utils-cana">https://www.nrdc.org/resources/driving-out-pollution-how-utils-cana</a>...</td>
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<td>Please consider replacing what &quot;center pivot irrigation&quot; is, or using a less technical term.</td>
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How are birds and sea lions stranded? What does this mean?

Water demanding is not the correct wording. Watering during and after rainfall is a bad practice, not a water problem.

Human caused climate change or human activities are noted five times on page 1086 and throughout the text. We thank the reviewer for the comment. The text has been revised to incorporate this suggestion.

This chapter will benefit from a technical editor, many statements are abrupt and disjointed. Possibly discuss the effect of climate change on Arizona monsoons (and haboobs and the possible health impacts). Delete will or may

Vague statement. What times of year? What acidic values? Also change increasing as much to increasing by 1.5 times.

Golden Gate or Golden Gate Bridge? Add bridge, unless golden gate is a place, but I've never heard of it used this way.

Change marine plants and wildlife to marine flora and fauna

The heat of human cause climate change is used many times in this section, consider changing it in some places, or just this ecosystem one. Attribution is mentioned on line 3 of page 1114 but this description comes after.

The description says days greater than 90 between 1976 and 2005 and 2036 and 2065 within the figure. Erase this as there is a description under the figure and this doesn't agree with the information shown.

Delete comma after differently.

Delete the word Indeed. It is unnecessary. Also what is a large fraction of?

Very long sentence, split in two after earlier sentence.

The description says days greater than 90 between 1976 and 2005 and 2036 and 2065 within the figure. Erase this as there is a description under the figure and this doesn't agree with the information shown.

The text has been modified as suggested.

Thank you for your comment. We have made the suggested change to the Traceable Accounts section. The text has been modified as suggested.

Thank you for the comment. The text has been revised to indicate that the area is Stinson Beach.

Thank you for the comment. The text has been revised to incorporate this suggestion.

Thank you for this helpful comment. We have added information and revised as suggested.

Thank you for the comment. The text has been revised to incorporate this suggestion.

Thank you for your comment. The chapter text has been revised to clarify the importance of including this information.

Thank you for your comment. We agree that the phrasing is unnecessarily repetitive and so have eliminated it from the other paragraphs. The text has been modified as suggested.

We thank the reviewer for the comment. The chapter text has been revised to clarify the importance of including this information.

Thank you for your comment. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

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Thank you for the comment. The text has been revised to incorporate this suggestion.
was filled, not formed. Recommend changing "formation of the lake" to "the filling of the reservoir"; Lake Mead is a reservoir, and it need not repeat every time.

We recommend removing, due to climate change, because these trends are linked elsewhere to climate change opposing trends. The term dropped is too colloquial when discussing declining reservoir levels.

Increased water demand because flow and demand have diversified the references, and have added some precision to the text, to note whether changes are region-specific, part of the region, pertinent to specific latitude bands, and pertinent to more maritime or continental locations.

Decreased snowpack is not a robust observation across the high elevation regions in Colorado. Snowpack is not declining as long, though. Plus, Fyfe et al. always normalizes data—not as robust as snelt sites. We thank the reviewer for this comment. Elsewhere in the chapter, we noted elevation-related variations in snowpack. Snow 2010 found decreases in Colorado SWE using one technique. In addition, the Mote et al. 2018 study found significantly more decreases in Colorado than did Mote et al. 2005. We thank the reviewer for the comment.

This sentence is awkward, consider cutting. This is not the only high energy practice.

Lake Mead for future use. Consistent with basin states in the U.S., Mexico will pursue water conservation projects and environmental restoration within that nation.

Insert an additional action, 4. In a 2017 binational agreement, Mexico agreed to absorb a share of shortages out of Lake Mead for future use. Consistent with basin states in the U.S., Mexico will pursue water conservation projects and environmental restoration within that nation.

Adaptation to climate change impacts in the southwest are mentioned throughout the chapter. For instance, an example of adaptation is described in the second paragraph of the Summary Overview:

"Climate change impacts in the Southwest are mentioned throughout the chapter. For instance, an example of adaptation is described in the second paragraph of the Summary Overview."
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<td>443190</td>
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<td>5</td>
<td>A portion of Key Message 3 – “increasing water demands from a growing population” is not supported by the text in that section, as the fact is actually contradicted by statements e.g. 1992, Revs 73-71, about per-capita water use stabilizing in CA, NV, and CO in recent years. Support stating this statement unless the section cites regional analyses which demonstrate increasing total municipal water use in recent decades. Reductions in per-capita use like those cited are on leasning pace with population growth in several SW cities, so that total municipal use is stable or declining, but it’s not clear whether this holds across the SW region. We thank the reviewer for the comment. The reductions noted were for temporary measures. Indeed, water use in California has now rebounded to pre-drought levels according to recent newspaper reports. See <a href="https://www.mercurynews.com/2018/03/10/california-water-use-continues-to-increase-as-conservation-declines/">https://www.mercurynews.com/2018/03/10/california-water-use-continues-to-increase-as-conservation-declines/</a>. The reviewer is correct that per capita and indeed total water use in many cities is either remaining flat or decreasing (see J. N. Flood’s book). However, in other places, municipalities have been active in seeking new supplies. These actions in some cases have been forward looking, rather than to meet immediate needs. The Southern Nevada Water Authority continues the process of acquiring water rights in northeastern Nevada. St. George, Utah is pursuing a ~ 100 kaf/year pipeline from Lake Powell. The Metropolitan Water District of Southern California has continued to investigate following opportunities on the Colorado River (e.g. Bard summer water sharing program, admittedly would last potentially longer in the future). In the Front Ranges of Colorado, state planning documents indicate a large supply demand gap of approximately 560 kaf to meet growth in the decades ahead, some of which is expected to come from the Colorado River. Colorado expects almost definitely to exceed its population from 5m to 10m by 2050. A pipeline proposal from Wyoming to the Colorado Front Range has resurfaced which would move 55 kaf/year for municipal use. See <a href="https://www.strib.com/news/environment/2018/02/27/entrepreneur-review-sustainable-zip-line-proposal-to-carry-green-run-water-from-utah-to-colorado/">https://www.strib.com/news/environment/2018/02/27/entrepreneur-review-sustainable-zip-line-proposal-to-carry-green-run-water-from-utah-to-colorado/</a>. The Central Arizona Project is pursuing the acquisition of form bands in Mohave County to assist with firming supplies for its canal, some of which is used for municipal uses. The recent system conservation efforts in the Colorado River Basin have been funded in large part by municipalities desiring to firm reservoir supplies. The Southwest is one of the fastest growing regions in the country and this growth drives at least some municipal entities to be proactive about their future needs even while they are making substantial progress on water conservation.</td>
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<td>David</td>
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<td>The 6-state Southwest region does not have a single “climate”, if fact, the huge climatic diversity of the SW is a key driver of the ecosystem, cultural, and economic diversity cited in this section. Thus, the notion that the SW is “under the hottest and direct climate” in the US is an unhelpful generalization that elides the enormous climate variability in temperature and precipitation regimes across the region—and it’s not even true, if “hottest” is interpreted as “highest annual average temperature”, for which the SW is hotter overall. The implication of this statement appears to be that SW being already hot and dry, is especially vulnerable to further warming and drying. But that isn’t uniformly true for the SW: the mountain snowpack of Utah and Colorado—which builds and melts in a cool season (winter)—is less vulnerable to the impacts of future warming than the snowpacks of the PNW or Northern Rockies, for example. Recommendation changing to “The Southwest encompasses diverse ecosystems, cultures, and economies, in part reflecting its enormous climatic diversity, including the hottest and driest climate in the U.S.” We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
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<td>The phrasing “has already led to heat-associated deaths and illnesses” implies that occurrences of such in AZ and CA are rare, which they are not. What is “new” about recent heat-related deaths and illnesses is obviously linked to hotter temperature; e.g., an increasing trend. We thank you for your comment. We have edited the text to clarify the point and to highlight aspects of heat waves that are changing.</td>
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<td>LAX airport is also at sea level in California. Thank you for your comment. We checked, and found that the elevation of Los Angeles International Airport is 228 ft. (39 m) above mean sea level.</td>
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<td>Glad this point is recognized here. We greatly appreciate the reviewer’s comment. [NO CHANGES TO TEXT REQUIRED]</td>
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<td>Indigenous peoples also rely on their cultural heritage places, traditional homes and building materials, sites, sacred places. All of these can be materially affected by climate change, and the material loss of cultural heritage disruptions and can lead to loss of traditional knowledges and knowhow. Recommend that this section incorporate the concept of cultural heritage and cultural risks to cultural heritage more fully. Missing references would be the 2012 UN report “Weathering Uncertainty: Traditional knowledge for climate change assessment and adaptation” by Nakamura et al., and the 2016 National Park Service Cultural Resources Climate Change Strategy (<a href="https://www.nps.gov/subjects/climatechange/culturalresourcesclimatechange_strategy.htm">https://www.nps.gov/subjects/climatechange/culturalresourcesclimatechange_strategy.htm</a>). We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
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<td>This description of the potential for decade-length droughts should include information from the historical and paleoenvironmental records, which show multiple multi-decade droughts over recent millennia before modern anthropogenic warming, which had substantial consequences for the human populations living there at those times. Relevant authors for the American Southwest include Tim Koehler, Scott Iggers, Margaret Nelson, Michelle Hegmon (among many others). Doug Kennett and James Kennett, Jon Erlandson, are good sources for the Southwest. We thank the reviewer for the comment. The prospect of multi-decade drought before anthropogenic warming was well established in the Southwest chapters of the Second and Third National Climate Assessments. We cite paleoclimatological records, including Ault et al. (2016) and Cook et al. (2015). The purpose of this section is to reflect on projected drought risk. We are grateful for your insights, your main point—that multi-decade drought affected human populations in the region, prior to anthropogenic warming, seems outside the point. It is worthy, however, of a comprehensive assessment of regional paleodrought impacts and lessons for the 21st Century.</td>
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<td>Key message and discussion that follows should recognize that it is not only ecosystems and modern infrastructure along the coast, but also a great deal of cultural heritage as well, which is an integral part of modern life, tourism, and community identity. Anderson et al. 2017 “Sea-level rise and archaeological site destruction: An example from the southeastern United States using DNHAA. [Digital Index of North American Archaeology]” is an analysis of heritage sites at risk on sea level rise and communities both begin to build more protective coastal infrastructure and move inland across the American Southwest. A similar analysis is available for the Southwest and Florida. We thank the reviewer for the comment. We now mention indigenous archaeological site vulnerability to SLR in Reys in the body of the text.</td>
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<td>This statement/assessment should include recognition that archeology is also at risk at Point Reyes due to sea level rise and ecosystem change; see report by Newland 2012 for the National Park Service: “The Potential Effects of Climate Change on Cultural Resources Within Point Reyes National Seashore, Marin County, California.” We thank the reviewer for the comment. We have modified the text to acknowledge the risk to archaeological sites, and have added the reference to work by Newland.</td>
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<td>The 6-state Southwest region does not have a single “climate”; in fact; the huge climatic diversity of the SW is a key driver of the ecosystem, cultural, and economic diversity cited in this section. Thus, the notion that the SW is “under the hottest and direct climate” in the US is an unhelpful generalization that elides the enormous climate variability in temperature and precipitation regimes across the region—and it’s not even true, if “hottest” is interpreted as “highest annual average temperature”, for which the SW is hotter overall. The implication of this statement appears to be that SW being already hot and dry, is especially vulnerable to further warming and drying. But that isn’t uniformly true for the SW: the mountain snowpack of Utah and Colorado—which builds and melts in a cool season (winter)—is less vulnerable to the impacts of future warming than the snowpacks of the PNW or Northern Rockies, for example. Recommendation changing to “The Southwest encompasses diverse ecosystems, cultures, and economies, in part reflecting its enormous climatic diversity, including the hottest and driest climate in the U.S.” We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
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California.” Effects of Climate Change on Cultural Resources Within Point Reyes National Seashore, Marin County, level rise and ecosystem change; see report by Newland 2012 for the National Park Service: “The Potential Effects of Climate Change on Cultural Resources Within Point Reyes National Seashore, Marin County, California.”
The phrasing of this key message should be re-assessed and filled out. Attention to Indigenous peoples and Indigenous communities is certainly important. However, they are not the only groups with history, heritage, and attachment to landscapes in the Southwest. The framing of this section leaves out contexts of Hispanic settlement and the history of other European arrivals and arrivals in this region. Other major themes that are missing include: Gold Rush history and other mining/extractive industries; development of cattle ranching; early water infrastructure. Authors should examine—why it is Indigenous peoples are recognized as having history that is important and relevant to them and their adaptation, but other communities in the region do not? It may be appropriate to add another key message.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

The adaptation of the figure is somewhat misleading. Indicate that the graph shows the estimated cumulative reservations and homelands of most of the Southwest tribes, or similar.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

The phrasing of this sentence presents the finding of the Abotzoglou and Williams (2016) study on wildfire burned area. As such, it was intended to be an example of how future-oriented analyses that use climate model projections: as an estimate subject to uncertainties related to climate sensitivity, as well as uncertainties in the statistical association of particular climate conditions and burned area. The phrase “induced by wildfire across the western United States from 1984-2015” is estimated to be twice what would have burned had human-caused climate change had not occurred.”

We thank the reviewer for the comment. The chapter text has not been modified because this sentence is specifically about impacts on Indigenous peoples and Indigenous communities.

The adaptation of the figure is somewhat misleading. Indicate that the graph shows the estimated cumulative contribution due to anthropogenic climate change and other factors based on fuel aridity.

We recognize the complexity of the analysis and provide more detail in the traceable account. Qualification is needed in this paragraph—If these aren’t the only some areas and there is limited restoration, the system may transition altering patterns of carbon uptake.

We appreciate this comment. However, with limited space, it is necessary to focus on a few themes. This is not to imply that other themes are not important. Part of the determination to focus on Indigenous peoples was learning from the previous assessments, which included that Indigenous peoples and communities are among those experiencing and witnessing climate change impacts first and foremost, and among those leading in actions to adapt to and mitigate such impacts. As such, a distinct need was articulated to not only have a standalone Tribal and Indigenous Peoples Chapter, but that tribal related issues are part of each region as well. Indigenous communities are certainly not the only frontline communities and not the only areas with important local knowledge. We recognize that there are other place-based subsistence communities whose livelihoods, practices, values, and life ways are also deeply rooted to the land. There are also other frontline communities in what locates that are at the forefront of climate impacts and environmental injustices. However, tribes and Indigenous peoples are particularly unique with their status as sovereign nations, extensive traditional homelands upon which they have dwelled for millennia, and Indigenous knowledge developed over generations of long-term observations about changes occurring to the ecosystems, water bodies, plant and animal species, etc. on the land.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

The adaptation of the figure is somewhat misleading. Indicate that the graph shows the estimated cumulative reservations and homelands of most of the Southwest tribes, or similar.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

Indigenous and knowledge developed over generations of long-term observations about changes occurring to the ecosystems, water bodies, plant and animal species, etc.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

The phrasing of this section presents the finding of the Abotzoglou and Williams (2016) study on wildfire burning area. As such, it was intended to be an example of how future-oriented analyses that use climate model projections: as an estimate subject to uncertainties related to climate sensitivity, as well as uncertainties in the statistical association of particular climate conditions and burned area. Also, the use of "induced by wildfire across the western United States from 1984-2015" rather than a difference between two scenarios.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
The specific assertion that there has been a 36%-20% reduction of [Southwest region] snowpack, and its water content since 1950/54 is not directly attributable to Fyfe et al. 2017 (hereafter F17) or Pierce et al. 2008 (hereafter P08), contrary to the citations of those two studies. F17 found that there was a 10-20% reduction in annual maximum SWE (SWEm) based on the periods 1980-1991 and 2001-2010, over a domain that covers the entire Western US, i.e. about double the area of the 6-state SW region. F17 argued their main finding is a range than they analyzed two types of SWE data.

1) The 30% reduction was calculated from the in situ SNOWTEK observational network; this result is likely both more robust and more comparable with prior SWE analyses, (though with the caveats about data emission and exclusion given below).

2) This 20% reduction was derived from the average of four grid’s mean for/19/6; the robustness of the SWE output from these methodologies has been rigorously assessed.

For 1 above, F17 analyzed only SNOWTEK data from the NENS network, which has relatively few sites in California. Most of the in-situ SWE observations in CA are from the California Dept. of Water Resources’s network (functionally similar to SNOWTEK, whose data were not analyzed by F17. Thus California is under-represented in their analysis. 1. F17 also included all sites below 2500m, for unknown reasons. This excluded a handful of SNOWTEK sites in CA, and many dozens of sites in OR, WA, ID, and MT, further affecting analysis 1.

These issues, combined with the difference in coverage between the SW region and the much larger F17 domain (affecting analyses 1 and 2), mean that it is unclear how the F17 findings for regionally averaged SWEm trend (both 1 and 2) might scale to the smaller SW region. We can say that if F17 shows (in Figures 3) that the vast majority of SNOWTEK sites in the SW region declined in SWEmnus between 1982-1991 and 2000-2010. We found that from 1950-1990, the ratio of April SWE to March-April precipitation (SWE/P), had declined from 1-20% across a West-wide domain similar to that used by F17. SWE was taken from manually measured resources, which are mostly co-located with current SNOWTEK sites. While the SWEm-P metric is imported, arguably more so than SWE itself, it does not speak clearly to trends in SWE. In fact, P08 found that the site-based trends in SWE from 1950-1999 mainly ranged from -10% to 10%, with 72% of the trends

The phrasing of this sentence presents the finding of the Metz and Williams (2016) study on wildfire with climate change. The AW 2016 finding, being based on climate model simulations, should be treated in the same way as future-oriented analyses that use climate model projections: as an estimate subject to uncertainties related to climate sensitivity, as well as uncertainties in the statistical association of particular climate conditions and burned area. Also, the use of “evidenced” is awkward as it implies a trend over time (e.g., 1984-2015), rather than a difference between two census.

Recommended changing “The ones that were burned by wildfire across the western US from 1984-2015 is estimated to be twice what would have burned had human-caused climate change had not occurred.”

The sentence refers to the lower vulnerability under warmer emissions scenarios. An example is given in the following sentence.

Good point. In 1st sentence of coastal section changed “15%” to “~10%” that statistic is based on the water-level change that is relative to the gage near the Golden Gate Bridge. According to Gary Griggs (UC Santa Cruz coastal geology expert), because the San Andreas fault is a strike slip fault, this is little vertical land movement over the 1900-present at this location due to earthquakes. Later in this section, “faz” was deleted, and I changed “expansion of heated water” to “thermal expansion of the ocean”.

This sentence refers to the lower vulnerability under warmer emissions scenarios. An example is given in the following sentence.

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We thank the reviewer for the comments. The chapter text has been revised to incorporate the suggestion.

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Southwest is more complicated than portrayed by Prein and colleagues, as some parts of the region will receive more dry and slightly less dry conditions, then perhaps with an occasional wet year thrown in (e.g., when Pacific ocean conditions favor the increased precipitation the region). How can it really be suggested that what is now considered a "drought" is the same as what is considered a "drought" in the future (and if this is the case then that period should be highlighted). With climate change, what is really happening is that the average amount of rainfall is dropping--so the baseline is dropping, and then there will be fluctuations about this declining baseline that is projected. So, I'd really suggest changing "drought in the Southwest Region" (by the way, it's not drought in the River, but, in the Colorado River Basin), so I'd suggest saying "drought with the increasing aridification of the Southwest region caused by climate change has led to a drop in the level of Lake Mead to the lowest level since Hoover Dam was built in 1935."

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

I'd suggest rephrasing to say "with the increasing temperatures brought on by climate change now reducing the overall amount of precipitation falling in the region," which is an important issue and is not well handled here. Might build bigger reservoirs to hold more in reserve from wet years; if instead a declining baseline is the overemphazing issue. Also, it might be said that the energy to move water is a key factor.

We thank the reviewer for the comment. We mention, a little further down in the text, that agricultural irrigation accounts for 70%. We regret that we lack the space to include a pie chart.

We thank the reviewer for the comment. We have revised the text accordingly to be more clear.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. It is best to avoid the word "may" as it is really meaningless--almost anything "may" happen. Good practice is to use "should" or "likely" or "probable." It is best to avoid the term "possible." It is best to use "may be better framed indicating an aridification trend due to human-induced climate change. It would be helpful to have a pie chart regarding the apportionment of water--I thought agriculture was the biggest user. Also, it might be said that the energy to move water is a key factor.

We thank the reviewer for the comment. We have revised the text accordingly to be more clear.

I'm surprised this says "fish" and would instead, or in addition, say "fruits and vegetables." Saying "food" sounds too big a term if this means manufacturing of prepared foods--so maybe say "fruits, fish, and vegetables."

We thank the reviewer for the comment. We mention, a little further down in the text, that agricultural irrigation accounts for 70%. We regret that we lack the space to include a pie chart.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

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<td>True, and likely the only way for this to happen with an expanding subarctic would be increased incidence of</td>
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<td>The report really needs to tell the public this is not just a drought---don’t expect wet conditions to return. This is</td>
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The use of colloids is not as extensive as suggested...at this point some farmers, often whaling captains, are using them. "Suggest changing: "Many of these foods are stored" to "These foods are sometimes stored".

The authors appreciate this suggestion and the text has been modified slightly.

The interval also applies to the Yupik community of Kaktovik.

The authors appreciate this suggestion and the text has been modified slightly to reflect that Kaktovik is one community among others to use this new technology.

I have not heard of the kind of adaptation described here regarding wildfire exposure for rural Alaska and am wondering if they only apply to areas closer to urban settings.

The authors thank the reviewer for the comment. The recommendations cited from the State of Alaska are for rural Alaska residents.

I'm wondering why this is considered "very high confidence." Change has been made as suggested.

I'm wondering why there is high confidence when there is limited evidence of successful, community-driven, proactive adaptation. There is a much longer history of reactive adaptation among Alaskan communities.

I'm wondering why this is considered "very high confidence." Change has been made.

I have not heard of the kind of adaptation described here regarding wildfire exposure for rural Alaska and am wondering if they only apply to areas closer to urban settings.

The authors thank the reviewer for the comment. The recommendations cited from the State of Alaska are for rural Alaska residents.

The suggestion that climate change is a risk management problem belies the many significant challenges that Alaska Natives are facing alongside climate change, all of which can threaten physical and cultural continuity: I don't think there is a deficit of knowledge and risk analysis—most Alaskan communities have hazard mitigation plans with GIS information (developed by external consultants). The problem is more with putting this knowledge into action in a manner that communities can control and maintain.

The authors appreciate the comment by the reviewer, but the paragraph is concerned with risk. We have however, deleted the first sentence as it is not directly related to erosion.

The authors appreciated this comment. While the suggestion was not used, the text was modified to make the discussion more clear.

The轴 values on the upper left image of this figure seemed too small to read. Increasing the font size would improve legibility.

The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. 1, NCA4 Vol. 2, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce these trends, and the projections of future changes in precipitation and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent; such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large-scale modes of natural variability, and to reproduce their net response to external forcing that captures the intersection of many processes which produce observable climate system feedbacks (e.g., Flato et al., 2013)." Chapter 8: Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat events and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." Chapter 8: A few longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compounding extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm periods implies that climate models are more likely to underestimate than to overestimate the amount of long-term future change (medium confidence)." Chapter 15: The supporting evidence and rationale for these key messages are available from NCA4 Vol. 1, 2, and 3.
That these health claims are highly questionable has already been pointed out to the USGCRP. See for example:
increasingly unlikely.

Comment: The entire message falsely states speculative attributions and projections of impacts as established
physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable
computer models. That climate change will have negative impacts has yet to be determined and appears
increasingly unlikely.

The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales
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The economic consequences of climate change seem to be a bit over-scaled and named in this chapter. The Arctic is becoming a newly accessible ocean. Completely discounting the idea that technological change and economic conditions could not cause rapidly unfolding consequences, possibly similar to those associated with the newly accessible Atlantic and the Pacific Oceans of the 15th century, seems overly focused on an exceptionality of the present. It is reminiscent of the idea that is different in its view of modern financial markets. Although it is assumed in the report that climate will drastically different than the historical conditions, technology and economic circumstances are treated as static and fixed in the present. Physical and economic opportunity in a globalized world can induce rapid exploitation and technology advances that allow new systems to compete for markets more effectively than those that have always been in place, as well as creating new opportunities. (Crichton-Stuart, A. S., Keich, M., & Gossard, J. C. (2017). Arctic Climate Change, Economy, and Society: (ACCEES) Integrated perspectives. Arctic, 40(1), 34-134. And Gattey, Tanya. Economic value of ecosystem services, minerals and oil in a melting Arctic: A preliminary assessment.) Ecosystem Services 24 (2017): 180-186. And Melia, Nat, Keith, Hareris, and Ed Hawkins. "Sea ice decline and last century transfer." Arctics shipping routes." Geophysical Research Letters 43, no. 18 (2016): 9720-9728. (The report notes Melia in a narrower context just a few lines above.)


Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation). (Chapter 5) Find over longer time scales, Vol. 1, concludes that. "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that could contribute to feedbacks, compoud extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm paleo-records suggests that climate models are more likely to understate than to overstate the amount of long-term future change (medium confidence)." (Chapter 15) The supporting evidence and traceable accounts for these key messages are available from NCA4 Vol. 1, Chapters 1, 4, and 15.

The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature presented in NCA4 Vol. 1, NCA4 Vol. 2, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce these trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These factors include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The text has been modified as suggested.

<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
</tr>
</thead>
</table>
| George     | Badrus    | 141046     | Test Region  | 26      | Alaska              | 1190      | 1190    | 19         | 19      | This entire message falsely states speculative attributions and projections of impacts as established physical facts. The attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

The text has been modified as suggested.
<table>
<thead>
<tr>
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<th>Last Name</th>
<th>Comment ID</th>
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<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
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<td>Jensen</td>
<td>141004</td>
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<td>26: Alaska</td>
<td>1169</td>
<td>1182</td>
<td>1182</td>
<td>17</td>
<td>17</td>
<td>More protection measures often merely displace stresses, which should perhaps be noted.</td>
<td>The text has been modified as suggested.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141005</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1187</td>
<td>1187</td>
<td>1187</td>
<td>25</td>
<td>35</td>
<td>The sea ice is also a platform for spring whale feeding behavior. The chapter &amp; figure 250a (250b &amp; 250c also have a problem from citation.)</td>
<td>The authors appreciate the suggestion, and the text has been modified slightly to include the bucheting of herring or also a problem for citation.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141006</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1189</td>
<td>1189</td>
<td>1189</td>
<td>13</td>
<td>36</td>
<td>The chapter &amp; figure 250a (250b &amp; 250c also have a problem from citation.)</td>
<td>The authors appreciate the suggestion, and the text has been modified slightly to include the bucheting of herring or also a problem for citation.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141007</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1190</td>
<td>1190</td>
<td>1190</td>
<td>3</td>
<td>31</td>
<td>More recent estimates e.g. for Newtok and Kivalina are a bit higher.</td>
<td>The authors appreciate this comment, but we are not aware of updated property documented costs for relocation. The &quot;more recent estimates&quot; for Newtok and Kivalina that mention a range from $100-$400 million appear to come from a 2003 report, found at <a href="https://www.gao.gov/products/GAO-04-143">https://www.gao.gov/products/GAO-04-143</a>. The GAO study that was cited in the chapter was more recent and more detailed than the GAO report, so the authors determined that it provided a more reliable figure.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141008</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1193</td>
<td>1193</td>
<td>1193</td>
<td>24</td>
<td>31</td>
<td>More recent estimates e.g. for Newtok and Kivalina are a bit higher.</td>
<td>The authors appreciate this comment, but we are not aware of updated property documented costs for relocation. The only ones we are aware of are those in the local media.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141009</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1186</td>
<td>1187</td>
<td>1187</td>
<td>25</td>
<td>31</td>
<td>This section omits any consideration of the loss of cultural heritage (archaeological sites, old cemeteries, TCPs, etc.) which can occur as a result of habitat loss for wildlife, or because of lack of cultural connectivity to the land. This loss is of great concern to many rural communities. These places represent ties to a community's history which connects people to their forebears. Every story also contains information which could be useful in developing culturally appropriate adaptations, which is lost when the sites are lost.</td>
<td>The authors thank the reviewer for the suggestion and the text has been modified to include loss of cultural heritage.</td>
</tr>
<tr>
<td>Anne</td>
<td>Jensen</td>
<td>141010</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1180</td>
<td>1180</td>
<td>1180</td>
<td>6</td>
<td>14</td>
<td>Coherent consequences of thawing permafrost also include the loss of tangible cultural heritage, including archaeological sites, structures and objects, and traditional cultural properties (TCPs). The consequences often include the thawing and decay of the artifacts and associated information which can be highly significant in connecting present-day people to their ancestors and their past.</td>
<td>The authors thank the reviewer for the suggestion and the text has been modified to include these terms.</td>
</tr>
<tr>
<td>Ezri</td>
<td>Zheng</td>
<td>143011</td>
<td>Figure</td>
<td>26: Alaska</td>
<td>1171</td>
<td>1171</td>
<td>1171</td>
<td>8</td>
<td>8</td>
<td>Add ar. &quot;to&quot; water</td>
<td>The text has been modified as suggested.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143060</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>176</td>
<td>176</td>
<td>176</td>
<td>8</td>
<td>8</td>
<td>Add ar. &quot;to&quot; water</td>
<td>The text has been modified as suggested.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143061</td>
<td>Whole Chapter</td>
<td>26: Alaska</td>
<td>176</td>
<td>176</td>
<td>176</td>
<td>10</td>
<td>10</td>
<td>This chapter has significant detail about the changes in climate happening in AK. It should possibly be shortened, perhaps even reducing the number of key messages, by referencing the CSSR and relying on that document at the details of climate change in AK. This CSSR chapter could focus more on the impacts.</td>
<td>The authors appreciate the reviewer's comment and have included references to the CSSR where appropriate. The authors feel that the subject matter presented in the Alaska chapter goes beyond the scope of the CSSR. In addition, the Alaska chapter was produced to be used as a stand-alone document and simply citing the CSSR may not provide the information contained in the Alaska chapter to all readers.</td>
</tr>
<tr>
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<td>Armstrong</td>
<td>143062</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>181</td>
<td>181</td>
<td>181</td>
<td>11</td>
<td>11</td>
<td>There is no citation for this statement.</td>
<td>Key Messages are intended to stand alone and are not an appropriate place for cross-referencing.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143063</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>182</td>
<td>182</td>
<td>182</td>
<td>14</td>
<td>17</td>
<td>This paragraph should be expanded greatly and should be the main focus of this section. The key message is focused on all residents, communities, etc., but hardly any mention is made of the risks, impacts, and adaptation options of the people.</td>
<td>The text has been modified with citations.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143064</td>
<td>Whole Chapter</td>
<td>26: Alaska</td>
<td>182</td>
<td>182</td>
<td>182</td>
<td>26</td>
<td>26</td>
<td>This chapter touches on relying more heavily on the CSSR for the climate change details, this chapter lacks information on the impacts and responses of communities/people. All of the KMs mention people, but the supporting text for the KMs mostly focuses on physical changes.</td>
<td>The authors appreciate these comments about the chapter and key Messages and have modified both in various places.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143065</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>182</td>
<td>182</td>
<td>182</td>
<td>26</td>
<td>26</td>
<td>Are there no citations for any of the statements in this paragraph?</td>
<td>Clarion has been added.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143066</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>183</td>
<td>183</td>
<td>183</td>
<td>13</td>
<td>18</td>
<td>Are there no citations for any of these statements?</td>
<td>The authors thank the reviewer for this suggestion. Additional references have been provided to support these effects.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143067</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>186</td>
<td>186</td>
<td>186</td>
<td>15</td>
<td>15</td>
<td>This sentence is repeated.</td>
<td>Repeat sentence has been deleted from text.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143068</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>187</td>
<td>187</td>
<td>187</td>
<td>9</td>
<td>15</td>
<td>What is appropriate for the climate is a model focused on Indigenous communities, it means that much of the idea of a larger KM is repeated in this section (and others). Is this the best approach?</td>
<td>This is a good question and the authors appreciate this input. The KMs have been written to stand alone, and some have been modified based on this comment and others. We hope we have addressed this in the updated draft.</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143069</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>189</td>
<td>189</td>
<td>189</td>
<td>15</td>
<td>15</td>
<td>'believe ecosystem services' is more widely accepted than 'environmental services'</td>
<td>The definition of ecosystem services has a different meaning from environmental services, which includes ecosystem services and services provided directly by the physical environment (such as temperature moderation, stable ground for supporting infrastructure, smooth surfaces for overland transportation).</td>
</tr>
<tr>
<td>Kristian</td>
<td>Armstrong</td>
<td>143070</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>0</td>
<td>0</td>
<td>There are more challenges to relocation than just the costs. It would be worthwhile to mention the legal and societal aspects as well.</td>
<td>A sentence has been added to the text to reflect this comment.</td>
</tr>
<tr>
<td>Marcus</td>
<td>LaToff</td>
<td>143101</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1109</td>
<td>1109</td>
<td>1109</td>
<td>2</td>
<td>7</td>
<td>Key message 1 could be improved for clarity. Suggestions:</td>
<td>The authors appreciate this comment and the Key Message has been modified.</td>
</tr>
<tr>
<td>Tania</td>
<td>LaToff</td>
<td>143102</td>
<td>Text Region</td>
<td>26: Alaska</td>
<td>1109</td>
<td>1109</td>
<td>1109</td>
<td>14</td>
<td>14</td>
<td>&quot;Butter&quot;</td>
<td>&quot;Butter&quot; has been deleted from the sentence.</td>
</tr>
</tbody>
</table>
Page 1171, line 15 - The authors appreciate these comments and the text has been modified.

Page 1171, line 35 - The text has been modified and the USEPA reference added.

Page 1172, line 35 - The authors appreciate these comments and the text has been modified.

Page 1173: Line 21 - Without clear direction, it is difficult to understand the reviewers comment. There are five clear ideas presented here, all supported by the literature, and all required to present appropriate context: (1) Temperature was variable, than has an obvious directional trend; (2) It is very clear that the warming trend is, but in all cases it is larger than the rest of the US; (3) Decadal variation is a key aspect still, despite the trend; (4) That variability has a known cause, namely couple North Pacific and Arctic variation, with decadal persistence; and (5) Precipitation is not as clear as temperature. Most of these ideas get one, at most two sentences, and the entire abstract length - 250 words. The authors respectfully do not think it wander, and have decided to make changes.

Fonness after Hartmann and Wendel 2015 have been removed.

Page 1173, line 38-page 1174, line 4 - NCA3 sets the task of reporting science new and relevant since NCA3. This comparison points out that both average and extreme temperatures are ranging faster in Alaska than the rest of the US, a key consideration for adaptation.

Page 1173: Line 5-21 - Without clear direction, it is difficult to understand the reviewers comment. There are five clear ideas presented here, all supported by the literature, and all required to present appropriate context: (1) Temperature was variable, than has an obvious directional trend; (2) It is very clear that the warming trend is, but in all cases it is larger than the rest of the US; (3) Decadal variation is a key aspect still, despite the trend; (4) That variability has a known cause, namely couple North Pacific and Arctic variation, with decadal persistence; and (5) Precipitation is not as clear as temperature. Most of these ideas get one, at most two sentences, and the entire abstract length - 250 words. The authors respectfully do not think it wander, and have decided to make changes.

Fonness after Hartmann and Wendel 2015 have been removed.

The authors thank the reviewer for this suggestion. The additional material has been referenced and the section has been modified to describe the anticipated increased risk of Vibrio infections due to sea surface temperature rise.

Reference has been corrected here and in other locations.

The authors thank the reviewer for this comment, and the KM has been modified slightly; however it is beyond the scope of the chapter to discuss climate engineering at this time, although it is discussed slightly in Chapter 29.

Reference has been corrected here and in other locations.

Reference has been corrected here and in other locations.

Reference has been corrected here and in other locations.

Reference has been corrected here and in other locations.

The authors appreciate this comment. The text has been modified based on part of this suggestion. In response to the reviewers comment, the KM has been modified to include the literature, the KM has been modified to include the literature, and the text has been modified.
Michael MacCracken 144632 West Region 26: Alaska
1170 1170 9 3 The chapter needs to be updated on the world 14: may use instead a word from the likelihood lexicon, sharpening as necessary to do so. I try to avoid mentioning too much context in my comments, leaving that to a systematic look at the issue, but see lines 10, 19, and 28 on this page alone.

Michael MacCracken 144632 West Region 26: Alaska
1170 1170 9 9 I'd suggest changing 14-16 years to something more generic like "within a few decades". The text has been modified to state "within this century".

Michael MacCracken 144634 West Region 26: Alaska
1170 1170 14 34 There are two degrees of confidence: 1) there is a degree of confidence and uncertainty, and 2) it would better be stated that there is high confidence in some of these effects, e.g, warming.

The term certain has been changed to assured.

Michael MacCracken 144635 West Region 26: Alaska
1172 1172 14 14 Does it need to be mentioned that these species are also important for Alaskan marine mammal species? The chapters on the "Is it a bit under". The authors appreciate this comment and the text has been modified.

Michael MacCracken 144636 West Region 26: Alaska
1172 1172 19 22 Two more uses of "may" need replacing. And also, "could" or "may not really give an indication of likelihood for the world that should be avoided.

The term has been modified to replace "may" with other terms in the three places identified above.

Michael MacCracken 144637 West Region 26: Alaska
1172 1172 24 28 Again, context is needed for the numbers. Are these annual costs? As a percentage of what? etc. The $3-5 billion cost, this estimate represents a projected cost for 2010 to 2030 and is further clarified in the Economics sections of the chapter.

Michael MacCracken 144638 West Region 26: Alaska
1172 1172 31 26 Change "n" to "has been". And has been modified following suggestions.

Michael MacCracken 144639 West Region 26: Alaska
1173 1173 8 8 Extra parentheses need to be taken out. The text has been modified following suggestions.

Michael MacCracken 144640 West Region 26: Alaska
1174 1174 27 29 I'd suggest starting the sentence with the phrase "With these projected changes, below AIIs". After review of the section, the text was modified slightly.

Michael MacCracken 144641 West Region 26: Alaska
1175 1175 19 12 Again, I generalize to "the next few decades". The text has been modified to reflect the time horizon.

Michael MacCracken 144642 West Region 26: Alaska
1177 1177 24 24 I'd suggest changing "are reported from" to "have been found". The text has been modified following suggestions.

Michael MacCracken 144643 West Region 26: Alaska
1182 1182 14 14 Is it true that the amount of glacial ice on this line alone will become so low that the amount of loss has dropped. Would it be possible to provide the rate of loss of Alaska glaciers (e.g., annual rate they would be melted in 200 years, or whatever--this time is shrinking by the rate of melt may decrease).

The authors avoid trying to give hard dates for this change. However, the evaluation of all glacial ice is not fully known and needs more attention. At this point in time, we do not know enough about glacial processes to answer this question, and depending on how the glacial change may vary, one can get dramatically different results.

Michael MacCracken 144644 West Region 26: Alaska
1184 1184 22 22 Another "may" and this one would really seem to be a "will" or "will likely" there are quite a number of mentions to current and change.

The text has been modified following suggestions.

Michael MacCracken 144645 West Region 26: Alaska
1188 1188 22 22 Another "may" that can be replaced by "will" or "will likely" and other changes to the sentence. The term "may" has been removed from the page in this particular sentence, however, the use of "may" has been evaluated throughout this chapter and changed when appropriate.

The word "may" has been removed from this sentence. It is more appropriate to replace "may" with "will" or "likely". The sentence reads: "This is not true for Hawaii and the Pacific Islands".

Michael MacCracken 144646 West Region 26: Alaska
1189 1189 19 19 There are no degrees of certainty". Some of these effects are underestimated with high confidence" would be an alternative phrasing. The text has been modified following suggestions.

The authors greatly appreciate the reviewer's comment about the chapter and hope that the content was useful.

Michael MacCracken 144647 West Region 26: Alaska
1190 1190 21 24 Because of "will" that really doesn't convey a likelihood. Would be better to reword to indicate likelihood.

The use of the term "will" has been retained here and refers to a future state and there are no current studies that would provide evidence that these events will actually occur or offset beneficial effects on the time horizon.

Michael MacCracken 144648 West Region 26: Alaska
1191 1191 14 14 I was not surprised to note omission of problems from wildfire smoke - health, visibility, etc.

The health issues associated with wildfire in Alaska is mentioned under Key Message 5: Human Health.

Michael MacCracken 144649 West Region 26: Alaska
1192 1192 9 9 No description of "detailed temperature..." but no explanation as to what drives the direction of each arrow (in particular the downward blue arrow). Same as Figure 27.2 is intended to be a cartoon showing some of the primary climate indicator variable and impacts in the Pacific Islands that are summarized in the entire chapter. Unfortunately, limited space prevents us from providing more details in the introduction. The bullet points in the text after the figure citation provide additional detail on these indicators and impacts, we have added notes in the bullet points that designate the KM with more information. For example, KMs 3 and 102 have been used as a basis in this discussion, so KMs 3 and 102 will be added to the executive summary. In the full RMI text that this sentence was pulled from, this citation was already present.

The term certain has been changed to assured.

Michael MacKerron 144708 Whole Chapter 26: Alaska

This chapter was especially interesting because it focused on the climate change affects Alaska is experiencing. It mentions the effects on ecosystems, animal species, infrastructure, and human health. The chapter provides an interesting perspective of an area of the globe where not many people witness the effects of climate change, but where these effects are highly significant.

The authors greatly appreciate the reviewer's comment about the chapter and hope that the content was useful.

Michael Mak 144876 West Region 27: Hawaii and Pacific Islands
1231 1231 5 5 Why in World Vision et al. 2017 [4], the benefits in our MRA 4 V4 (1-2 CSR) sed rate as a resource supporting ENOS as the prevalent cause of climate variability in the Pacific? Having reviewed the CSR, there is little information about this claim. The text was adjusted and the introduction (Figure 27.1) to clarify the World Vision reference refers to ENOS's influence on global climate variability, while the VFI reference refers specifically to that of the Pacific Islands.

False projections of ENOS and La Nina intensity and frequency are uncertain. Here, we mention recent findings from model studies in Future Climate Change that point to a doubling in both EN and La Nina (Eliasson et al. 2014 and 2015). Detailed coverage of the future of ENOS is beyond the scope of this report, but readers are encouraged to read the cited references, Chapter 5 of the CSR for more details.

Cowan & Otto, 2014, has been used as a basis in this discussion, so KMs 2 and 102 will be added to the executive summary. In the full RMI text that this sentence was pulled from, this citation was already present.

The term certain has been changed to assured.

Michael Mak 144878 West Region 27: Hawaii and Pacific Islands
1231 1231 14 27 sentence, "Streamflow in Hawaii has declined..." The statement requires a reference citation. If none can be provided, suggest deleting.

Text has been changed to assured.

Michael Mak 144879 Figure 27: Hawaii and Pacific Islands
1239 27.2 27.2 The figure caption (or accompanying text description) needs more explanation for each of the corresponding red and blue arrows in the diagram. For example, there is an up and down arrow for "Winds and Waves Changing" but no explanation as to what drives the direction of each arrow (in particular the downward blue arrow). Some gaps for Ocean Chemistry and Extreme Events.

Figure 27.2 is intended to be a cartoon showing some of the primary climate indicator variable and impacts in the Pacific Islands that are summarized in the entire chapter. Unfortunately, limited space prevents us from providing more detail on these indicators and impacts, we have added notes in the bullet points that designate the KM with more information. For example, KMs 3 and 102 have been used as a basis in this discussion, so KMs 3 and 102 will be added to the executive summary. In the full RMI text that this sentence was pulled from, this citation was already present.

The term certain has been changed to assured.

Michael Mak 144900 West Region 27: Hawaii and Pacific Islands
1240 1240 17 The block is essentially the description of Figure 27.2. However, additional information is needed. On the first bullet point, starting with "decorated temperature...", briefly provide more specificity to match the arrow descriptions in the figure. The word "detailed" is subjective. The second bullet point on line 7-8, "more refined estimates", but this is also subjective. Can something more robust or quantitative be said about these estimates? Ideally, line 16-20(3), the last bullet point, the worst challenging event that ever occurred is a singular event beyond the broad context of Figure 27.2. Suggest refining the bullet point to fit the ocean chemistry arrow(s) and move the reference to a singular bad event elsewhere in the chapter.

Text has been modified following suggestions.

Michael Mak 144901 West Region 27: Hawaii and Pacific Islands
1241 5 remove the word "through". The text was adjusted accordingly.

Michael Mak 144902 West Region 27: Hawaii and Pacific Islands
1242 1242 16 16 With respect to this paragraph, I ask "so what?" What is the significance of these efforts, particularly in relation to climate projections another region? This short section is meant to highlight that although there is and will always be uncertainty in future projections of both physical climate and socio-economic impacts, uncertainty is not a reason to put off taking action, either through adaptive policies or projects. Additional language has been inserted to clarify this, and to provide a few examples of ways in which these initiatives are building evidence to climate impacts.
Source: NOAA. Vague. Please provide a document, website, or manuscript from NOAA that can be reviewed.

"annual bleaching will begin in 2035..." - many in the Pacific region are already seeing and experiencing annual threats, use lowercase M in "Many", and complete the sentence.

Please (please) remove the words, "Pacific peoples resist the role of victims." Then place a comma after the Marra et al. 2008; Kruk et al. 2015). Please define "storminess" as used in this context.

"storminess" - lots of context for this in the Pacific region, and term is used without references (Atkinson 2005;...). Please provide a source for this statement. As it currently reads, it may be construed as opinion.

Line 9 - "and under-scaled catchment systems..." - please provide a source/reference for this statement. As it currently reads, it may be construed as opinion.

Line 8, "Because they are dependent on restricted..." - maybe use the word 'variable' instead of restricted.

"...and under-scaled catchment systems..." - please provide a source/reference for this statement. As it currently reads, it may be construed as opinion.

"...discussions involving multiple stakeholders are underway". Great! Could the authors elaborate a bit on what this means?

"...the most severe impacts..." - assume this is related to climate change?

"Increasing both area for water capture..." on line 2 -- how? They are already limited in size geographically.

"Based on a network of representative weather stations..."  Please provide a source for this statement. As it currently reads, it may be construed as opinion.

The entire paragraph is fairly wordy and redundant. Suggest a simplification/shortening to convey the message more succinctly.

"...and under-scaled catchment systems..." - please provide a source/reference for this statement. As it currently reads, it may be construed as opinion.

The text has been revised to incorporate this suggestion.

"...such as changing rainfall patterns". Remove the word "is". Replace sentence with: "...such as changing rainfall patterns..."

We agree with this suggestion to rephrase and have changed the text to "shallow freshwater lenses."

We appreciate the reviewer for the comment. The figure caption text has been revised to incorporate this suggestion.

Due to the size of the topic and the page limit for this chapter, we focus on broad trends rather than providing such a level of specificity. In May 2015, the Principals of the Subcommittee on Global Change Research made the decision to use the full range of IPCC RCPs and CMIP5 products for physical climate science analyses in the NCA4. NCA4 will focus on RCP 8.5 as a high-end scenario and RCP 4.5 as a low-end scenario. The use of RCPs 8.5 and RCP 4.5 as core scenarios is generally consistent with the range of emission scenarios used in the Third National Climate Assessment (NCA3). For more detail on the selection of these report-wide scenarios, please see: National Climate Assessment (NCA3). For more detail on the selection of these report-wide scenarios, please see: https://www.globalchange.gov/nca4/docs/default-files/files/external%20memos/NCA4%20Summary%20of%20Findings-20150506.pdf

We appreciate this comment, but space is limited. Here we have provided some example explanation in response to the review, and added more detail in the text to provide context.

We thank the reviewer for the comment and agree with the suggestion made due to space limitations. (3) Regarding monitoring and adaptive capacity: We have added an additional clarifying phrase. (4) Regarding evaporation-related variables: The variables were added as requested.

We agree with this suggestion to rephrase and have changed the text to "shallow freshwater lenses."

We have made slight changes to improve the sentence's readability. After consideration of the first point in this response, we have determined that the existing text is clear and accurate. Thus, we have kept "such as changing rainfall patterns" without parenthesis because it is central to the point being made in the sentence.

We appreciate the reviewer's comment. The text has been revised slightly to highlight the paragraph.
### First Name Last Name | Comment ID | Comment Type | Region | Chapter | Figure/Table Number | Start Page | End Page | Start Line | End Line | Comment | Response
---|---|---|---|---|---|---|---|---|---|---|---
David Koipik | 414708 | red region | 27. Hawai'i and Pacific Islands | | | 1422 | 1426 | 9 | 7 | Year book mark not defined! | This comment does not appear to be consistent with the text in the document. It likely references a formatting error that has been resolved in the text.
David Koipik | 414708 | red region | 27. Hawai'i and Pacific Islands | | | 1427 | 1429 | 18 | 23 | The present text says this: | The comment is consistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 (Climate Science Special Report, the CSSR); that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David Koipik | 414749 | red region | 27. Hawai'i and Pacific Islands | | | 1248 | 1249 | 0 | 0 | Present text: | The comment is consistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 (Climate Science Special Report, the CSSR); that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David Koipik | 414750 | red region | 27. Hawai'i and Pacific Islands | | | 1251 | 1253 | 24 | 30 | Present text: | The comment is consistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 (Climate Science Special Report, the CSSR); that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David Koipik | 414751 | red region | 27. Hawai'i and Pacific Islands | | | 1236 | 1237 | 14 | 20 | Present text: | The comment is consistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 (Climate Science Special Report, the CSSR); that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David Koipik | 414752 | red region | 27. Hawai'i and Pacific Islands | | | 1259 | 1260 | 40 | 53 | The present text says this: | The comment is consistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 (Climate Science Special Report, the CSSR); that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
This is the present text:
13 Key Message 6: Climate change impacts in the Pacific Islands are expected to amplify existing ties and lead to complex interactions between economic, environmental, social, and cultural costs. For example, climate change impacts on ecosystem and social systems may result in severe 14 disruptions to island local communities and the risk of human conflict on the model of 15 migration. Early interventions, already occurring in some places around the region, can 16 prevent costly and lengthy rebuilding of communities and livelihoods, and minimize the 17 data and information on a variety of impacts. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These attributions, projections and risks appear to be travel primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

This comment is inconsistent with the author’s thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature and modeling efforts. NGA Volume 1, Climate Science Special Report. The CSSR study provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.

This whole chapter needs to focus more on cultural heritage or cultural resource adaptation sector. The National Park Service (NPS) funded a series of case studies that focused in detail on the National Marine Sanctuary of American Samoa vulnerability assessment and adaptation planning findings (1) We have added the suggested H Climate Change Special Report section cited in the chapter, in NPS adaptation. (2) Space limitations currently limit us from adding additional case studies such as the OPA Logistic report. While the author team has chosen not to include this case study, we recommend contacting the PADA or team to add it to the US National Climate Resilience Toolkit.

This ought to be alphabetized by last name, I would think. The text has been revised to incorporate this suggestion, Technical Contributors are now alphabetized by last name.

This ought to be alphabetized by last name, I would think. The text has been revised to incorporate this suggestion, Technical Contributors are now alphabetized by last name.

We greatly appreciate the reviewer’s comment about the Pacific Islands chapter and hope the content is useful.

We thank the reviewer for their comment and suggested revision. The text has been revised here and throughout the chapter to eliminate weak future conditional words such as “may” or “could” and to use more specific language to improve the reader’s ability to understand the report.

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May want to include National Marine Sanctuary of American Samoa vulnerability assessment and adaptation planning findings. This ought to be alphabetized by last name, I would think. The text has been revised to incorporate this suggestion, Technical Contributors are now alphabetized by last name.

We greatly appreciate the reviewer’s comment about the Pacific Islands chapter and hope the content is useful.

We have now more discussion of the importance of cultural heritage. We think the reviewer for the suggestions, and the useful literature

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<table>
<thead>
<tr>
<th>First Name</th>
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<tr>
<td>Sandra</td>
<td>Fatorić</td>
<td>140038</td>
<td>Test Region</td>
<td>28. Near-Term Adaptation Needs and Increased Resilience</td>
<td>1327 1327 9</td>
<td>10</td>
<td>Please first add word “local” before learning processes. Then please add additional reference before (Kimura, Pulwarty et al. 2014) as: Fatorić and Seekamp, 2017 Reference: Fatorić, S. &amp; Seekamp, E. (2017). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land-Use Policy 68, 254-263. We thank the reviewer for the suggestion. We now cite this work elsewhere in the chapter, but have chosen not to cite it again here.</td>
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<tr>
<td>Sandra</td>
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<td>Test Region</td>
<td>28. Near-Term Adaptation Needs and Increased Resilience</td>
<td>1325 1325 15</td>
<td>15</td>
<td>Please add following sentence in line 15 as: Another example in a comprehensive decision support tool that is driven by annual budget allocations, measures of risk from climate change, measures of historical significance and use potential, and treatment costs for various adaptation actions has been developed and tested using set of historic buildings at Cape Lookout National Seashore, North Carolina (Fatorić and Seekamp 2017). We thank the reviewer for the suggestion. We now cite this work elsewhere in the chapter, but have chosen not to cite it again here.</td>
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<tr>
<td>Sandra</td>
<td>Fatorić</td>
<td>140041</td>
<td>Test Region</td>
<td>28. Near-Term Adaptation Needs and Increased Resilience</td>
<td>1316 1316 29</td>
<td>30</td>
<td>Please add “which can enhance transparency and foster defensive decision making” (Fatorić and Seekamp 2017). The new sentence is: Such frameworks rely on and support participatory stakeholder processes, which can enhance transparency and foster defensive decision making (Fatorić and Seekamp 2017). We thank the reviewer for the suggestion. We now cite this work elsewhere in the chapter. Thanks for the suggestion.</td>
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<tr>
<td>Elizabeth</td>
<td>Barrett</td>
<td>140038</td>
<td>Whole Chapter</td>
<td>28. Near-Term Adaptation Needs and Increased Resilience</td>
<td>1354 1354 6</td>
<td>4</td>
<td>It could be helpful to add at least one paragraph explaining the relationship between adaptation and other frequently discussed concepts like vulnerability, adaptive capacity, and resilience. Here is a suggested paragraph: Adaptation can help reduce vulnerability to climate change impacts, where “vulnerability” is: a function of the character, magnitude, and rate of climate variations to which a system is exposed, its sensitivity, and its adaptive capacity” (Bierbaum et al. 2014, 672). Here, “adaptive capacity” means the “potential of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, take advantage of opportunities, and cope with the consequences.” (Bierbaum et al. 2014, 672). Resilience can support successful adaptation and reduce long-term vulnerability. (Cutter et al. 2008, 600; Adger, Arnell, and Tompkins 2005, 79, 83; Nelson, Adger, and Brown 2007, 400). Resilience is the idea that a community can weather through and bounce back from surprise by having the right kind of resources or “capital” and the flexibility to draw on those most readily available. (Hains et al. 2006, 130; Walker et al. 2006, 22; Nelson, Adger, and Brown 2007, 407; Cutter et al. 2008, 599; Magis 2010, 402). Resilience is the idea that a community can weather through and bounce back from surprise by having the right kind of resources or “capital” and the flexibility to draw on those most readily available. (Hains et al. 2006, 130; Walker et al. 2006, 22; Nelson, Adger, and Brown 2007, 407; Cutter et al. 2008, 599; Magis 2010, 402). We thank the reviewer for the suggestion. We now cite this interesting work elsewhere in the chapter. Thanks for the suggestion.</td>
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<td>28. Near-Term Adaptation Needs and Increased Resilience</td>
<td>1334 1334 4</td>
<td>4</td>
<td>Suggest adding another sentence at the end of this sentence along these lines: “What may appear to be an adaptation action expressed in a community plan may never actually be carried out.” Thank you for this comment. We have significantly rewritten this text.</td>
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</table>
We thank the reviewer for this comment. The chapter text has been revised to incorporate the suggestions.

We have added the start and end of the revised "beyond instrumental change" section. Thank you for this comment.

We have revised this sentence along the lines suggested by this comment.

We appreciate the reviewer's comments and agree with the point in the recommended citation that in some cases too many resources are spent on scientific assessments relative to adaptation implementation. That said, "assessment" is a broad term that goes beyond formal scientific studies. We doubt whether it is possible for humans to take deliberate actions to adapt to climate change (or any type of risk) without some type of assessment.

We have included more citations throughout the chapter.

We have revised this sentence along the lines suggested by this comment.

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Thank you for this comment; we have included some of these points and cites in the text.

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We thank the reviewer for this comment and have incorporated change to the text.

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We appreciate the reviewer's comments and agree with the point in the recommended citation that in some cases too many resources are spent on scientific assessments relative to adaptation implementation. That said, "assessment" is a broad term that goes beyond formal scientific studies. We doubt whether it is possible for humans to take deliberate actions to adapt to climate change (or any type of risk) without some type of assessment.

We thank the reviewer for this comment and have incorporated change to the text.
Adaptation to these speculations is unwarranted and yields no benefits. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.

Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.

Response: We thank the reviewer for the comment, but respectfully disagree. Please refer to the climate science special report the accompanies the NCA.
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<tr>
<td>Susanne</td>
<td>Moser</td>
<td>141795</td>
<td>Whole Chapter</td>
<td>19b: Near-Term Adaptation Needs and Increased Resilience</td>
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<td>The Adaptation chapter as a whole does not constitute an objective or well informed assessment. It reads more often like a textbook rather than an assessment; in many places it is vague - something the &quot;may, can, could, or might policy&quot; in NCA3 was various about avoiding - and therefore is unhelpful for researchers or decision-makers; and it includes a number of overt or hidden normative statements. What is its more serious flaw, however, is that it is dated, uninformative, does not provide adequate perspective, and is in many instances rosy-eyed and unsupported by evidence. I will provide a few sample passages where that is the case, but having just completed a serious assessment of the state of adaptation as a field of practice in the US, I find this chapter simply to be a document of wishful thinking. It is wholly inadequate as a definitive federal document reflecting the state of adaptation in the US. It simply and categorically does not. The traceable account suggests the author team did a comprehensive literature review and consulted experts who are not named or counted, so this does not provide very convincing evidence that this search and consultation was thorough. For example, the current reference list consists of 108 references (it is uncountable, but I can only work with what is presented); more than half (57) of these references are pre-NCA3. So, a total of 52 references are post 2014. By comparison, a quick Web of Science search for these terms yields 223 references. So, a first indication that the literature search was not comprehensive. More importantly, SO MUCH of what is going on in the adaptation arena is reflected in non-peer-reviewed journal articles, and yet often well researched and peer-reviewed. This body of work is generally termed &quot;grey literature&quot; but is permissible (and other chapters in the assessments rely on such references). That body of work is 100% missing from this assessment. It reads therefore like the authors simply do not know what is going on in America. I will make more specific comments separately to reflect how these omissions make the chapter essentially biased or useless. I am sorry to have to say this. I will send several documents to the review email and urge the author team to read those documents to sharpen the assessment.</td>
<td>We thank the reviewer for the comment. We have included more citations in our revised draft, have removed at least some of the &quot;may, can, could, or might policy&quot; and revised those sections that might have led the reviewer to consider us as &quot;rosy-eyed.&quot; The chapter did and now we more so draw heavily on the grey literature.</td>
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| Susanne   | Moser     | 141796     | End Region   | 20b: Near-Term Adaptation Needs and Increased Resilience | 1312 - 1314 | 20 - 24 | 14 | 15 | My comment pertains to KM 1 and the text that goes with it. This is a good example of how this chapter is biased and wholly unsupported by adequate evidence. The section claims early on that NCA3 adaptation has "increased significantly" in scale and scope, which is graphically depicted in Figure 28.1. I want to know where the author team comes up with that conclusion. Its PRIMARY reference given as evidence is the Bierbaum article which was commissioned PRIOR to 2014 for NCA3 and it concluded - see the title of the paper - that adaptation is progressing but not enough. Its key take home message was tempered down even further by all the other evidence accumulated in all the chapters of NCA3 to the conclusion that Melillo et al 2014 came to, namely that we were not seeing many examples of implementation. So, one pre-NCA3 paper is given as evidence that we have progressed beyond the NCA3 statement. Several more paragraphs on p. 1313 claim there is evidence of progress, but provide not a single reference. Then at the top of p. 1314, there are several other references - one about progress of federal agencies - which was mandated under Obama and is not seriously counted and this is not in any way acknowledged; and then two legal papers and the tribal chapter. In the accompanying traceable account, the paper also refs to Vogel et al 2014 - a compilation of case studies expressly claiming NOT to be representative of the US and including case studies that do NOT consider anthropogenic climate change or forward looking climate information; and a review paper by Stoll and Morehouse that explicitly says that implementation is seriously hindered. Nor does it include a broader set of references of barriers studies or reviews of case studies or other reviews that conclude just the opposite of the author team. How in the world can the authors claim that the country as a whole has moved into implementation? Because of maybe 2 or 3 dozen projects that have been successful in overcoming major funding and institutional hurdles? How can I say that it is news to the dozens, maybe more, communities can't get beyond the planning stage, and when thousands have even begun yet??? This comment exemplifies (and note, there are many more unsupported statements like this throughout the chapter) what I call wishful thinking, bias, and lack of groundedness in the reality of adaptation in the US. A better informed chapter would consider the long list of studies and reviews on barriers to adaptation; it would seriously consider a comprehensive review of the adaptation field just published by the Kresge Foundation (as | We thank the reviewer for the comment, which we found very helpful. We have qualified our statements and added more current citations.
This set of comments pertains to KM3. This message and supporting text and transferable account are bizarre to me.

Rebecca Ambrosh
141001
Red Region
28. Near-Term Adaptation Needs and Increased Resiliency
1316
1316
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The first dimension of this KM, which is about codes, regulations and standards that prevent even the willing from building back better and be forward-looking is a type of institutional barrier and there is growing literature on that. The efforts of ASCE are misrepresented as “the engineering community is already overcoming this.” FAR from it. The ACEC document offers a framework and makes very high level recommendations about what SHOULD be done. But that is a far cry from doing it already. If the author team knew more about how difficult and lengthy it is to change codes and standards, such a lofty, rose eyed statement would not be made.

I have the entire chapter marked red because it makes so many generalized claims that are unsupported, I truly do not even know where to begin.

We thank the reviewer for the comment. We have revised the KM and give examples of the points made.

Thank you. We disagree with all the many and various claims in this comment. The utility of an adaptive management framework has been documented in the references already cited in this chapter. The capacity for adapting to surprise or unplanned for events is expressly recognized the emphasis on learning and revising within applications of the adaptive management framework as illustrated by the examples we include.

Thank you. We have completed the reference citation to Townsend et al., 2015, and have added additional references to support our claims herein. We disagree that references are missing on almost every claim we make.

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The set of networks cited are extremely selective, not reflective of much of what is happening in the world of websites or are actively defunded. So, the authors can't say that maybe, but then they need to work a lot harder to still say the truth to power. Avoidance of waning federal resources is disingenuous at best! There is also no discussion that many resources are federal and have been either withdrawn or taken off - the available resources are equally good and judged by what criteria - anything is missing - what is there is useful and to whom. What is the purpose of this section? It is no associated with a KM, nor does it provide a comprehensive overview of available resources and networks, nor does it provide a critical assessment of whether what is out there is useful to whom, anything is missing, the available resources are equally good and judged by what criteria, maybe there is too much information and too many tools, in conflict with each other, or simply useless and overwhelming to users. There is also no discussion that many resources are federal and have been either withdrawn or taken off websites or are actively defunded. So, the authors can't say that maybe, but then they need to work a lot harder to still say the truth to power. Avoidance of waning federal resources is disingenuous at best! The set of networks cited are extremely selective, not reflective of much of what is happening in the world of adaptation in this country, and yet, one of the federal networks (CCU) is out of business, so why bother mentioning it?

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We revised this KM. Box 26.1 tells common attributes of effective adaptation practices.

We have re-written the key message and deleted the Table.
Rebecca Moser 141006 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1413 1237 C 26 I cannot comment on every paragraph as I have a day job. But this document is a wholly inadequate back-up to the claims. The uncertainty mentioned in several EM sections has nothing to do with, or comprise only a partial list of the uncertainties pertaining to the EM - the discussion of statistical significance of the evidence base for the first EM is completely lacking, given that there are these studies mentioned, none of which mention anything quantifiable. The references are pre-NCA3 and hence not supporting the statements made here at all. So meta analysis and a set of case studies, none of which claiming comprehensiveness or representativeness. The measure of "best-case" for adaptation implementation taking place is "financial levels" (whatver that is?), and yet, there is not a single reference to a study in this entire chapter that would look at what kind of money has been spent on adaptation in the US. Not even a single reference to barrier studies that show that the lack of money for implementation is the biggest hurdle people face. So, not only is there no convincing evidence for the KM; the text here is just a bit of nonsense for no evidence at all. The text claims there has been no "gap" analysis, which is untrue (see traceable-sponsored review of the US adaptation field, which does exactly that). But the flaws all with standing, the authors rely on these studies to give them high confidence. Is that just may be a bad presumption? I find it depressingly misstated. And then the medium confidence on judgements on outcomes, where does it come from? There is no serious discussion of outcomes in the entire chapter, and the only thing that the authors say about it is that assessing adaptation effectiveness is in the early stages still, offering no judgement on outcomes at all - nowhere in the entire chapter!! That, too, would seem to be just a tad bit overconfident, doesn’t it?

We have added a such a sentence.

Susanne Moser 141007 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1334 1335 7 24 I have commented on test passages how the argument here is incomplete. The superficiality in discussion continues in the Traceable Account. Only an evidence base for non-stationarity is offered, but no evidence base for how the non-recognition of that non-stationarity is hindering adaptation. That, however, is what the message is about. hard to justify when the argument in the chapter is unclear, and hence there is no reliance on relevant literature to back it up. The description of the confidence level relies on pre-NCA3 studies (and hence pre-NCA3 knowledge). Really? That is what this is a consensus? Seems dated and unformed by relevant recent science.

We have altered this statement. Thank you for the comment.

Susanne Moser 141008 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1335 1335 B 34 There is a medium confidence that many organizations are familiar with iterative risk management. Well, there is no evidence shown for that claim and the description of where the confidence comes from does not offer it either. It is moreover impressive as no one knows how to interpret "many". But even so, it’s just assume many do. Who will be expected to make most of the adaptation decisions? How, often is it claimed that local governments have to a lot to say about that. The question is, do THEY know what iterative risk management is? are they skilled in doing it? And the answer is NO. So, once the impression here is taken care of, I wonder how much is left standing of the claim. Planners and climate resilience officers etc have barely a clue. You don’t learn this stuff in planning school.

I provided many other comments on the text already that questions the confidence and claims here. The uncertainty section does not account for any of the uncertainties pertaining to the claims in the EM.

We have rewritten this section. Thank you for the comments.

Susanne Moser 141009 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1335 1335 26 The authors claim high confidence in this EM, and claim an extensive evidence base, but is nowhere cited. Not here nor in the text.

They also continued their high confidence by describing the sample size as small making evaluation insufficient; also there are large ask-nodledged uncertainties in BC ratios. Earlier the authors claimed the literature is immature. So, all of this and yet "high confidence" - what am I missing. Seems disingenuous to me to claim that when our knowledge is so spotty especially when there is no critical assessment anywhere in this chapter of the underlying assumptions, the differences in approaches, the types, typically omitted from GIKs and so on.

We have rewritten this section. Thank you for the comments.

Susanne Moser 141010 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1336 1337 27 26 Neglecting missing any supporting referencing! Which who agrees with this claim that mainstreaming can produce effective adaptation - especially when it is NEVER critically looked at what "effective" might mean. To whom? When? Effective is necessarily subjective and therefore will never be easily agreed by everyone. Who is excluded from this agreement may also disagree with the assessment. Mainstreaming infers the problems of the institutions into which climate change is being mainstreamed. Institutions that perpetuate institutional racism, resource exploitation, maladaptation and so. So, please, just on the thinking here!

And even if there was some group of people that thinks mainstreaming is a good idea, the authors’ team’s job is not to just be an echo chamber for it, but reflect the fact that academics tend to be far more skeptical of it. So, some balance would be warranted and appropriate!!

The high confidence statement in the description of confidence for adaptation does not adequately address the KM. And the high confidence paragraph has nothing to do with mainstreaming or transformational change.

We now provide a better-cited discussion of mainstreaming, and discuss some of the reasons for pursuing an alternative approach. We thank the reviewer for the suggestion.

Susanne Moser 141011 Traceable Account 2B. Near-Term Adaptation Needs and Increased Resilency 1388 1395 C 28 The authors have to do much better job with referencing - several references cited in the text are not here referencing information-per-climate is incomplete in many instances referencing format is uneven.

The formatting and presentation of references will be done in the final layout of the report development process.

Debbra Ambrose 141012 Whole Chapter 2B. Near-Term Adaptation Needs and Increased Resilency 138 1395 C 28 The authors assert that the Mitigation chapter includes a key message that essentially says, we don’t need to worry so much about mitigation anymore because we can just adapt to whatever comes. You might want to have a conversation with them about that...

But even if you cannot dissuade them from that completely illusory statement, how would that bold claim affect what you want to say here? Would you feel quite so confident in progress with adaptation in this country? Would you insist on being quite so vague about the need for transformational change? Would you not want to look at the cost-effectiveness of mitigation vs the cost of inaction or the cost of adaptation? It might open up some sharper thinking about adaptation, if the burden of America’s future were all on adapted just saying....

We have tried to address some of these comments in our revised discussion of KM5. We thank the reviewer for the suggestion.
The Summary Overview section does not actually summarize what's in the chapter. In that the intent it also doesn't create the sense of urgency that I think is truly needed for this chapter to open up. The reader needs to understand why it's so critical to invest in adaptation actions now because we're already experiencing changes in our climate and extreme weather events. A Summary Overview should highlight the core components woven throughout the entire chapter instead of being a technical description of why we need to adapt. It can be put after the summary overview, and beef up the summary overview with reasons why this is so important and the urgency here to truly grab the reader's attention from the start.

We have re-written the summary. We thank the reviewer for the suggestion.
In 2015 FEMA began requiring states to assess the impacts of climate change and how the frequency and magnitude of natural disasters may change in the future and what actions the state may take to reduce their commensurate risks and vulnerabilities to these natural disasters. More information on this policy change can be found here (https://www.nrdc.org/experts/becky-hammer/fema-finalizes-new-requirement—... ). We have revised the text to address this point. We thank the reviewer for the suggestion.

Some specific examples of elements that the assumption of climate stationarity is hampering adaptation efforts are flood maps produced by FEMA (also known as Flood Insurance Rate Maps). These maps are the primary tool that policy makers, developers, engineers, designers, local officials, and users use to determine their flood risk. But these maps do not account for changing future conditions, and are based entirely on past storms and current topography, bathymetry, etc. As such, our nation’s primary risk communication tool for storms falls woefully short of what’s needed to inform the public about future flood risks. New York City is a location where FEMA is working with the City to create more future-oriented flood maps, which could serve as a model for other coastal areas of the country (see https://www.nrdc.org/experts/rob-moore/fly-wel-get-flood-maps-consider—... ). New York State has adopted regulations that anticipate future sea level rise and different estimates over various timescales and probabilities. These are worth citing, as they are a good example of the types of policies governments at all levels should be incorporating into design standards for public buildings, facilities, and infrastructure (see https://www.nrdc.org/experts/rob-moore/fly-wel-get-flood-maps-consider—... ). A similar standard was put in place by President Obama, known as the Federal Flood Risk Management Standard. This would have required all federal agencies to ensure that projects they fund incorporate an additional margin of safety for flood risk and, where it made sense, incorporate projections of future sea level rise (see https://www.nrdc.org/experts/rob-moore/president-raises-flood-protection—... ). Unfortunately, these standards were rescinded by the present administration just days before Hurricane Harvey made landfall (see https://www.nrdc.org/experts/pat-scota/hurricane-harvey-makes-landfall—... ).

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We thank the reviewer for the suggestion. We have revised the text to address this point. We thank the reviewer for the suggestion.

It is worth noting some of the efforts that federal agencies have undertaken to get states and local communities to plan for and implement adaptation measures. HUD has overseen two efforts successful efforts in this regard. Rebuild By Design and the National Disaster Resilience Competition. Rebuild By Design was a design-driven approach to create innovative local resilience solutions that was conducted in the aftermath of Superstorm Sandy. It was structured to connect local communities with some of the nation’s leading design firms to collaboratively identify and solve problems and address vulnerabilities that were exposed by Superstorm Sandy. The design solutions for the winning proposals ranged in scope and scale—from large-scale green infrastructure to small-scale residential resiliency retrofits. The competition process strengthened the understanding of regional interdependencies, fostering coordination and resilience both at the local level and across the U.S. Ultimately, nine projects were selected for implementation and received HBDB-DR funding totaling $500 million. Each of the seven winning projects are moving forward, undergoing engineering studies and environmental assessments, and will break ground in 2019. The program was such a success that HUD later used it as a model for the National Disaster Resilience Competition, which distributed nearly $1 billion in unencumbered HUD DR funds to fourteen projects throughout the United States. FEMA has also taken steps to get states to pro-actively address changing future conditions that result from climate change. In 2015 FEMA began requiring states to assess the impacts of climate change and how the frequency and magnitude of natural disasters may change in the future and what actions the state may take to reduce their commensurate risks and vulnerabilities to these natural disasters. More information on this policy change can be found here (https://www.nrdc.org/experts/becky-hammer/fema-finalizes-new-requirement—... ). We have revised the text to address this point. We thank the reviewer for the suggestion.

The term “uncertainties” is used several times without defining whether these are planning uncertainties, scientific uncertainties, funding uncertainties, etc. The chapter uses “uncertainties” several times without defining whether these are planning uncertainties, scientific uncertainties, funding uncertainties, etc. It is worth noting some of the efforts that federal agencies have undertaken to get states and local communities to plan for and implement adaptation measures. HUD has overseen two efforts successful efforts in this regard. Rebuild By Design and the National Disaster Resilience Competition. Rebuild By Design was a design-driven approach to create innovative local resilience solutions that was conducted in the aftermath of Superstorm Sandy. It was structured to connect local communities with some of the nation’s leading design firms to collaboratively identify and solve problems and address vulnerabilities that were exposed by Superstorm Sandy. The design solutions for the winning proposals ranged in scope and scale—from large-scale green infrastructure to small-scale residential resiliency retrofits. The competition process strengthened the understanding of regional interdependencies, fostering coordination and resilience both at the local level and across the U.S. Ultimately, nine projects were selected for implementation and received HBDB-DR funding totaling $500 million. Each of the seven winning projects are moving forward, undergoing engineering studies and environmental assessments, and will break ground in 2019. The program was such a success that HUD later used it as a model for the National Disaster Resilience Competition, which distributed nearly $1 billion in unencumbered HUD DR funds to fourteen projects throughout the United States. FEMA has also taken steps to get states to pro-actively address changing future conditions that result from climate change. In 2015 FEMA began requiring states to assess the impacts of climate change and how the frequency and magnitude of natural disasters may change in the future and what actions the state may take to reduce their commensurate risks and vulnerabilities to these natural disasters. More information on this policy change can be found here (https://www.nrdc.org/experts/becky-hammer/fema-finalizes-new-requirement—... ). We have revised the text to address this point. We thank the reviewer for the suggestion.

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<td>11</td>
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<td>Suggest reviewing use of &quot;some&quot; through document. It often is unnecessary and/or not specific enough. For example, p.1314 line 34-37: &quot;AC thinks much deeper and decides bigger than reflected in some of the more recent data&quot; (some could be removed without loss of clarity). Suggestion used by some of the water management agencies.</td>
<td>Due to space constraints we dropped the sentence mentioned.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142794</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1308</td>
<td>1308 11</td>
<td>11</td>
<td></td>
<td>In this context, does infrastructure mean physical infrastructure or social/planning infrastructure (i.e., established processes). If the former, consider adding &quot;planning frameworks or processes&quot; or something similar.</td>
<td>Thank you for this request for clarification; we reviewed the sentence above and revised Key Message 2.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142795</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1308</td>
<td>1308 14</td>
<td>14</td>
<td></td>
<td>Confusing wording. Consider changing to &quot;Because some GCMs reside in the atmosphere for decades or longer, many climate-influenced variables would continue to change throughout the 2100 even if greenhouse gas emissions were immediately stopped.&quot;</td>
<td>Thank you for your comment. We revised the text to address this recommendation.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142796</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1309</td>
<td>1309 9</td>
<td>9</td>
<td></td>
<td>Built-in human infrastructure seems redundant. Consider changing to built infrastructure.</td>
<td>Thank you for your comment. We discussed this with the reviewer and removed this phrase.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142797</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1309</td>
<td>1309 10</td>
<td>11</td>
<td></td>
<td>Consider changing &quot;alternative adaptation options&quot; to &quot;adaptation alternatives&quot; or &quot;adaptation options.&quot; In the first, it is not clear what adaptation is an alternative to. The proposed change seems to reflect the paragraph description.</td>
<td>Thank you for your recommendation; we revised this paragraph, and removed this phrase.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142798</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1310</td>
<td>1310</td>
<td>2</td>
<td></td>
<td>Is there a reason why this figure does not align with the five steps mentioned on p. 1308, line 12 and p. 1312 line 26-27?</td>
<td>Thank you for the reviewer for the comment. The figure has been revised to incorporate the suggestion and align with the text.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142799</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1311</td>
<td>1311 8</td>
<td>12</td>
<td></td>
<td>Suggest choosing one definition instead of offering two in order to avoid confusion.</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Anne</td>
<td>Mursh</td>
<td>142800</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1311</td>
<td>1311 21</td>
<td>21</td>
<td></td>
<td>Word missing.</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142801</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1311</td>
<td>1311 24</td>
<td>24</td>
<td></td>
<td>Consider changing to frequency of heat waves. The definition of extreme heat has not changed over time, the incidence has.</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142802</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1312</td>
<td>1312 2</td>
<td>2</td>
<td></td>
<td>Confusing wording. Consider changing to &quot;Because some GCMs reside in the atmosphere for decades or longer, many climate-influenced variables would continue to change throughout the 2100 even if greenhouse gas emissions were immediately stopped.&quot;</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Anne</td>
<td>Mursh</td>
<td>142803</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1312</td>
<td>1312 17</td>
<td>19</td>
<td></td>
<td>The sentence &quot;Achieving the benefits of deep uncertainty...&quot; seems to fit better in the paragraph above (line 7-12).</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142804</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1312</td>
<td>1312 26</td>
<td>36</td>
<td></td>
<td>Link appears to be broken.</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Anne</td>
<td>Mursh</td>
<td>142805</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1312</td>
<td>1312 38</td>
<td>38</td>
<td></td>
<td>Link appears to be broken.</td>
<td>Thank you for the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142806</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1313</td>
<td>1313 13</td>
<td>13</td>
<td></td>
<td>Other actions are vague. Consider specifying or deleting.</td>
<td>Thank you for the reviewer for the comment and have incorporated change to the text.</td>
</tr>
<tr>
<td>Anne</td>
<td>Mursh</td>
<td>142807</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1314</td>
<td>1314 21</td>
<td>21</td>
<td></td>
<td>It would be great to have an example of other climate impacts that could be better integrated into coastal adaptation (e.g., extreme heat's effect on coastal tourism, ocean acidification impact on coastal fisheries).</td>
<td>Thank you for the reviewer for the comment, but were unable to add additional examples due to lack of space.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142808</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1314</td>
<td>1314 27</td>
<td>28</td>
<td></td>
<td>In this context, does infrastructure mean physical infrastructure or social/planning infrastructure (i.e., established processes). If the former, consider adding &quot;planning frameworks or processes&quot; or something similar.</td>
<td>This text has been revised.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142809</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1315</td>
<td>1315 24</td>
<td>26</td>
<td></td>
<td>There are two distinct points that are could be better differentiated here. (1) there has been more natural variability over the last millennium than previously thought. (2) over the past century, climate change models are wrong.</td>
<td>Thank you for your comment. We revised this paragraph, and removed this phrase.</td>
</tr>
<tr>
<td>Anne</td>
<td>Mursh</td>
<td>142810</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1315</td>
<td>1315 12</td>
<td>12</td>
<td></td>
<td>Built-in human infrastructure seems redundant. Consider changing to built infrastructure.</td>
<td>Thank you for your comment. The chapter text has been revised to incorporate the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142811</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1315</td>
<td>1315 14</td>
<td>14</td>
<td></td>
<td>Controversial statements. In risk management familiar or not familiar to decisionmakers, businesses, and communities? Suggest starting line 20 with &quot;on the other hand, climate adaptation also is less familiar...&quot; or something similar.</td>
<td>Thank you for your comment. Each of the three types is defined in the bulleted list, and the references in the citation. In addition, we provide and discuss examples in the paragraphs immediately below the bullet list.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142812</td>
<td>Fig/Reg.</td>
<td>Chapter 12</td>
<td>Near-Term Adaptation Needs and Increased Resilience</td>
<td>1324</td>
<td>1324 19</td>
<td>24</td>
<td></td>
<td>Why is worth mentioning a few of the models developed already so readers don't think they have to start from scratch.</td>
<td>We now make the mention.</td>
</tr>
<tr>
<td>First Name</td>
<td>Last Name</td>
<td>Comment ID</td>
<td>Comment Type</td>
<td>Chapter</td>
<td>Figure/Table Number</td>
<td>Start Page</td>
<td>End Page</td>
<td>Start Line</td>
<td>End Line</td>
<td>Line</td>
<td>Comment</td>
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<td>Tomi</td>
<td>Vest</td>
<td>142019</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>126</td>
<td>152</td>
<td>10</td>
<td>12</td>
<td></td>
<td>May be worth mentioning Moody's November 2017 announcement that it will consider climate risk in state and local bonds.</td>
<td>We now do so. Thanks for the suggestion.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142020</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>127</td>
<td>157</td>
<td>12</td>
<td>23</td>
<td></td>
<td>May be worth noting that these also factor in success of non-climate actions. In other words, adaptation is applying the same toolkit to new challenges.</td>
<td>We thank the reviewer for the suggestion but were unable to include it due to space constraints.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142021</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>129</td>
<td>157</td>
<td>21</td>
<td>21</td>
<td></td>
<td>Consider deleting “in New York”. Our colleagues in NYS and CT have also made adaptation strides since Sandy! The text has been modified as suggested.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142022</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>130</td>
<td>158</td>
<td>14</td>
<td>18</td>
<td></td>
<td>Please capitolize Climate Resilency Design Guidelines. We have deleted this text.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142023</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>158</td>
<td>13</td>
<td>13</td>
<td></td>
<td>Second include not needed. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142024</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>133</td>
<td>153</td>
<td>16</td>
<td>36</td>
<td></td>
<td>It is not clear how to understand the line “The judgements are also consistent with how one would expect organizations to behave.” We have deleted this line.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142025</td>
<td>Whole Chapter</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>133</td>
<td>153</td>
<td>18</td>
<td>26</td>
<td></td>
<td>The specific examples throughout the chapter are especially useful but they are mostly past mentioned or referred to and could be - added more context and background, for example more explanation around the examples listed in the benefit-cost ratio section. We have significantly expanded our use of adaptation examples. Due to space constraints, however, we were unable to add any such examples to the benefit cost section.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Vest</td>
<td>142026</td>
<td>Whole Chapter</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>133</td>
<td>153</td>
<td>19</td>
<td>28</td>
<td></td>
<td>Images are helpful but are only explained in captions and would be great if they were linked more directly to the concepts described in the text. Unfortunately, due to space constraints we had to drop all our pictures.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142027</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>152</td>
<td>10</td>
<td>12</td>
<td></td>
<td>Individuals are mentioned in list of who can take adaptation actions but there is no mention of what those actions might be. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142028</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>130</td>
<td>150</td>
<td>14</td>
<td>36</td>
<td></td>
<td>Mention of New York City’s climate resiliency design guidelines references wrong date (2016) - these were released in 2017. The climate projections reference the 2050 report, “Climate change adaptation in New York City.” The 2017 guidelines use the NRC 2015 report projections, “Building the Knowledge for Climate Resilency”. <a href="http://onlinelibrary.wiley.com/doi/10.1111/ncon.12368.full">http://onlinelibrary.wiley.com/doi/10.1111/ncon.12368.full</a> Thank you for this comment; the text has been updated accordingly.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142029</td>
<td>Whole Chapter</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>153</td>
<td>14</td>
<td>26</td>
<td></td>
<td>Often investments in adaptation increase GHG footprint of organizations adapting to climate change. We recommend the authors note mitigation be considered in adaptation strategies. We now mention co-benefits that can occur when an organization simultaneously plans for adaptation and mitigation.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142030</td>
<td>Figure</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>130</td>
<td>150</td>
<td>14</td>
<td>26</td>
<td></td>
<td>These stages are not independent and build on each other. Some comments with use of figure on page 1313. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142070</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>130</td>
<td>150</td>
<td>14</td>
<td>32</td>
<td></td>
<td>There is value in examining the past, present, and future, especially for local scale assessments and investments. While the author acknowledges this point, after consideration, the author team determined that the primary emphasis of this paragraph should remain on the importance of considering future climate impacts, since that is a less established practice than considering past conditions. We appreciate this comment and added this concept to the text.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142072</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>132</td>
<td>153</td>
<td>18</td>
<td>19</td>
<td></td>
<td>Deep uncertainty is jargon, please explain, or delete the word deep. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142073</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>153</td>
<td>9</td>
<td>13</td>
<td></td>
<td>A third is the experience of extreme events. We thank the reviewer for this comment and have incorporated change to the text.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142074</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>153</td>
<td>16</td>
<td>17</td>
<td></td>
<td>Please note that including climate change in planning practices in itself is an adaptation action. We thank the reviewer for this comment and have incorporated change to the text.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142075</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>131</td>
<td>153</td>
<td>16</td>
<td>18</td>
<td></td>
<td>Please explain what is meant by capacity building and land use changes. We thank the reviewer for the comment and have incorporated this text.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142076</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>135</td>
<td>155</td>
<td>24</td>
<td>26</td>
<td></td>
<td>We recommend modifying key Message 2 to focus on uncertainty and lack of predictability as the big challenge instead of stationarity. Adaptation, hindered by assumptions of a stationary climate, is not the correct framing, especially in this influential report. Rather the uncertainty and lack of predictability of climate information is more important to articulate as a challenge. It is not smart planning to fully replace the observed and anticipated with climate projections. A trades-off should be considered in planning to get the full picture. We thank the reviewer for the comment and agree that information about both historic and projected future climate is useful for adaptation. We left the WM with its current focus and address uncertainty in the discussion of AM’s.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142077</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>135</td>
<td>155</td>
<td>24</td>
<td>28</td>
<td></td>
<td>It is more than societal expectations and rules etc. it is also the state of climate science and deep uncertainty surrounding adaptation. We thank the reviewer for this comment and have rewritten this text.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142078</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>136</td>
<td>156</td>
<td>1</td>
<td>26</td>
<td></td>
<td>Organizations do face a large number of climate projections, but this statement insinuates that the range is the correct and complete range an organization should plan for. We thank you. We disagree that we have increased that numerical projections of climate-changed futures are in any sense correct. We have added the words “produced with myriad uncertainties” to emphasize our point of contrast the assumed observational stationarity.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142079</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>136</td>
<td>156</td>
<td>13</td>
<td>25</td>
<td></td>
<td>No sentence is confusing because all decisions are judgement at single points in time. Please rephrase. Thank you. We added “is strongly iterative and” to re-emphasize that the point of this sentence is the set of decisions taken over time to adapt rather than a single decision in time.</td>
<td></td>
</tr>
<tr>
<td>Mckee</td>
<td>McFeely</td>
<td>142080</td>
<td>Text Region</td>
<td>28: Near-Term Adaptation Needs and Increased Resiliency</td>
<td>136</td>
<td>156</td>
<td>12</td>
<td>22</td>
<td></td>
<td>Climate vulnerability assessments are part of all the other frameworks, it is not its own framework. Thank you. We have changed the sentence to make clear that vulnerability assessments are an element of the larger framework.</td>
<td></td>
</tr>
</tbody>
</table>
Mikko McFeely 142081 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1317 1317 6 11 Please consider combining reduce exposure and reduce sensitivity to reduce exposure and sensitivity. Though these concepts differ, they are very similar enough to combine for this document. This will help reduce confusion in the text.

Mikko McFeely 142082 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1318 1318 7 7 Please remove. We recommend changing, many decisionmakers do not appreciate...to some decisionmakers do not. Many decisionmakers do appreciate the extent and are interested in taking action.

Mikko McFeely 142083 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1318 1318 9 8 Add to sentence, and impact different decisionmaking processes (such as annual operations).

Mikko McFeely 142084 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1318 1318 13 13 Consider changing the word reference to research.

Mikko McFeely 142085 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1318 1318 - 13 Please consider combining reduce exposure and reduce sensitivity to reduce exposure and sensitivity. Though these concepts differ, they are very similar enough to combine for this document. This will help reduce confusion in the text.

Mikko McFeely 142086 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1321 1321 9 9 Add to environmental following societal.

Mikko McFeely 142087 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1321 1321 14 14 Add past end current and future. Past information should be part of the information considered.

Mikko McFeely 142088 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1314 1314 2 2 Suggest mentioning the pioneering work of the water utility sector in adaptation planning by adding the following sentence to the end of this text section: The water sector is pioneering approaches in using different decision support systems for water utility adaptation. Reference is Kaatz, L., Rauhier, K., Rauhier, R. 2015. Embracing Uncertainty: A Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Association of Metropolitan Water Agencies.

Mikko McFeely 142089 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1321 1321 25 25 Suggest adding an additional sentence to the end of this text section to read: Other examples from the water sector illustrate how water utilities are planning for climate uncertainty using decision support approaches (such as scenario planning and decision scaling). Reference is Kaatz, L., Rauhier, K., Rauhier, R. 2015. Embracing Uncertainty: A Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Association of Metropolitan Water Agencies.

Mikko McFeely 142090 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1330 1330 14 14 The sentence could also mention other sector. Suggest adding to read: Federal agencies, non-governmental organizations, water utilities, engineering industry associations, transportation and public works departments, and private sector consultants...

Mikko McFeely 142091 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1321 1321 - 13 The mention of NGOs residing for decades is repeated. Nearlyverbatim, at least 3 to 4 times.

Mikko McFeely 142092 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1308 1308 7 7 I understand the point being made, but I don’t know of any adaptation programs that aren’t looking at future conditions and projections.

Mikko McFeely 142093 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1309 1309 22 22 Suggest referring to mention of climate adaptation frameworks. Climate vulnerability assessment is not an adaptation framework. It’s a process element under a climate adaptation framework. Risk governance should be added to the list.

Mikko McFeely 142094 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1309 1309 26 28 The author must also be honest about the fact that adaptation will likely take substantial investment, which could be hard for prohibitive for certain communities. Could be framed as future loss savings.

Mikko McFeely 142095 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1309 1309 38 38 Suggest mentioning the pioneering work of the water utility sector in adaptation planning by adding the following sentence to the end of this text section: The water sector is pioneering approaches in using different decision support systems for water utility adaptation. Reference is Kaatz, L., Rauhier, K., Rauhier, R. 2015. Embracing Uncertainty: A Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Association of Metropolitan Water Agencies.

Mikko McFeely 142096 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1309 1309 35 35 The mention of NGOs residing for decades is repeated. Nearlyverbatim, at least 3 to 4 times.

Mikko McFeely 142097 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1309 1309 35 35 Maintaining a concept that has been used widely in many sections and is often used in the context of international development and over the last years applied in the climate change field. However, there is no standard definition of mainstreaming in the context of climate change adaptation. Maintaining climate change adaption goes beyond integration of it into planning processes. For example the United Nations defines it as the iterative process of integrating considerations of climate change adaptation into policy making, budgeting, implementation and monitoring processes at national, sector and subnational level. Suggest adding a definition of mainstreaming which addresses its holistic nature.

Mikko McFeely 142098 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1311 1311 3 3 I understand the point being made, but I don’t know of any adaptation programs that aren’t looking at future conditions and projections.

Mikko McFeely 142099 C� Region 18. Near-Term Adaptation Needs and Increased Resilience 1311 1311 14 14 Abstract language. Be more precise, give examples.
Increased Resiliency

28. Near-Term Adaptation Needs and Increased Resiliency

The discussion of KM5 now contains such examples. We thank the reviewer for this important suggestion. We have added to our chapter a discussion of the challenges of financing adaptation actions.

Mainstreaming is now defined on p. 1320. We thank the reviewer for the comment and have incorporated change to the text.

Managing climate risk also requires the use of all information available. Fast records, current climate and future climate projections. There is no doubt in the necessity of incorporating nonstationary but it’s critical to also note the importance of continuing to evaluate historic records in planning and decision making. Thank you. The text was altered to include the importance of historical and paleoclimatic information.

This point about the timescales of climate change threats not aligning with politics and government is incredibly important. It seems a little odd that this point is in the section on nonstationarity. It may fit better in an introductory message.

We have revised the wording. Thank you. We have increased discussion of obstacles to adaptation throughout the chapter to include this one.

We thank the reviewer for the comment. Our revised chapter now includes more discussion of the strengths of mainstreaming in climate change adaptation. Mainstreaming is now defined on p. 1320.

Increased Resiliency

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<td>143329</td>
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<td>2B. Near-Term Adaptation Needs and Increased Resilience</td>
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<td>This statement is missing the concept that all of these phenomena (categorizing cause of place, safeguarding cultural resources and landscapes, social connectivity for example) are actually also components that enable effective adaptation. Cultural resources (again for example) should not be framed as solely &quot;victims&quot; of climate change that need to be protected by means of adaptation; rather, through the social connectivity, sense of place, scientific data they provide, they are in fact part of society's means of adapting. Starting reference for this: National Park Service-Cultural Resources Climate Change Strategy (<a href="https://www.nps.gov/subjects/climatechange/culturalresources%E6%B0%94%E5%80%99%E5%8F%98%E5%8C%962013.htm">https://www.nps.gov/subjects/climatechange/culturalresources气候变化2013.htm</a>)</td>
<td>We thank the reviewer for the comments. The chapter text has been revised to incorporate the suggestion.</td>
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<td>312 312 7</td>
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<td>Add cultural resource management to natural resource management.</td>
<td>We thank the reviewer for the comments. The chapter text has been revised to incorporate the suggestion.</td>
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<td>Addendum to &quot;range of recent recorded natural variability&quot;: 1. archaeological and paleoenvironmental records recorded variability substantially in many places. This should be recognized here. What key for understanding the adaptability of human systems is not the length of human records, but the rate and amplitude of change to which given systems respond. In some cases, relevant variability may fit well within ecologically recorded changes. In other cases, relevant variability may require larger time frames.</td>
<td>Thank you. We have made clearer that not all current climate change effects and impacts are outside the range of measured/historical climate variability in all places.</td>
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<td>315 315 14-19</td>
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<td>This statement implies that many organizations that deal with weather-related phenomena currently do that fine粒度. Governing bodies such as the National Park Service in California and the infrastructure and community societies shown in Texas, Florida, and Puerto Rico during the recent 2017 hurricane season – this implication should be demonstrated with several examples, rather than assumed to be true.</td>
<td>Thank you. We disagree that the sentence makes that implication because we do not agree with that implication. The sentence ideally states that organizations manage now for events which are in some cases the same events to be expected under climate-change futures (though frequencies, intensities, and durations can be different), thereby setting up the discussion of things that are new and which are not new for adaptation efforts.</td>
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<td>This section is completely missing discussion of what is meant by society's expectations and rules, as set out in the key message.</td>
<td>Thank you. We disagree that the point of this Key Message is to articulate the existing social rules and expectations, and we have included in this discussion how some of those expectations - for stationary environmental/conditions, e.g., hinder progressive adaptation.</td>
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<td>This is a biased treatment of risk communication. For risk communication to be effective, it must be clearly established to whom communication is directed, from whom, what is being requested, by a trusted messenger, in forms and formats that incorporate the language and knowledge and access of the target community. Without these, risk communication is likely to fail. Additional discussion and relevant sources needed here.</td>
<td>Thank you. Although this is not the sole mention or discussion of risk communication in the chapter, and this is not a chapter devoted to risk communication even only about climate change, we have adjusted the language to include a few of the details you provided.</td>
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<td>Strongly recommend meeting this with reference to US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability: the diverse historical and social forces that shape community vulnerability, community capacity to respond.</td>
<td>Thank you. Although this comment does not provide a citation, we think that the reference to the USGCRP white paper is outside the bounds of reference to be assessed in this report.</td>
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<td>318 318 4-28</td>
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<td>This chapter uses a mechanistic review of adaptation, but does not provide an assessment of where the US is in terms of efforts to adapt: this distinction should be discussed. I appreciate recognition of the concerns about handling current variability, but this concern should transition to a broader discussion of how and why current methods and management aren't designed for the present--why CAN'T modern systems handle current variability? Our modern systems didn't spring out of nowhere -- they're developments from previous systems that came together at certain times and certain places. This section misses components of social systems such as power, inequality, capitalistic economic values, and social/memory of change. I strongly recommend reconsideration of this section using Adger et al. 2009 (Are there social limits to adaptation) as a starting point.</td>
<td>We now discuss some of these issues and, in particular the points made by Agler et al, in the discussion on NMS.</td>
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<td>Strongly recommend meeting this with reference to US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability, particularly the diverse historical and social forces that shape community vulnerability, community capacity to respond.</td>
<td>Thank you the reviewer for the comment and have incorporated the findings of the recommended study into our chapter.</td>
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<td>Need to unpack/qualify statements here about social cohesion. As written here, this appears to assume a single community in which members are equal. Please see the US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability, particularly the diverse historical and social forces that shape community vulnerability, community capacity to respond. It includes several important social processes.</td>
<td>Thank you for the suggestion. We have revised this report and discuss its findings.</td>
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<td>The section is inadequate in describing the differences that come from describing adaptation in terms of cost-benefits or a single monetary signal. Adaptation and change are deeply social constructs, and success-failure requires navigating the intersecting values, cultures, communities, histories involved. Again, strongly recommend reworking these sections, beginning with Agler et al. 2009 (Are there social limits to adaptation) and the USGCRP Social Science white paper on vulnerability as starting points for concepts and sources.</td>
<td>Agreed. We now discuss Agler et al in our Beyond Incremental Change section and the USGCRP Social Science white paper on vulnerability later in this section.</td>
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<td>322 322 26-28</td>
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<td>Cross-reference this section with the US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability.</td>
<td>Agreed. We now discuss the USGCRP Social Science white paper on vulnerability later in this section.</td>
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<td>324 324 12-24</td>
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<td>The section emphasizes processes: &quot;getting the data right&quot; – it does not capture system interdependencies and uncertainty on taking action/determining what actions to take. Strongly recommend connecting this section to NMS chapter 17.</td>
<td>Our revised chapter has many cites to NGA Chapter 17. In this section we refer to previously discussed Chap 17 ideas, but don't cite it here.</td>
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<td>325 325 29-30</td>
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<td>31</td>
<td>The section also appears to prioritize getting the right models and data; without recognition of the system and social complexities of determining what to do and being able to do something about the data. Recommend reworking this section in accordance with NMS chapter 17.</td>
<td>We have re-written this. NMS in Chapter 17 includes the points made here.</td>
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<td>328 328 1-7</td>
<td>7</td>
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<td>The example used here emphasizes engineering components of a road--but completely misses the social implications of land cultivation criteria that are the basis for road location. What is location? (exposure), what access does it allow and encourage? (if road exists, will people build along it, depend on it), if access is lost, who suffers? These social implications should be incorporated here.</td>
<td>The social implications of the road are of course vital, but are not relevant to the point of this example, which is focused on the location to which road engineers need to consider future climate conditions in choosing the material with which to resurface their roads. If the engineers are doing their job properly, the broader social implications will be inescapable to this particular design choice.</td>
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Increased Resiliency
Adaptation Needs and
28. Near-Term

These key messages need a complete revision, most of all to combine and simplify them down to three: 1) adaptation is needed, 2) adaptation is cost effective, 3) there are examples of this being done. Please pay careful thought to the messages they want to convey to this audience based on the literature assessed. It may be necessary to incorporate more quantitative descriptions and especially descriptions of whether the numerous examples (almost all from more social science and improved integration of social science with adaptation planning.) Please be clear about this. It’s not clear from the reference listed that the authors are creating these social science approaches. We have revised this section. We agree that social science needs to be more extensively integrated into adaptation planning, a point which is reflected in topics covered in this chapter. However this is also not the place in the chapter to recommend research needs.

Key Message 3: This section can be enhanced by incorporating key insights from the USGCRP white papers. Discussions in this chapter can be enhanced by incorporating key insights from the USGCRP white papers.

Perspectives on Climate Change (USGCRP 2018, Part 1, 2 & 3 - upcoming), each on (1) social vulnerability under climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to facilitate adaptation. Paper (2) discusses the underlying drivers of climate change and how these factors interact dynamically over space and time. These white papers collectively highlight the importance to consider social, cultural, political, and economic factors and past decisions for understanding drivers and vulnerability of climate change, and the need for multi-sector, multi-dimensional approaches and governance structures for mitigation and adaptation responses. We thank you for your comment. We are not able to add additional authors at this time but have consulted a wide range of experts beyond those included as authors when writing this chapter.

Please clarify - new techniques for what by whom? This section notes in a very passive fashion that ways of understanding the variability of what? what is the risk of adapting only to current climate conditions?)

We thank the reviewer for this comment and revised Key Message 1. Thank you for the suggestion. We now cite this work: Thank you for your suggestion. We now cite this work. Thank you for the suggestion.
Adaptation Needs and Increased Resiliency
28. Near-Term
Increased Resiliency
Adaptation Needs and
Increased Resiliency
This key message, and the underlying text, is wading dangerously close to policy advocacy, as the authors (and therefore the federal government) are endorsing one type of adaptation approach. I cringed at “appropriate framework” as this is straight out advocacy (are other frameworks therefore inappropriate?) It is a frustrating message, since earlier messages talked about thinking ahead to consider future ranges of climate change so that adaptation decisions can be made that last. Now, the authors are saying something different, that people should take smaller iterative steps. Most of all, I don’t understand why this is a key message. There are likely many frameworks out there that would work for different people, places, and things. Why is knowing about one of them so key as to force it to a key message? If the authors had taken the approach of explaining how adaptation positions are something that no one does once and is done, but rather is something that communities need to forever plan for, that would be more interesting. Thank you for this comment; we have revised Key Message 3.

Adaptation Needs and Increased Resiliency
28. Near-Term
Increased Resiliency
Adaptation Needs and
Increased Resiliency
This states stages were “underway throughout the United States”. By whom? Also, how is a stage underway? Figure 1?
Again, this last sentence of key message 5 seems to contradict key message 3. KM3 says to be iterative, KM5 says incremental changes aren’t enough (though it doesn’t explain why it isn’t enough or what “beyond incremental changes” entails). Very confusing to the reader.

Adaptation Needs and Increased Resiliency
28. Near-Term
Increased Resiliency
Adaptation Needs and
Increased Resiliency
Thank you for this comment; we have revised Key Message 3.

Adaptation Needs and Increased Resiliency
28. Near-Term
Increased Resiliency
Adaptation Needs and
Increased Resiliency
We agree that this was confusing and revised Key Messages 1 and 2.
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<tr>
<td>Allison</td>
<td>Crimmins</td>
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<td>Figure</td>
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<td>Near-Term</td>
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<td>This figure needs replacing with something more useful to the chapter's audience, or at least a lot of revision. As the only figure in this chapter, it is unfortunate that this figure is focused on yet another framework, one that offers from the one just discussed in the text and from the CDC BRACE framework and from the near-3-S frameworks discussed in this chapter. What about an image of a home with suggested examples of ways an individual or family could take adaptation steps in their own home/neighborhood? What about a map with successful adaptation measures marked on it? How about a graph or map showing how many cities and states have adaptation plans? Anything but another conceptual diagram with boxes and arrows. This figure is outdated, not least because every project, everywhere would have a different time and center of the stages and they would all be at different stages (in other words, not every adaptation action is at the implementation stage now). So how can you say where NCA3 or NCA4 fall? This figure was already in NCA3 and in the 2014 NAS, which will be 4 or 5 years old by the time this report is released. I think the authors can do better and be more creative than recycling this old conceptual diagram for each other.</td>
<td>We have revised the figure to make it more accessible and removed the supporting text to make the meaning clearer.</td>
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<td>Delete this paragraph, it is not needed.</td>
<td>We have shortened this paragraph and focused it more on the chapter's main themes.</td>
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<td>15</td>
<td>May want to also cite the EPA 2017 report (CEA) and not just the mitigation chapter.</td>
<td>We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
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<td>26</td>
<td>Delete this paragraph, it is not needed. Just use the existing NCA glossary which already has this term.</td>
<td>The text now incorporates the definition as part of a larger exposition on the benefits of climate risk management.</td>
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<td>This is a better phrasing than in the executive summary</td>
<td>We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.</td>
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<td>Suggest deleting both these paragraphs. Not sure what “and society” is supposed to mean, nor why schools and communities were left of this list (line 7). None of the examples listed were relevant to individuals. The second sentence is redundant to this section development in the chapter.</td>
<td>We have revised the text.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>143906</td>
<td>Figure</td>
<td>2B</td>
<td>Near-Term</td>
<td>1312</td>
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<td>26</td>
<td>27</td>
<td>Suggest deleting this sentence and avoid endorsing this one framework. This is also redundant to the previous section and at the same time contradicts Figure 2B.1.</td>
<td>After consideration of this point, we have determined that the framework is helpful to understand the process of adaptation.</td>
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<td>Near-Term</td>
<td>1312</td>
<td>1312</td>
<td>31</td>
<td></td>
<td>This sentence starts with “Since then” as is “since NCA4”, but the references listed here are all from 2013, which is BEFORE NCA4.</td>
<td>We have revised the references.</td>
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<tr>
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<td>Near-Term</td>
<td>1312</td>
<td>1312</td>
<td>44</td>
<td>48</td>
<td>Delete this paragraph and just provide the references. This is also redundant to text in the key message 5 section, so it does not need to be said twice.</td>
<td>We thank the reviewer for the comment and have modified the text accordingly.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
<td>Crimmins</td>
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<td>1312</td>
<td>1312</td>
<td>18</td>
<td>39</td>
<td>I'm not sure this statement is true. Most of the chapters I've must include adaptation actions, examples of implementation, and even evaluations of how effective those actions have been. Suggest removing other chapters.</td>
<td>We thank the reviewer for the comment and have modified the text accordingly.</td>
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<tr>
<td>Allison</td>
<td>Crimmins</td>
<td>143910</td>
<td>Foot Region</td>
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<td>Near-Term</td>
<td>1313</td>
<td>1313</td>
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<td></td>
<td>Suggest deleting “awareness ... And 2)” and just having the sentence read “Adaptation actions in the United States have increased in part due to growing recognition that investing in adaptation provides economic and social benefits that exceed costs.” This assertion needs citations to support it. Please provide citations that adaptation action have increased as well as citations that show the cause of this to be awareness and recognition of cost benefits. Six reasons are important. We have added a citation.</td>
<td>Six reasons are important. We have added a citation.</td>
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<tr>
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<td>Suggest deleting (a) awareness ... And 2)” and just having the sentence read “Adaptation actions in the United States have increased in part due to growing recognition that investing in adaptation provides economic and social benefits that exceed costs.” This assertion needs citations to support it. Please provide citations that adaptation action have increased as well as citations that show the cause of this to be awareness and recognition of cost benefits. Six reasons are important. We have added a citation.</td>
<td>Six reasons are important. We have added a citation.</td>
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<td>2B</td>
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<td>14</td>
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<td>This reference is quite old - does it still stand true for NCA4? Where are the other citations for this section? Also why is this paragraph above the Key Messages? Yes, this citation still holds. The point it makes now seems relevant for the reminder of the Anticipate.</td>
<td>We have revised the figure to make it more accessible and removed the supporting text to make the meaning clearer.</td>
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<tr>
<td>Allison</td>
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<td>1314</td>
<td>19</td>
<td></td>
<td>We are zero citations for more than an entire page. Please provide citations of the literature the authors referred to some of these conclusions.</td>
<td>Citations provided.</td>
<td></td>
</tr>
<tr>
<td>Allison</td>
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<td>Near-Term</td>
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<td>20</td>
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<td>The phrase “no longer reliably” should be deleted. This was true in NCA3 either, so this is not a new thing. This phrase is true and needed. In some cases stationarity turns out to be a reasonable assumption (e.g. the current best science suggests the average annual rainfall in Los Angeles will stay constant at its historical values over the next decade). But the stationarity assumption is not reliably true in general.</td>
<td>The phrase is true and needed. In some cases stationarity turns out to be a reasonable assumption (e.g. the current best science suggests the average annual rainfall in Los Angeles will stay constant at its historical values over the next decade). But the stationarity assumption is not reliably true in general.</td>
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<td>Suggest deleting this sentence and avoid endorsing this one framework. This is also redundant to the previous section and at the same time contradicts Figure 2B.1.</td>
<td>After consideration of this point, we have determined that the framework is helpful to understand the process of adaptation.</td>
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<td>Suggest deleting this sentence and avoid endorsing this one framework. This is also redundant to the previous section and at the same time contradicts Figure 2B.1.</td>
<td>After consideration of this point, we have determined that the framework is helpful to understand the process of adaptation.</td>
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<td>This sentence starts with “Since then” as is “since NCA4”, but the references listed here are all from 2013, which is BEFORE NCA4.</td>
<td>We have revised the references.</td>
<td></td>
</tr>
</tbody>
</table>

We have revised the paragraph to make it more accessible and removed the supporting text to make the meaning clearer.
This is a very troubling statement. If there is not yet sufficient evidence, how can the authors possibly assert the
This sentence refers to "a growing body of literature". Where is that literature? Please provide citations.
I'm not sure this statement is true, nor why the only citation listed here is from 2014.
Delete these sentence. They are all inside baseball.
Citation needed
Here is yet another numbered list.
paragraph. Please remember the NCA audience when revising the language of this chapter.
whole paragraph can be deleted and the point about doing all three actions can be added to the previous
Please delete all these cliche buzzwords, starting from "holistic, multisector, and multijurisdictional...". This
This is a great few sentences that really help the reader digest and relate to the three types of action. It just
too specific here in this list.
US climate and health assessment (suggest citing that here). Also, delete the example on lines 9-10, as it is way
This is yet another framework, but at least one that is easier to digest and more familiar, as it was defined in the
the text has not yet explained what this approach IS. The first half is confusing and lines 36-39 can be deleted.
Again this paragraph is full of jargon (commonalities??) and is more about why this one approach is so great, but
This is a very troubling statement. If there is not yet sufficient evidence, how can the authors possibly assert the
This sentence refers to "a growing body of literature". Where is that literature? Please provide citations.
I'm not sure this statement is true, nor why the only citation listed here is from 2014.
This text makes it sound like this already happens, so who is this advice aimed towards?

There are not citations in this paragraph. Citations are needed at the end of the sentences on line 32, 33, and 34.

As one ... multiobjective approach. This part of the sentence is not needed and another word that starts with "multi" is really not needed.

Delete "As one ... multiobjective approach. This part of the sentence is not needed and another word that starts with "multi" is really not needed.

 deletes this entire paragraph. Especially the jargon phrase "multiobjective or multicriteria analysis". This topic is better covered by the paragraph on lines 24-38.

Citation needed

This sentence says there is "considerable literature". Where is this literature? Please provide citations.

28, the text says climate adaptation is extremely local in nature for both risks and responses. I agree with this, values still hold true with current events? What was the ratio in Florida for Irma? In the Gulf for Maria? On line 20, and after "farm level" on line 20.

This says there is "literature". Where is it? Citations are needed at the end of line 19, after "precipitation flooding".

This paragraph does not add to the narrative and lack enough citations. Delete this entire paragraph. Especially the jargon phrase "multiobjective or multicriteria analysis". This topic is better covered by the paragraph on lines 24-38.

This sentence describes norms and expectations that currently exist in other sectors and suggests that climate adaptation would be advanced if these norms and expectations come include adaptation as well. This text describes norms and expectations that currently exist in other sectors and suggests that climate adaptation would be advanced if these norms and expectations come include adaptation as well. This text is not focused on any particular sector.
Confidence and likelihood rankings are not provided here - please add citations.

which is already in the Uncertainty section. That last sentence in particular is a rather wild assertion with no

Grammar - two "include"s

This sentence talks about "long-standing research". Where is this research? Please provide citations at the end

Delete - not needed.

Delete - irrelevant.

Delete - repetitive.

Please provide the years when Sandy and Katrina happened. This may be fresh in the mind of east-coasters, but

Curious that the examples here are from other countries. It seems like the Southwest would have ample drought

This entire paragraph is redundant to other text in the chapter. Drop it.

Agreed. We thank the reviewer for the comment

Both these paragraphs can be completely deleted. They repeat information already in the chapter. The first paragraph starts out with "Second," but its redundant, not second. The second paragraph has yet another list. Overall, these two paragraphs did not contribute to the understanding of this message.

Thank you. We have added more examples, including several text boxes. Evaluating the extent to which adaptation actions worked is non-trivial, and we were unable to do so in this chapter.

Agreed. We thank the reviewer for the comment

Agreed. We thank the reviewer for the comment

The text has been modified as suggested.

We thank the reviewer for the comment. We have added the phrase "by public sector organizations" to make

clear that these statements are focused on those types of entities. re: elected officials, see Madison et. al. 1787,

We re-wrote it

The word 'mainstreaming' is defined here in the text, so it should not be used in the key message since readers

are not relevant to individuals or families, but can only be made by larger organizations or governments.

so it doesn't sound so elitist. This bullet point really drives home that the adaptation actions listed in this chapter

by elected officials? Yikes. If the authors must keep it in, at least change "professional staff" to "dedicated staff"

Agreed. We thank the reviewer for the comment

These paragraphs have been moved and re-written to better focus on the important information they contain,

while reducing any redundancy.

Here we have another list (framework??) and even a list within a list (lines 13-18).

We have re-written this text, which now includes many cites

We have re-written this paragraph

We have re-written this section

We have re-written this section

Please provide the years when Sandy and Katrina happened. This may be fresh in the mind of east-coasters, but

not people in the west.

The text has been modified as suggested.

We have shorted this discussion.

We thank you for this comment - we agree this sentence was not necessary to the paragraph and have deleted it.

We thank you for this comment; we disagree and believe these examples are useful to illustrate the point.

We have deleted this text due to space constraints.

We have deleted this text due to space constraints.

We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

We have re-written this section

Thanks for your comment; we did include confidence rankings for key messages 2 in the "Description of confidence and likelihood" section.

Thank you for this comment. We feel the explanatory sentences on the stationarity assumption are necessary to

around this section.
There is much that the authors can do to further this important area of research than to endorse an array of frameworks. This is an important opportunity to set the precedent for the adaptation chapter and there is much to take away from this chapter on adaptation. My guess is that none of them would have to do with risk management is an important message from this chapter. The National Academy of Sciences review panel thanks for the reviewer for the comment. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Adaptation efforts will ultimately be essential if we are to protect valuable infrastructure, homes, businesses, natural spaces, and individual livelihoods from climate change impacts. In order to deploy these efforts, substantial commitments to both capital investments and biophysical engineering of adaptation strategies must occur. Such a delay is already discussed in the Adaptation Response chapter. However, of great importance, but not discussed in the chapter is who should be held responsible for deploying adaptation strategies. Considering the amount of investment that will be required, there will ultimately be disagreement over who should supply capital. Should it be those who will be most impacted if they do not adapt, or should it be those whose-behavior is responsible for warming climate change and therefore created the need for adaptation? The issue with placing the burden on the people most impacted is that those individuals may not have the means to effectively adapt. As discussed throughout the draft NCA, the people who will suffer most impact are likely to be the most disadvantaged, including the poor, the elderly, and communities of color.

It would be wrong to place the burden of adaptation on those most vulnerable to climate change. The burden should therefore be placed on those who are most responsible for bringing about climate change. A study that analyzed emissions primarily from companies that produce fossil fuels found the 63 percent of global industrial CO2 and methane emissions between 1751 and 2010 come from just 80 international entities. These entities included 56 crude oil and natural gas producers, 37 coal injectors, and 7 cement producers (Hendle, B., Tracking anthropogenic carbon-dioxide and methane emissions to fossil fuel and cement producers, 2014, 2016, 2017, 2018). Based on historical data and climate modeling, emissions from these 80 fossil fuel entities have contributed an estimated 57 percent to the observed rise in atmospheric CO2; approximately 50 percent to the rise in global mean surface temperature; and approximately 25 percent to global mean sea level rise between 1751 and 2010 (Hendle, B., et al., The rise in global atmospheric CO2, surface temperature, and sea level from emissions traced to major carbon producers, 144 Climate Change 579 (2017)). A separate study attributed 71 percent of global industrial greenhouse gas emissions since 1989 to just 100 fossil fuel producers, with 51 percent of emissions since 1988 attributed to just 25 corporate and state producers, including ExxonMobil, Shell, BP, Chevron, and Peabody (CDP and Climate Accountability Institute, The Carbon Majors Database, CDP Carbon Majors Report 2017, July 2017). Therefore, fossil fuel companies can be directly held to climate change based on their extraction and distribution of fossil fuel resources.

We greatly appreciate the reviewer's comment. We revised the text to include this point.

Thank you for this comment. We revised the text to include this point.

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Thank you for the comment. We revised the text to include this point.
<table>
<thead>
<tr>
<th>First Name</th>
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<td>Michael</td>
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<td>28.2.2</td>
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<td>This can be the case for proactive adaptation. For reactive adaptation, the impact occurs first and then the struggle to figure out what to do to stop it being whacked again and again. Basically, proactive adaptation is picking up a safety vest before one goes into waters with a storm coming in one's way, or choosing not to go in the water at all, and reactive adaptation is yelling for help when you are trapped in a rip tide. I’d encourage describing the difference—and noting that many regions in US are trying to do the former, and the putting off trying to fix the issue through denial and turning away is doing the latter—and imposing this on the whole population to the extent it can (except for this assessment trying to bring sense to national policy makers).</td>
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<td>This assumption is no longer true as a point first made at the Villah meeting in 1970, if not before. The process here makes this seem a recent finding. I'd urge referencing the Villah WMO/UNESCO report regarding this point, just to highlight a need to the extensive efforts to get this point across.</td>
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<tr>
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<td>I think a clarification is needed here about how “extreme” conditions can become more common—It seems to imply the bell curve is simply flattening instead of shifting (and maybe also flattening), and the needs to be made very clear (to readers). NOAA’s practice is to re-evaluate its normal to the past three decades, and this has the effect of understanding the intensity of the extreme for those aspects of society and the environment (e.g., city location with respect to sea level and mix of towns in the forest, respectively) that have time horizons three or longer than three decades. If one looks at the Hansen et al., shifting bell curve, one gets a good sense of this—looking at the current decade compared to the mid-20th century norms the use (actually 1951-80), we are now experiencing five or even six sigma events (in his case, summer average temperature anomaly for land areas in the US) those deviations imply in several million bushels—very rare and very impactful on ecosystems etc. that were established in the mid-20th century (so after World War II) when much of developed nation infrastructure was built) and before (when most ecosystems became established). Indeed, Hansen et al. results indicate that warm extremes that were 1 in 1000 by mid-1970s in the mid-20th century are now occurring 12% of the time. I make this point here because I think it is important to, especially here and in this context, to give some explanation of what “extreme” means and how it is that communities can be having, for example, 205-years storms in successive years (basically, the statistical analysis for flooding was based on mid-20th century, and the bell curve has shifted such that it is now not at all unlikely to have years with successive or even multiple occurrences of what was once rare—especially given that until at least a few years ago it was required practice by civil engineers to only use past data in their analyses and building/bridge designs—not to look ahead. I guess my main point here is that the discussion, at least so far in this chapter, is quite idiosyncratic and I think is needed some real discussion of reality and the situation are now in.</td>
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<tr>
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<td>Somewhere, saying “from climate change” does not seem right, what is happening is an increase in the amount of annual losses due to climate change—It was not as if there were no losses before. And it likely needs to be said that we give it a shot of hope, even if over optimistic) that adaptation has the potential to moderate this, so this sentence becomes: “I presume, assuming no adaptation (or HO).”</td>
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<td>Need to rephrase to use lexicon and not “may’’—and do throughout the chapter (I just raise issue in every instance)</td>
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<td>22</td>
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<td>Change to “defined as the” on line 21 and “it” to “its” on line 22</td>
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<td>1311</td>
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<td>Put at some of what we know is certain (e.g., sea-level rise) and adaptation includes preparing for certain consequences (I agree that amount by exactly when is a bit uncertain, but one could also say it is certain that sea level rise is going to rise 1 foot, then 2 feet, and this uncertainty is when that will occur, so I am a bit concerned about the definition).</td>
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<td>Needs to be said more carefully for CO2 to make sure readers don’t depend on the point. For CO2, what has been unfortunate is the perpetuation created by the persistence of popularizations of CO2 in the atmosphere (to give a bit of hope, even if over optimistic) that adaptation has the potential to moderate this, so this sentence becomes: “I presume, assuming no adaptation (or HO).”</td>
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<td>Very few long-lasting emissions of short-lived species can start to have an effect well before 2050 (if we would only do it and stop using GHG-100 as a way to combine the effects of GHGs). Is there any way to invent a footnote about what “largely unmanageable” means and indicate that short-lived emissions reductions can make a difference. And then, of course, there is climate interventions, which could make an early difference. I’d suggest adding a qualifying phrase at the end of the sentence ending on line 2. (I agree, however, on the conclusion on line 3, and then on line 4, urge mention of both carbon dioxide removal and climate intervention.</td>
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<td>Don’t you need to indicate that there is also the potential for migration here, and indicate the difference?</td>
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<tr>
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<td>16</td>
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<td>Regarding the phrase “successful adaptation measures”—in general, what has been accomplished to date seems to be “no-decision and put off just the problem. I’d be cautious calling these “successful” unless one adds some sort of qualification</td>
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<tr>
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<td>13</td>
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<td>Need to add because impacts are being felt, for example in Newport News, raising road height is a response to flooding, etc. I think it needs to be made clear that impacts requiring responses are already occurring–reactive adaptation is already happening.</td>
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<tr>
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<td>1314</td>
<td>1314</td>
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<td>19</td>
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<td>Regarding “may see” in addition to getting rid of “may,” the role problem has been that using past states is required good practice in the particular professional field. Hopefully, this is changing.</td>
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**Evidence and Arguments**

29. Mitigation: Avoiding and Reducing Long-Term Risks

- Increased Resiliency
- Adaptation Needs and Opportunities

**Adaptation Needs and Opportunities**

- Increased Resiliency
- Adaptation Needs and Opportunities

**Mitigation: Avoiding and Reducing Long-Term Risks**

- Increased Resiliency
- Adaptation Needs and Opportunities

**Notes**

- The name of our Project (column 1) should be: American Climate Prospectus (ACP)
- The American Climate Prospectus (ACP) is the peer-reviewed technical analysis, whereas the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers.
- We have updated the referenced document and added a new reference.
- We now say regional scales
29. Mitigation: Avoiding and Reducing Long-Term Risks

Avoiding and Reducing Long-Term Risks

While some Federal agencies support family planning programs, we are not aware of any such programs being supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.

29.2

We agree with the commenter regarding the importance of co-benefits to climate change mitigation. This discussion is presented in 29.5.1, where we take a broader focus on “Co-effects of Mitigation Actions”, and include effects beyond health (e.g., energy security). We believe the current coverage of co-effects is appropriate in the context of the different issues presented in the chapter and overall space constraints. However, in response to this comment we have included additional references to the co-benefits literature. We may note that health co-benefits are discussed in greater detail in the Air-Quality and Health chapters, as well as a number of the regional chapters.

29.5.1

You might further add the first paragraph of 29.5.1: In my perspective, much stronger emphasis is required on the concept of co-benefits of climate mitigation policies. Co-benefits are key drivers of climate policy adoption and urban governments find it attractive. This makes their work much easier when dealing with public for GHG reduction projects. Computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.

After careful consideration of this point, we have determined that the content of the key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.

29.3

After careful consideration of this point, we have determined that the content of the key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.

29.4

After careful consideration of this point, we have determined that the content of the key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.

29.5

After careful consideration of this point, we have determined that the content of the key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.

29.1

After careful consideration of this point, we have determined that the content of the key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.
This chapter should distinguish between mitigation contributions to climate change and mitigating the potential impacts of climate change. Mitigation of potential impacts should mention flooding, storm surge, wildfires and other threats to infrastructure.

This comment relates to the distinction between mitigation and adaptation, terminology that is defined in the glossary of the NCA and concepts that are covered in detail in Chapters 29 and 28, respectively. We note that the documenter’s letterbox is the focus of Key Message 1. Furthermore, the chapter title has been changed from “Mitigation: Avoiding and Reducing Long-Term Risks” to “Reducing Risks through Emissions Mitigation” for two reasons: 1) to better inform readers’ expectations about the chapter focus being on the consequence of emissions reductions in impacting future impacts. A large number of studies share a general conclusion that (1) the long-term impact of emissions reductions declines with time from the present and (2) reductions in line with lower-emissions scenarios require significant mitigation efforts to begin during this decade. See section 29.2 of this draft report, Figueres et al. (2017, doi:10.1038/546593a), Xu and Ramanathan (2017, doi:10.1073/pnas.1618481114), Hansen et al. (2017, doi:10.5194/esd-8-577-2017), Rockstrom et al. (2017, doi:10.1126/science.aah3443), Schellnhuber et al. (2016, doi:10.1038/nclimate3013); Schnellnhuber et al. (2016, doi: 10.1038/nclimate3013); Xu and Ramanathan (2017, doi:10.1038/NGEO3031).

The authors have clarified the text to address this comment: "Large reductions in present-day emissions of the long-lived GHGs are estimated to have modest temperature effects in the near-term (over the next couple decades), but these emissions reductions are necessary to achieve any long-term objective of preventing warming of any desired magnitude in the long-term."
Social Science Concerning Committee 142440 Whole Chapter 29. Mitigation: Avoiding and Reducing Long-Term Risks

Given the large uncertainties regarding global and domestic commitments to reducing GHG, this chapter should provide enough context and evidence to allow the reader to evaluate the risks from climate change under varying scenarios for GHG reduction. While it is good to describe how development can address committed climate change and residual risk even after GHG mitigation, it is also important for policy makers to understand the consequences of setting an “adaptation only” or “mostly adaptation” approach to managing climate risks, as opposed to a “mitigation first, adaptation complementary” approach.

The text has been modified as suggested.

Social Science Concerning Committee 142441 Web Chapter 29. Mitigation: Avoiding and Reducing Long-Term Risks

We should please include acknowledgment of the limitations in how current modeling systems address social and economic adaptation to climate change. Most modeling systems address some types of population migration, however, the social, cultural, and economic consequences of the potentially large projected climate impacts will likely have broad ranging impacts on how and where population live, work, remit, and engage in other social activities, as well as impacting vulnerabilities to climate change related risks. This has implications both for total societal impacts, and also for the types of adaptation behaviors that governments, communities, and individuals will undertake. A good reference for this is C.P. Weisser et al. 2017 Refining climate change assessments around risk: recommendations for the US National Climate Assessment. Environ. Res. Lett. 12(08)0201

The current text, online & acknowledge that there are uncertainties in understanding and quantifying the role of adaptation in modifying risk. In a short Executive Summary statement such as this, the author team believes this is the appropriate level of detail, though the topic paid more attention in the main text and the uncertainties sector of the final three key messages. We also refer the reader to sections 29.6.2 and 29.6.3 addressing direction for future research, both of which refer to the need for advancements in the understanding of adaptation potential. The suggested Weaver et al. reference has useful suggestions for improving assessment processes, but does not appear to be directly relevant to uncertainties in modeling of adaptation.

Social Science Concerning Committee 142442 Figure 29. Mitigation: Avoiding and Reducing Long-Term Risks

This figure should be referenced in all of the other impact chapters that present quantified impact information. Chapter 28 of the NCA is focused entirely on adaptation, so it is beyond the scope of this chapter to treat adaptation in depth. We note, however, that this chapter addresses the role of adaptation in reducing risk in a paragraph starting on page 1357, line 36 (which also directs the reader to Chapter 28 for more information). It addresses the interactions between mitigation and adaptation in text from page 1358, lines 15 through page 1359, line 10. The authors have decided not to make further additions to the text on this topic.

The text has been modified as suggested.

Social Science Concerning Committee 142443 Whole Chapter 29. Mitigation: Avoiding and Reducing Long-Term Risks

We have updated the numbers using the latest available report from EPA (2018 US Inventory of GHG Emissions and Sinks), which are consistent with the numbers cited in the comment.

The text has been modified as suggested.

Social Science Concerning Committee 142444 Whole Chapter 29. Mitigation: Avoiding and Reducing Long-Term Risks

We have updated the numbers using the latest available report from EPA (2018 US Inventory of GHG Emissions and Sinks), which are consistent with the numbers cited in the comment.

The text has been modified as suggested.
Social Science Coordinating Committee 242426 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1351 1354 3 20
   For this key message section, it would be very helpful to tie back to the individual sector chapters, e.g. for air quality health impacts, cite back to chapter 13, for extreme heat impacts, cite to chapter 14, etc.
   Citations to the Air Quality and Harvest Health chapters have been inserted into this section.

Social Science Coordinating Committee 242444 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1354 1356 8 7
   The subtitle results and explanations seem inconsistent with the statements in Chapter 13 that additively will be removing and reducing these damages through warming air quality. The statements may be consistent, but for a more complete explanation is needed.
   These results are based on modeling using the U.S. Forest Service’s NEX dynamic vegetation model, which, while important, projects large-scale shifts in vegetation with longer fire return intervals (e.g., infrequent fires in the near-term lead to changes in forest composition, resulting in fewer fires over time). So while this particular result is inconsistent with other studies cited in the Forests chapter, we note that the Forests chapter does discuss these uncertainties associated with forest composition. We’ve included a brief description of the context behind these results in the caption for Figure 29.2, as well as the inserted account for Key Message 41. In both locations, we also refer the reader to the Forests chapter for more detail regarding what the weight of evidence shows across the literature.

Social Science Coordinating Committee 242455 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1355 1358 2 19
   Please link these statements back to the sector chapters, which also have discussions of the benefits of mitigation strategies.
   We have inserted references to other NCA4 chapters (from both Volumes I and II) throughout our chapter.

Social Science Coordinating Committee 242474 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1358 1361 14 14
   The cited reductions in damages through adaptation are for what projected climate scenario? Does adaptation reduce damages significantly for all of the potential future scenarios, e.g. RCP8.5, RCP4.5, etc?
   Regarding these adaptation estimation results, EPA (2017a) estimated adaptation relative to both RCP2.6 and RCP4.5. Diaz (2016), while Houser et al (2014) estimated for RCP8.5. In the EPA study, benefits of adaptation were similar in proportional terms across both scenarios. We have added text to indicate that conclusions reflect results across both scenarios.

Social Science Coordinating Committee 242475 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 15
   I recommend a citation to C. P. Weaver et al. 2017 Reframing climate change assessments around risk: recommendations for the US National Climate Assessment. Environ. Res. Lett. 12 020201
   The suggested Weaver et al reference has useful suggestions for improving the assessment process from the perspective of a decision-maker’s information needs, but does not appear to be directly relevant to the message of the current chapter text, which addresses the underlying research enterprise of improving analytical frameworks for decision-making under uncertainty. No changes made.

Social Science Coordinating Committee 242476 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 28
   This NCA3, there has been progress made in interdisciplinary research to enhance understanding of drivers and social vulnerabilities of climate change and responses. As an example, in March 2017, the USGCRP Social Science Coordinating Committee organized a workshop “Social Science Perspectives on Climate Change”, that brought together federal researchers and managers as well as academic social scientists to discuss understanding of drivers, vulnerability of and adaptation to climate change from four disciplines – anthropology, archaeology, geography and sociology. The workshop resulted in three USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, Part 1, 2, 3 - 29) on one (1) social vulnerability to climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. Paper 2 (discusses the underlying drivers of climate change, including demographic, economic, political, social stratification and inequality, technology, infrastructure, and land use, and how these factors interact across global and local scales). In addition, the white papers collectively highlight the importance to consider social, cultural, political, and economic factors and past decisions for understanding drivers and vulnerability of climate change, and the need for multi-tiered, multi-dimensional approaches and governance structures for mitigation and adaptation responses. Discussed in Section 29.6.2 can be enhanced by referencing the white papers.
   We agree with the commenter regarding the significant progress that has been made in understanding the nature of these climate vulnerabilities. The current text, page 1352 verso 29, acknowledges these advances and offers an array of supporting examples in Table 29.1 with references. However, we also note that this discussion does not emphasize the interdisciplinary nature of these advances, and in response we have added additional text to line 29. We appreciate the suggested USGCRP white paper citations and have added them to the chapter assessment.

Social Science Coordinating Committee 242477 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 28
   The discussion in Section 29.6.3 can reference the USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, Part 1, 2, 3 - 29), each on (1) social vulnerability to climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. Each of the three papers also identify research needs and future directions for interdisciplinary research which can be relevant in this section.
   We appreciate the suggested USGCRP white paper citations and have added them to the relevant sections of the discussion in 29.6.3.

Shaye Wolf 14E029 Whole Chapter 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 28
   Executive Summary – Figure 29.2.2
   While we support this figure and its general message, the figure and accompanying table should also compare the damages associated with the RCP 2.6 emissions scenario, which is the only RCP scenario consistent with keeping global temperature rise below 2°C and in the ballpark of being consistent with the Paris Agreement target of well below 2°C. “showing the avoided damages associated with the RCP 2.6 pathway is critical for informing the public about the real-world benefits of strong, urgent climate action.” By omitting information about the benefits of the RCP 6.0 pathway, the NCA is doing a disservice to the American public and decision-makers since we should be striving for this pathway (or even more ambitious 1.5°C pathway).
   We agree that the presentation of results for RCP2.6 would provide useful information for this chapter, however, the author team was limited to the available results in the literature. Figure 29.2 is based on the findings from the CIRA2.0 modeling project and Technical Report (EPA 2017a), which were developed to inform NCA4. Consistent with NCA4 guidance developed by the USGCRP Interagency Working Group, CIRA2.0 focused on RCP8.5 and RCP4.5 as the two forcing scenarios. In addition, the statistical downscaling dataset recommended for use in NCA4, and used in CIRA2.0, did not simulate RCP2.6. However, we note that Figure 29.2, which is based on a different study, includes values for RCP2.6. No changes made to the text of figure.

Shaye Wolf 14E031 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 28
   Key Message 1 is misleading in stating that climate change only occur under high emissions scenarios and without adaptation will impose substantial damages. The other chapters of the NCA make clear that the current atmospheric concentrations of CO2 and CH4 are already imposing substantial damages, and moreover that damages will be substantial even under the lower RCP 2.6 emissions scenario (which would result in 2°C of warming).
   The key message must be changed to reflect the current state of scientific understanding, for example: “Recent scientific advances in impact quantification demonstrate that climate change is already imposing substantial physical and economic damages on the United States economy, human health, and the environment, and that these damages will become extreme under the higher emissions scenarios, with the potential for many more lost lives and annual economic losses in some sectors reaching hundreds of billions of dollars by the end of the century...”
   The key message has been changed in response to this comment. The revised language reads: “Without significant global mitigation, climate change will impose substantial damages on the United States economy, human health, and the environment. Announced in some sectors, assuming high emissions and no adaptation, are projected to “grow to” (emphasis added) hundreds of billions of dollars by the end of the century. Some impacts, such as sea level rise from ice sheet disintegration, will be irreversible for thousands of years, while others, such as species extinction, will be permanent.” Furthermore, the supporting main text has additional text to reinforce this point: “Moreover, the impacts and costs of climate change are already being felt in the U.S.”

Shaye Wolf 14E032 Fed-Red 20: Mitigation Avoiding and Reducing Long-Term Risks 1361 1361 14 28
   The Executive Summary states that, “climate change is projected to significantly affect human health, the economy, and the environment in the United States, particularly in futures with high greenhouse gas emissions. The verbs “affect” is misleading. As stated Key Message 1, climate change is projected to significantly damage human health, the economy, and the environment.” “Affect” makes the changes sound neutral, and should be changed to “harm,” “damage,” “negatively affect,” or “adversely affect.”
   In response to this comment and to be consistent with the language used in the rest of the chapter, the executive summary sentence has been changed to use the word “damage” instead of “affect.”
The Chapter states that “This chapter does not evaluate technology options, costs, or the adequacy of existing or planned mitigation efforts relative to meeting specific policy targets as those topics have been the subject of several comprehensive scientific assessments (e.g., IPCC, 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, [Stocker, T.F. et al. (eds.)], Cambridge University Press (2013) at section 29.3.1 on Long-Term Temperature Goals and the Paris Agreement. We also refer readers to Chapter 14 of the CSFR which provides more detail about pathways and global cumulative net CO2 emissions commensurate with 2°C of global warming above pre-industrial levels. A discussion of the U.S. carbon budget relative to that of other countries is a normative policy question that is outside the scope of this chapter and report.”

We note that the chapter title has been changed from “Mitigation: Avoiding and Reducing Long-term Risks” to “Reducing Risks through Emissions Mitigation” in order to better inform readers’ expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking. Information on the global carbon budget and emissions pathway has been incorporated into section 29.3.1 on Long-Term Temperature Goals and Paris Agreement. We also refer readers to Chapter 14 of the CSFR which provides more detail about pathways and global cumulative net CO2 emissions commensurate with 2°C of global warming above pre-industrial levels. A discussion of the U.S. carbon budget relative to that of other countries is a normative policy question that is outside the scope of this chapter and report.

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• Accelerate research and planning for negative emission technology deployment.
• Keep agriculture emissions at or below current levels, establish and disseminate regional best practice, ramp deforestation by 2025;
• Reduce emissions from forestry and other land use to 95% below 2010 levels by 2030, stop net
• Increase building renovation rates from less than 1% in 2015 to 5% by 2020;
• All new buildings fossil-free and near-zero energy by 2020;
• Develop and agree on a 1.5°C-consistent vision for aviation and shipping;
• Last fossil fuel passenger car sold by 2035–2050;
• No new coal power plants, reduce emissions from existing coal fleet by 30% by 2025;
to reach 100% share by 2050;
• Sustain the current growth rate of renewables and other zero and low-carbon power generation until 2025 to reach 100% share by 2050;
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The section on the Paris Agreement must recognize the global significance of the agreement, which was adopted by most of the world countries, and should recognize the significance of its climate targets. Under the Paris Agreement, most of the world countries committed to the climate change target of holding the long-term global average temperature “...to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.” On December 12, 2015, 195 nation-states and supra-national regional organizations meeting in Paris at the 2015 United Nations Framework Convention on Climate Change Conference of the Parties consented to the Paris Agreement committing its parties to take action so as to avoid dangerous climate change. The United States signed the Paris Agreement on April 22, 2016, as a legally binding instrument through executive agreement, and the treaty entered into force on November 4, 2016. The Paris Agreement codifies the international consensus that climate change is an “urgent threat” of global concern, stating that “climate change represents an urgent and potentially irreversible threat to human societies and the planet and thus requires the widest possible cooperation by all countries.” The United States, however, failed to ratify the Paris Agreement, claiming that this country has done more on climate change than any other country so far and that the deal is “unfair.” The decision to withdraw from the Paris Agreement represents the agency of emissions reductions is captured in the existing text. In order to reach the Paris Agreement’s long-term temperature goal, Parties to the Agreement “aim to reach global peaking of GHG emissions as soon as possible... and to undertake rapid reductions thereafter.” The remainder of the comment does not make a particular request or suggestion to the authors.

In response to this comment, we have revised the text to emphasize the significance of the agreement, and have included the number of parties who have ratified the Agreement as well as the percent of global emissions that they represent. The agency of emissions reductions is captured in the existing text. In order to reach the Paris Agreement’s long-term temperature goal, Parties to the Agreement “aim to reach global peaking of GHG emissions as soon as possible... and to undertake rapid reductions thereafter.” The remainder of the comment does not make a particular request or suggestion to the authors.

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**Comment**: It should be acknowledged elsewhere in this section that we are already seeing the impacts and costs of climate change and extreme weather. For example, data from NOAA show that 2017 tied a record for the number of tropical cyclones with costs greater than $1 billion each. You could also refer to a September 2017 report by the University of Global Fund, which found that the cost from "weather events influenced by human-induced climate change, with a total of $56 billion in economic losses and damages, house significantly [sic] from $135 billion in the 1980s and $212.6 billion in the last decade—a two-fold increase compared to the 1960s and an almost three-fold increase, compared to the 1930s." (Watson, P, 2017) We have modified the text to incorporate the point that CDR costs vary across different measures, and that are estimated to be currently expensive at scale. We have also indicated that these costs needs be viewed in the context of other mitigation options, both of which are points we made in the CDR section on which this section draws. We have emphasized the point by adding text indicating that CDR is frequently an elimination of mitigation scenarios that also involve more traditional mitigation options, which includes scenarios with negative emissions.

**Response**: Thank you for your suggestion. Concerning your note, we strongly encourage you to correct the worrisome "projected to grow to hundreds of billions of dollars by the end of the century" but does not quantify the cost of present-day impacts due to a lack of robust estimates. In response to the comment, we have added a statement that the impacts and costs of climate change are already being felt in many places, and that many extreme weather events can now be attributed with nontrivial confidence to human-induced warming, citing the Attribution Of The CSR (CSR 10-2/2). We appreciate the reference to the US white paper and have reviewed the report. As the report describes the economic costs of recent US weather events, we have not used the citation, as this key message addresses climate damages, and there is not a sufficient literature basis to make a claim about the fraction of attributable storm damage to human-induced climate change. Instead we cite the assessment of physical attribution in CSR 10-2.

**Comment**: Respectfully ask consideration of the following language: The Plan-Do-Check-Act Cycle (PDA) to Mitigate Climate Change, by Dr. Philibren, supports more and better use of the PDA to reduce contributions to climate change, including the materials used in production, how/what services are rendered and energy. The PDA is a focused tool used in the implementation and maintenance of a management system for change and continual improvement. Its history dates back to the 1940s and the development of the International Standard for Standardization (ISO) series of quality standards, (ISO 9000). In 1993, the U.S. Environmental Protection Agency (EPA) initiated the Code of Environmental Management Principles, which used the PDA for continual environmental management improvement. In 1996, the first ISO Environmental Management System (EMS) standard was published as ISO 14001 EMS and included the PDA, an EMS calls for an organization to identify environmental aspects (causes) and impacts (effects) and plans to manage them (e.g., address risks) accordingly. Since that time, a number of ISO climate change standards have been promulgated, dealing primarily with GHG inventories and emissions. To date, there are over 1.3 million organizations that have certified to the ISO quality and EMS standards with many integrating the two management systems. The key to successfully using the PDA as a climate change tool is to ensure that managers incorporate the PDA continual improvement cycle into the performance culture of the organization.

**Response**: We note that the Plan-Do-Check-Act Cycle is less relevant to the focus of this chapter, as no management systems are being discussed or implemented, so the specific requested change has not been made to the chapter test. However, we agree that iterative risk management is related to the PDA concept. In coordination with Ch 28: Adaptation, we have added text describing iteration risk management, a strategy in which initial actions are modified over time as learning occurs and that chapter focuses primarily on the first stage of the iterative process in which risks and vulnerabilities are identified.

**Comment**: This is a quite limited view about CDR, there being a number of approaches that might be less expensive. The real challenge is really the scaling up of CDR, especially when emissions are not bought down. So, while mitigation can likely be a lot more cost-effective, as its cost-base are the easy changes are made, CDR is likely to be a better option. Thus, I really think the framing has to be a little different here, indicating that all play together and research is needed on all; and that then the least expensive option may change as one goes from efficiency to substitution of renewables to use of biofuels and CDR. I think a more integrated perspective is needed in this paragraph, especially in that there will be need for negative emissions to meet the temperature targets as virtually all emissions pathways now envisioned will lead to significant temperature overshoots. On the other hand, the front of the chapter needs to reflect the more integrated approach of options I’m urging here.

**Response**: We have modified the text to incorporate the point that CDR costs vary across different measures, and that are estimated to be currently expensive at scale. We have also indicated that there are costs needs be viewed in the context of other mitigation options, both of which are points we made in the CDR section on which this section draws. We have emphasized the point by adding text indicating that CDR is frequently an elimination of mitigation scenarios that also involve more traditional mitigation options, which includes scenarios with negative emissions.

**Comment**: Actually, I think it would be better to just indicate that climate sensitivity is the response of the climate system to changes in radiative forcing that are caused, for example, by changes in atmospheric composition. The text now focuses only on CO2 and makes it seem that one does not have to worry about the problem until CO2 doubles. The revised text has now removed the "the change that would result from a doubling of CO2 in the atmosphere relative to preindustrial levels" from the sentence since "climate sensitivity" is defined in the glossary of the NCCA Volume 1 or Climate Science Special Report (CSSR).

**Response**: We agree, and the text has been modified to ensure the sentence is clear and concise.

**Comment**: This is a really vague sentence—undoubtedly by whom, to what end, etc. Is this about the US or the globe, what climate change scenarios are being discussed or implemented, so the specific requested change has not been made to the chapter test. However, we agree that iterative risk management is related to the PDA concept. In coordination with Ch 28: Adaptation, we have added text describing iteration risk management, a strategy in which initial actions are modified over time as learning occurs and that chapter focuses primarily on the first stage of the iterative process in which risks and vulnerabilities are identified.

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Linda David | MacCracken | 144093 | Text Region | 29- Mitigation: Avoiding and Reducing Long-Term Risks | 32 | 150 | 34 | 150 | Given all the impacts described in this assessment, it needs to be made quite clear that the notion of 1.5 to 2°C as the long-term stabilization level for the Earth’s temperature (especially in light of the change over land and mid-high latitudes which would not have very, very severe consequences of the environment and society (the equilibrium sea level sensitivity from palaeoformations is 15 to 20 meters per degree), as Hansen and colleagues made clear in a paper a few years ago. The global average temperature easily needs to be brought back down to less than 0.5°C, and that would likely not keep sea level rise within a range that would not require very substantial impacts to most of the world’s coastal cities. The Paris Accord can be considered a start, but it is not in political one and not scientifically based. | In response to this comment, we have inserted the following statement where the 2°C objective is mentioned: “These targets were developed with the goal of avoiding the most severe climate impacts; however, they should not be viewed as thresholds below which there are no risks and above which numerous tipping points are suddenly triggered.”
Linda David | MacCracken | 144094 | Text Region | 29- Mitigation: Avoiding and Reducing Long-Term Risks | 9 | 150 | 7 | 150 | Another statement that really is in strange way is the global warming up and up and up after tremendous error. Offsetting the significant offsets of the Paris objectives, much less the 0.5°C value that was when major climate impacts started to occur. It would be just as unwise to say now that everyone might stop mitigation so why even give it a try. Given it is important to the world and is relatively easily done, it would seem for better for the fog to jump out of the pot even though there is of course the chance that someone might put the fog back in the pot. The world, thus, perhaps to a bit of people’s surprise, has kept from having an all-out nuclear war. Consider the case of the world climate. Given the advance consequences of climate change without SRM, the situation sure looks pretty bleak. Given that staying below 1.5°C likely requires ending global food use in a decade or two, and the world is lacking the warning of looming to the world shortfall of SRM, this is a light of the scale dismaying situation that we are in (which this chapter does not really seem to highlight very well). I just think the overall presentation on this issue in this section is totally inadequate in laying out the dilemma that we face. | We believe it is important to reflect the literature on risks of sudden cessation of SRM, leading to rapid climate change. We have modified the text however to indicate that this refers specifically to “sudden” cessation of “large-scale” SRM, and that a gradual phaseout of SRM would not have the same effect.
Linda David | MacCracken | 144095 | Text Region | 29- Mitigation: Avoiding and Reducing Long-Term Risks | 22 | 1359 | 14 | 1359 | This is really a very narrow way of thinking about these approaches. Various of the approaches could potentially be applied regionally to moderate the projected increase in tropical cyclone intensity, to moderate amplified Arctic warming, to make up or loss of the sulfate cooling offset, to moderate increases in water temperature over sensitive areas like the Great Barrier Reef, to moderate loss of ice from the ice sheets, etc. – given how little funded research there has been, we just do not know, but there quite possibly are a number of special types of activities that might be pursued. And given that variations in orbital parameters involving changes in the amount of radiation at various latitudes by several percent are apparently what drive (with feedbacks) the growth and decay of ice sheets for glacial-interglacial cycling, that human stimulated changes of a few percent, so comparable to what major volcanic eruptions do, could seem worth investigating. Why be chance Nature to cause the eruption of volcanic eruptions over a period of time. I don’t know of any studies suggesting that such an event would not be welcomed to limit the cooling, so what is it thus summarily is downgrading the potential stopping of human activity to do this is a light of the scale dismaying situation that we are in (which this chapter does not really seem to highlight very well). I just think the overall presentation on this issue in this section is totally inadequate in laying out the dilemma that we face. Indeed, climate intervention is not perfect, but that is not the issue to be considered. What needs to be considered is if it makes more sense to do mitigation plus CDR and adaptation with or without a role played by global and regional SRM. One can hope that every other approach is adequate and so SRM is not needed, but this is not the way that things look now if one wants to keep the temperature increase below the former objectives and then come back quickly, as it is essential to be below 0.5°C. And this section simply does not hit that. | We agree that describing climate intervention as aimed solely at moderating global average temperature is overly narrow, and have added a modified text in several places to indicate the possibility of other aims (the first sentence of the section, the fourth sentence of the revised text which defines SRM, and the discussion of pros/cons of SRM with an added reference). More generally, we have indicated the first sentence that the main treatment of this issue is in the Climate Science Special Report, so that the reader can refer for additional discussion. Given the focus of this chapter, we provide only a brief accounting of climate intervention strategies, based primarily on the CSSR treatment.
Linda David | MacCracken | 144096 | Text Region | 29- Mitigation: Avoiding and Reducing Long-Term Risks | 31 | 1361 | 13 | 1361 | Where is the reference to the Hansen et al. paper of a few years ago making clear the extent of damages from SRM, and have added the following sentence to our text: “The Hansen et al. paper was published in 2013. The SRM was not developed frompalaeoformations but the equilibrium sea level sensitivity estimate of 15 to 20 meters per degree.” | We have reviewed the Hansen et al. 2018 (and earlier variants) paper exploring the potential pathways for terrestrial SRM. The estimates of the potential role of terrestrial SRM resulting from their paper were based on an assumption that land use changes could be maintained to 2100, while SRM would be developed to a level that would hold the global surface temperature to 1.5°C. This is a substantial over-estimate of the potential for terrestrial SRM, as well as an over-estimate of the potential for SRM in general. We have included an additional page number to our discussion of terrestrial SRM in the revised text where the Hansen et al. paper is mentioned.
David Arpich | 251617 | Text Region | 3- Land Cover and Land Use Change | 23 | 176 | 22 | 176 | Here is the text as written: 29 Key Message 1: Changes in land cover, which may be driven by societal choices concerning land use, continue to impact local- to global-scale weather and climate by altering the flow of energy and water between ecosystems and the atmosphere, with important feedback effects. The growth and decay of ice sheets for glacial-interglacial cycling, that human stimulated changes of a few percent, so comparable to what major volcanic eruptions do, could seem worth investigating. | This comment is inconsistent with the author’s thorough assessment of the science and is inconsistent with the current state of the science on this topic. Thank you for your comment. This key message is strongly supported by recent scientific literature as evidenced by the extensive number of references that we’ve cited throughout this section of the chapter. Additional support is provided in the chapter’s Traceable Account. Lastly, we refer you to NCA4’s Chapter 2: Our Changing Climate for additional details on the supporting science.
David Arpich | 144018 | Text Region | 3- Land Cover and Land Use Change | 34 | 158 | 34 | 158 | 13 However, climate change is expected to directly and indirectly impact land use and cover by altering disturbance patterns, species distributions, and suitability of land uses. Some feedbacks also play a role in the surface energy balance. | We agree that describing climate intervention as aimed solely at moderating global average temperature is overly narrow, and have added a modified text in several places to indicate the possibility of other aims (the first sentence of the section, the fourth sentence of the revised text which defines SRM, and the discussion of pros/cons of SRM with an added reference). More generally, we have indicated the first sentence that the main treatment of this issue is in the Climate Science Special Report, so that the reader can refer for additional discussion. Given the focus of this chapter, we provide only a brief accounting of climate intervention strategies, based primarily on the CSSR treatment.
Irle Heath | 144201 | Text Region | 5- Land Cover and Land Use Change | 18 | 183 | 16 | 183 | Most of the discussion on future vegetation depends on citations of the literature based on statistical modeling. | The references provided in this section include studies using dynamic vegetation models, as well as statistical approaches. We recognize the difficulty in making projections of vegetation/land cover change in this context, and have added a sentence at the end of the revised section emphasizing the limitations of projections and some of the other driving forces driving these changes. We have also included a reference the the review by Pearson and Havrda (2003) which discusses the limitations of species niche modeling.
The data continually cited as coming from US EPA is based on Forest Service statistics. Given that "USGS" is constantly used throughout as a source, why not just use USDA Forest Service as the source instead of US EPA? The USDA is not listed as a source for any of the specific data sources (see Reference list). The reference to the U.S. Geological Survey was erroneous for each of the three figures and has been updated. The land use estimates associated with the US EPA [2017] station were obtained from USDA Forest Service, Forest Inventory and Analysis (FIA) Program and USDA NRCS National Resources Inventory (NRI) data when available for an area, because the surveys contain additional information on management, site conditions, crop types, biometric measurements, and other data that is needed to estimate C changes, N2O, and CH4 emissions on those lands. If FIA and FIA data are not available for an area, however, that the N2O product is used to represent the land use. Since all these data sources were used in the land representation analysis within the National Inventory Report we used the US EPA [2017] station. We appreciate the suggestion and have determined that the current references are appropriate and adequate given the chapter's scope limitations.

The definition of land use here is diluted to much from academic, IPCC guidance for reporting to national greenhouse gas inventories, and official statistics of the US usage that is difficult to follow. Allow Grant Borré, the Forest Service author, the opportunity to contribute properly to this and fix.

The authors disagree. The first sentence of the chapter says: "Climate can affect and be affected by changes in land use—cover—the physical characteristics of land such as trees or pavement and, landscape—human management and activities on land, such as farming or recreation." The IPCC describes land use as "the total of all activities, arrangements, and inputs that people undertake in a certain land use cover type" and land cover as "the observed physical and biological cover of the earth's land, as vegetation or man-made features." We believe these definitions are entirely consistent. No changes have been made to the definition of land cover or land use. However, we have added additional identification to the caption of Figure 1 to describe the classification of land use in the National Land Use Dataset, which provides a hierarchical classification scheme to understanding land use. We have also included a table (S.1) showing land-use estimates from EPA.

This sentence is a bit sweeping, consider rewording removing "traditionally" or removing "short term". This chapter ignores the well accepted and used literature based on the official forest land statistics of the US national greenhouse gas inventory guidance is quite clear about land use change and land management. National Forest Inventories have always included two conditions for a wide variety of stakeholders. Decisions about..."cover", does this mean cover class?

We added wetland and beach loss and cited the Coastal, Northeast, and Southeast chapters. We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most sensible approach. We believe the comment refers to P192, L18. We do not feel that the word "class" needs to be included in the sentence. The term yield is meant. See the Lobell and Field (2007) paper for more information. After consideration of this point, we have determined that the existing text is clear and accurate.

The term "landscape" seems out of place. Is the term yield meant or is the term productivity meant by those terms are different. We have updated the text with a reference to the "Forests" chapter for a more thorough discussion of forest management and carbon dynamics.

The key messages have been modified to focus on how climate change affects land use which can in-turn, affect the ability of ecosystems to produce goods and services.

This chapter focuses on the recent history of land use change for the purpose of highlighting the broad trends rather than providing a number of specific case studies. We have updated the text to reflect this focus. The sentence refers to cover, use, and management in general terms. After consideration of this point, we have determined that the existing text is clear and accurate.

The authors believe the current text confirms the comment. We state a number of reasons why estimates of cover and use may differ, including "consistency and correct application of terminology and definitions, time, scale, data sources, and methods." While each approach may produce land use and land cover classifications, each method may provide different types of information at various scales so choosing appropriate data sources and clearly defining what is being measured and reported is essential. After consideration of this point, we have determined that the existing text is clear and accurate.

We appreciate this suggestion, but space is limited. The text has been revised to incorporate this suggestion. The intent of this figure and chapter was not to debate differences between terms and definitions. The text of this chapter was to illustrate how different land classifications and land use and land cover products and estimation procedures lead to different land use and land cover estimates. Each classification and data product or process has been developed with a specific set of goals and objectives which may be reflected in the definitions of land use and land cover and contributes to differences in the results. We thank the reviewer for the comment, but the suggestion is outside the scope of this report.

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This chapter, and paragraph in particular, focus on how changes in LULC/management can impact mitigation and adaptation. While climate impacts on soil C are certainly important, they are beyond the scope of this chapter.

We have added the review by Paustian (2016) to the text.
Figure 5.2 illustrates estimated changes in land cover while text in Chpt 6 reports land use changes in the forest land category. As the text indicates in Chpt 5, lines 2-17 on page 194, forest land cover has declined over the last decade but the forest land use has increased which is consistent with the text in Chpt 6. No changes were made.

Michael MacCracken: Figure 5.2 shows decreasing forest area in all regions, while Chapter 6 says there is net afforestation in the U.S. in recent decades.

Response

We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. The focus of this Key Message is the affects of climate on land use and cover. Impacts on ecosystem services was beyond the scope of this chapter.

Michael MacCracken: Figure 5.2. "Earth" the planet needs to be capitalized - although perhaps on the second line the text is referring just to the "earth" part of the surface and so it is fine as is. Just because some old style guides adopted the convention not to capitalize earth, man, and sea, is not a reason to exclude "earth" or "sea". NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets)

Response

Thanks for the comment. We have given Earth the respect he/she deserves and capitalized the "E".

Michael MacCracken: This sentence is unclear.

Response

After consideration of this point, we have determined that the existing text is clear and accurate.

Michael MacCracken: Figure 5.2 shows the net change in land cover, not land use. Furthermore, net change represents only a fraction of the total land cover change (gross change). The figure shows the annualized rate of change. The authors imply that the annualized rate of change is relatively small and likely not a significant driver of land use and climate change. However, when considered over sufficiently long temporal periods its cumulative effect can have profound consequences and significantly alter regional to global climate.

Response

We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. The focus of this Key Message is the affects of climate on land use and cover. Impacts on ecosystem services was beyond the scope of this chapter.

Michael MacCracken: The reference style for papers with more than 2 authors uses the first two authors names followed by et al. and the excuse that the proper name of our planet is "Terra" is something that not 1 in 100 would know). The names of the other planets are capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc. - the names are capitalized, like the names of all the other planets)

Response

We have added a sentence and two references discussing the name-change issue (Jenno et al, 2010; Kant and Hamilton, 2008).
<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
<th>Start Page</th>
<th>End Page</th>
<th>Start Line</th>
<th>End Line</th>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144274</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>194</td>
<td>199</td>
<td>21</td>
<td>22</td>
<td>I think you want “are the large declines”</td>
<td>We believe the text is correct as is.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144275</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>195</td>
<td>199</td>
<td>22</td>
<td>24</td>
<td>Please change to 99% in line 24.</td>
<td>We believe the text is correct as is.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144277</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>196</td>
<td>199</td>
<td>9</td>
<td>10</td>
<td>In judge significance, it would be helpful to also provide what the new percentage figure would be, if not just how much the change was.</td>
<td>Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144278</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>196</td>
<td>199</td>
<td>23</td>
<td>24</td>
<td>It would be helpful to provide the percentage of the present topic in order to judge how important this is as an introduction for the major water consumer in California.</td>
<td>The chapter focuses on broad trends for the topic. We refer those interested in a deeper treatment of the topic to the provided citations.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144279</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>197</td>
<td>199</td>
<td>15</td>
<td>15</td>
<td>Change “temperatures” to “temperature”</td>
<td>The text has been revised and the world is no longer used.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144280</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>197</td>
<td>199</td>
<td>5</td>
<td>6</td>
<td>While this wording might be technically correct, it is, in my view, a bit misleading. I’d suggest that what would happen would be a moderation of the warming, which is a cooling influence, but the other implication that warming will not generally be occurring. And the other thing that going to warm world is to increase the absolute humidity, and so the wet bulb temperature will rise and overall comfort index would also be affected in ways that would make the planet less comfortable for human beings.</td>
<td>Thank you for catching the typographical error. It was fixed.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144281</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>197</td>
<td>199</td>
<td>21</td>
<td>22</td>
<td>Change “may” to something like “are, in some situations.”</td>
<td>We appreciate the reviewer’s comment. However, each of the 8 studies cited shows that modeled or observed temperature for forest are cooler than those associated with herbaceous cover. After consideration of this point, we have determined that the existing text is clear and accurate.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144282</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>198</td>
<td>199</td>
<td>25</td>
<td>25</td>
<td>You might change “effects” to “manifestations”</td>
<td>The text has been revised and the word is no longer used.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144283</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>198</td>
<td>199</td>
<td>24</td>
<td>24</td>
<td>In addition to previous comments about adding ecological references to the list on line 24, I don’t understand why the word “observed” is included here—why not two direct sentences?</td>
<td>We agree with the comment and have removed “However” from the key Message.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144284</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>199</td>
<td>200</td>
<td>23</td>
<td>23</td>
<td>Change “may” to “can” or “have the potential to”—it’s not a question of permission, but ability.</td>
<td>The authors agree and have made the suggested change (“have the potential to”).</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144285</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>199</td>
<td>200</td>
<td>28</td>
<td>28</td>
<td>No need for word “future”—you actually have the scenarios now.</td>
<td>After consideration of this point, we have determined that the existing text is clear and accurate.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144286</td>
<td>Task Region</td>
<td>S. Land Cover and Land Use Change</td>
<td>199</td>
<td>200</td>
<td>25</td>
<td>25</td>
<td>This whole section is quite underdeveloped given its importance.</td>
<td>Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity.</td>
<td></td>
</tr>
<tr>
<td>Thomas</td>
<td>Shaw</td>
<td>146952</td>
<td>Whole Chapter</td>
<td>Appendix 1: Processes</td>
<td>144</td>
<td>200</td>
<td>29</td>
<td>30</td>
<td>Refers important and most reliable way to assess accuracy and biased evaluations of critical data, opinions, and hypotheses.</td>
<td>We thank the reviewer for the comments and agree that peer-reviewed literature is a critical component of science assessments such as the NCA.</td>
<td></td>
</tr>
<tr>
<td>Nikos</td>
<td>Bicbird</td>
<td>154311</td>
<td>Whole Chapter</td>
<td>Appendix 4: International</td>
<td>145</td>
<td>200</td>
<td>29</td>
<td>30</td>
<td>Send your feedback to the secretariat. The International-Applied-Science-Academies’ highlights a stratified assessment model (with distinct mandates and requirements, process, concept, structure, and discussion of international dimensions) from geographically varied nations with varying capacities to conduct such assessments. As such, it is intended to be a more illustrative than comprehensive presentation of national approaches to climate assessments. We agree that the EU’s recent report is an important and valuable document, and have included a reference to it in the text. However, since it is sufficiently similar to the NCA in scope and content and does not add additional geographic or development dimension, we have chosen not to include a full summary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141203</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>145</td>
<td>145</td>
<td>6</td>
<td>7</td>
<td>This shows the extraordinary nature of global sea level rise in the 20th and 21st centuries.</td>
<td>Thank you for the comment, we have a separate FAQ on sea level rise so see us choose not to include two different and at least five figures in this chapter.</td>
<td></td>
</tr>
<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141204</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>146</td>
<td>146</td>
<td>1</td>
<td>2</td>
<td>Consider also showing the six-core CO2 record of the last 800k years.</td>
<td>Thank you for the comments, we replaced the figure with one that shows CO2 over the past 800k years.</td>
<td></td>
</tr>
<tr>
<td>Robert</td>
<td>Kopp</td>
<td>141205</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>146</td>
<td>146</td>
<td>16</td>
<td>17</td>
<td>As discussed in previous pages, approximations associated with parameterizations are not the only cause of model uncertainty.</td>
<td>Thank you for the comment, a reference to that FAQ was added.</td>
<td></td>
</tr>
<tr>
<td>Rehan</td>
<td>Rashidi</td>
<td>144196</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>146</td>
<td>146</td>
<td>9</td>
<td>10</td>
<td>Many of the questions categorized under “Environmental effects” have more to do with the ozone layer than ecology.</td>
<td>Thank you for the comment, we assessed the questions in each category and will come up with appropriate headings based on the final version of each question.</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144200</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>144</td>
<td>144</td>
<td>7</td>
<td>8</td>
<td>Numerous independent studies sound vague and underwhelming, when the many, many hundreds of studies show evidence of warming. Consider rewording to better reflect the volume of research.</td>
<td>Thank you for your comment; we included the text to better reflect the actual volume of publications</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144201</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>144</td>
<td>144</td>
<td>22</td>
<td>23</td>
<td>Does a cooling upper atmosphere have different implications for the planet or atmosphere? CO2 being trapped near the surface and cooling warming makes sense, but some clarification of the importance/rellevance of a cool upper atmosphere would be helpful.</td>
<td>Thank you for your comment, we revised the text to clarify cooling of the upper atmosphere</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144202</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>145</td>
<td>145</td>
<td>4</td>
<td>4</td>
<td>Consider rewording: “In heavy winter events show that the atmosphere’s ability to hold water vapor has increased with its temperature (Ch. 3: Water).” Some warm unfamiliar weather patterns may be confused, as “unusual” implies that the atmosphere can no longer hold the vapor (i.e., release it as precipitation), rather than the volume in holding has increased. “Capacity” may work better than “ability.”</td>
<td>Thank you for the comment, the text was edited to be more clear for non-technical readers</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144203</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>146</td>
<td>146</td>
<td>10</td>
<td>11</td>
<td>Consider changing the color of the red indicator arrows (showing an increase or decrease) to a more eye-catching color. Due to the bright and variable colors used for the images themselves, the arrows get lost.</td>
<td>Thank you for your comment, the graphic is being redone to match the same graphic in the Overview chapter.</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144204</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>146</td>
<td>146</td>
<td>17</td>
<td>17</td>
<td>Please add a year estimate or reference to when the global Industrial Revolution started.</td>
<td>The comment is understood, but not address the specific request.</td>
<td></td>
</tr>
<tr>
<td>Aurin</td>
<td>Constable</td>
<td>144205</td>
<td>Task Region</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>145</td>
<td>145</td>
<td>11</td>
<td>13</td>
<td>Add “GHG” after the first mention of greenhouse gases in the intro paragraph, rather than in the first main paragraph after already using the abbreviation.</td>
<td>We included GHG after the first mention of greenhouse gases.</td>
<td></td>
</tr>
<tr>
<td>First Name</td>
<td>Last Name</td>
<td>Comment ID</td>
<td>Comment Type</td>
<td>Chapter</td>
<td>Figure/Table Number</td>
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<td>Comment</td>
<td>Response</td>
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</tr>
<tr>
<td>Tomi</td>
<td>MacCracken</td>
<td>A5.20</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>20</td>
<td>None</td>
<td>1491</td>
<td>1492</td>
<td>12</td>
<td>12</td>
<td>This heat-trapping gas is part of the carbon cycle and is released and absorbed through natural processes on seasonal to multidecadal time scales and longer, &quot;snowballing&quot; it if cut off, or missing the ending of the sentence. Consider removing &quot;longer&quot; or comparing the thought.</td>
<td>Thanks for the comment, &quot;snowballing&quot; was deleted and the sentence was edited for clarity.</td>
</tr>
<tr>
<td>Juanita</td>
<td>Bakken</td>
<td>142770</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1458</td>
<td>1458</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>&quot;Lower...&quot; and &quot;upper atmosphere&quot; have been used previously in the chapter without being noted (troposphere) and (stratosphere), consider introducing these terms earlier in the chapter for clarity and continuity.</td>
<td>Thanks for the comment, we edited the text to introduce troposphere and stratosphere earlier in the chapter Appendix 5: Frequently Asked Questions.</td>
</tr>
<tr>
<td>Tomi</td>
<td>MacCracken</td>
<td>A5.76</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1421</td>
<td>1421</td>
<td>20</td>
<td>20</td>
<td>1</td>
<td>20</td>
<td>While there is mention of &quot;summer&quot; and &quot;dry&quot; regions, it may be helpful to be in a more context regarding the implications on drought/flooding, and touching on the risks associated with these. This may be a little closer to home, that they are damaging phenomena rather than just &quot;more rain&quot; and &quot;less rain.&quot;</td>
<td>Thank you for the comment, we edited the text to include mentions of droughts and floods.</td>
</tr>
<tr>
<td>Juanita</td>
<td>MacCracken</td>
<td>A5.71</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1471</td>
<td>1471</td>
<td>1</td>
<td>1</td>
<td>At this point, it appears the figure contradicts the discussion paragraph, &quot;indeed of the 17 warmest years...&quot; perhaps a box would be helpful to note the discussion of this figure if the cost of these events was adjusted for inflation.</td>
<td>Thanks for the comment, we added a note in the figure captions saying these values are adjusted for inflation.</td>
<td></td>
</tr>
<tr>
<td>Juanita</td>
<td>MacCracken</td>
<td>A5.72</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1478</td>
<td>1478</td>
<td>14</td>
<td>23</td>
<td>1</td>
<td>23</td>
<td>The use of &quot;people&quot; makes these impacts sound very detached from the population as a whole, and makes it easy to think &quot;someone will be impacted, but not me&quot; when this is affecting everyone to some extent. Consider changing to &quot;we&quot; or &quot;everyone.&quot;</td>
<td>Thank you for the comment, the answer was edited to be more connected to the population as a whole Appendix 5: Frequently Asked Questions.</td>
</tr>
<tr>
<td>Juanita</td>
<td>MacCracken</td>
<td>A5.73</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1482</td>
<td>1482</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>Consider revisiting this sentence, for clarity.</td>
<td>Thank you for the comment, the sentence was revised for clarity Appendix 5: Frequently Asked Questions.</td>
</tr>
<tr>
<td>Juanita</td>
<td>MacCracken</td>
<td>A5.74</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1482</td>
<td>1482</td>
<td>17</td>
<td>31</td>
<td>1</td>
<td>31</td>
<td>It would be worth mentioning how much more potent these short-lived pollutants are compared to carbon, to add a layer of understanding.</td>
<td>Thanks for the comment, we added a statement about potency short lived species.</td>
</tr>
<tr>
<td>Juanita</td>
<td>MacCracken</td>
<td>A5.75</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>48</td>
<td>48</td>
<td>1</td>
<td>1</td>
<td>What is BCP 6.5 and BCP 4.5 stand for?</td>
<td>Thank you for the comment, in the front matter of the report all representative concentration pathways scenarios are described.</td>
<td></td>
</tr>
<tr>
<td>Tomi</td>
<td>Constible</td>
<td>A5.76</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1492</td>
<td>1492</td>
<td>18</td>
<td>38</td>
<td>1</td>
<td>38</td>
<td>How does it impact marine life? Examples would be helpful before diving into the specific question on page 1493.</td>
<td>Thank you for the comment, since there is an entire question devoted to ocean acidification, we just linked to that question for more details Appendix 5: Frequently Asked Questions.</td>
</tr>
<tr>
<td>Tomi</td>
<td>Constible</td>
<td>A5.77</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1496</td>
<td>1496</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>How does CO2 reduce the efficacy of herbicides?</td>
<td>Thank you for the comment, we edited the text for clarity. I will take a look to Zika et al., 2023 Review and Projected Increases in Atmospheric CO2 Concentration Can Enhance Gene Flow between Wild and Genetically Altered Rice (Dhaya satticala).</td>
</tr>
<tr>
<td>George</td>
<td>Bakken</td>
<td>A5.80</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>AS.6</td>
<td>582</td>
<td>2</td>
<td>2</td>
<td>I'm not sure what the best way to explain this to the general public is, as the actual processes are a complex with radiations from various depths within the atmosphere, etc. Nevertheless, the figure AS.6 is open to criticism, because although it was intended to be schematic, taken literally it is obviously wrong, or at least requires a lot of interpretation that is not provided. Figure AS.6 shows the same amount of solar radiation (arrow width) in both panels, but says &quot;less heat escapes into space&quot; in the left in the right panel. In fact, the amount of shortwave solar energy from the sun that is not immediately scattered or reflected must necessarily be re-radiated into space by the earth as thermal radiation (less a minuscule fraction stored on earth as it warms - maybe that is what it was intended to show). Also, the temperature of the earth would not rise as rapidly. Be it you think a professional figure something similar to my poor, hasty Powerpoint efforts sent separately might be a little closer. The sum of the widths of the outgoing arrows equals the width of the incoming solar arrow. I show in it is re-radiated from the atmosphere at a lower level causing near-surface warming. Of course, one cannot show the infinite series in the figure. So, the skinny downward arrow at the left end of the sequence represents the stored fraction and terminates the series logically. Suggested revised Fig AS.6 emailed separately as a pdf &quot;Bakken&quot; fig AS.6 &quot;suggestion&quot;.</td>
<td>Thank you for the comment, we included some of your suggestions in a new figure that is hopefully a better way to explain the concept to the general public Appendix 5: Frequently Asked Questions.</td>
<td></td>
</tr>
<tr>
<td>George</td>
<td>Bakken</td>
<td>A5.84</td>
<td>Figure</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>AS.20</td>
<td>571</td>
<td>2</td>
<td>2</td>
<td>Figure AS.20 page 1471 line 1 &quot;The 2016 on the figure appears mislabeled as it appears when you look at the page - should be above and somewhat right the curve to indicate the top line in 2016. This is if it is interpreted as a static figure (as it would be in the print edition). I know it looks ok when you run the video, but to cover all bases I'd move it to upper right of curve in the video. Or eliminate it from the static figure.</td>
<td>Thanks for the comment, we will fix the placement of &quot;2016&quot; Appendix 5: Frequently Asked Questions.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacDonald</td>
<td>A5.80</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1444</td>
<td>1444</td>
<td>14</td>
<td>14</td>
<td>I'm sure that in some nations the observations are by point observers, etc. Text here is too limited.</td>
<td>Thank you for your comment; we edited the text to be more inclusive Appendix 5: Frequently Asked Questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacDonald</td>
<td>A5.89</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1444</td>
<td>1444</td>
<td>17</td>
<td>18</td>
<td>Actually, the fronts go up and don and just, sort of always drifting on deep ocean currents.</td>
<td>Thank you for your comment; we revised the two sentences Appendix 5: Frequently Asked Questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacDonald</td>
<td>A5.80</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1444</td>
<td>1444</td>
<td>12</td>
<td>14</td>
<td>I would think it better to reword the order of these two sentences.</td>
<td>Thank you for your comment; we revised the text to be more inclusive Appendix 5: Frequently Asked Questions.</td>
<td></td>
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</tr>
<tr>
<td>Michael</td>
<td>MacDonald</td>
<td>A5.90</td>
<td>Appendix 5: Frequently Asked Questions</td>
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<td>1444</td>
<td>13</td>
<td>13</td>
<td>This is plain wrong. Most of CO2's influence is in the upper troposphere where the water vapor concentration is low. And the exploration does not mention the effect of the added water vapor and the importance of the convective coupling of the troposphere. And this idea of less heat coming up to warm the stratosphere is just wrong - that is not at all the major influence.</td>
<td>Thanks for the comment, the section of the text has been removed based off of suggestions by other reviewers Appendix 5: Frequently Asked Questions.</td>
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<tr>
<td>Michael</td>
<td>MacDonald</td>
<td>A5.91</td>
<td>Appendix 5: Frequently Asked Questions</td>
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<td>11</td>
<td>11</td>
<td>If just note that for some mountain glaziers, warming can lead to glacial growth as snow amount can increase as long as temperature is below freezing. So, now statistic, but it does not mean the other 80% are not responding. Warming can also lead to thinning and spreading, so just calculating area is not adequate.</td>
<td>Thank you for the comment, we added text about the other 80% responding and pointed the reader to the FAQ on Glaciers for more information Appendix 5: Frequently Asked Questions.</td>
<td></td>
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</tr>
</tbody>
</table>
This is hardly enough to explain the attribution issue.

I think we should leave UV out of the discussion. Also, the UV only has a very small role in the greenhouse gas effect, at least compared to the other gases.

But the atmospheric gases themselves do not really "trap" radiation.

When the atmosphere gets warmer, the atmosphere actually emits more radiation than it did before. Because more radiation is now emitted back to the surface, this leads to the surface warming and emitting more radiation, etc.

The resulting cooling influence would be larger than the long-term CO2 warming influence because it was only beginning to be understood that the presence time of at least some of the CO2 perturbation is many millennia rather than the several thousand years that were thought to be the case.

Second, during the 1960s there was a continuation of the buildup of tropospheric ozone, which resulted from going to tall stacks to emit the gases from coal-fired power plants and it was thought the resulting cooling influence would be larger than the long-term CO2 warming influence because it was only beginning to be understood that the presence time of at least some of the CO2 perturbation is many millennia rather than the several thousand years that were thought to be the case.

Third, the early satellite-derived trends of wintertime snow cover showed a strong positive change--it turned out this was due to the increasing snow cover went away. But there were strong proponents on both sides of the issue. The subsequent test seems to catch us pretty well.

We used the word analogous rather than similar.

The text was revised to include water vapor.

The text was revised to include water vapor.
<table>
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<th>First Name</th>
<th>Last Name</th>
<th>Comment ID</th>
<th>Comment Type</th>
<th>Chapter</th>
<th>Figure/Table Number</th>
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<th>Start Line</th>
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<th>Comment</th>
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<td>Michael</td>
<td>MacCracken</td>
<td>144718</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1452</td>
<td>1452</td>
<td>8</td>
<td>9</td>
<td>No, only about half of the Sun's energy reaches the surface. About 30% is reflected and about 20% is absorbed in the atmosphere.</td>
<td>Thank you for the comment, we included the suggested changes</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144719</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1452</td>
<td>1452</td>
<td>8</td>
<td>9</td>
<td>These also need to be mentioned. Indeed, it might be worth noting that all gases made of three or more atoms are GHGs (as including COF, etc.).</td>
<td>Thank you for the comment, we incorporated your suggestion into the main text</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144720</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1452</td>
<td>1452</td>
<td>8</td>
<td>15</td>
<td>There are no degrees of certainty. Replace “vanish” by “disappear” as there are degrees of confidence.</td>
<td>Thank you for the comment, “vanish” was replaced with “disappear”</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144721</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1455</td>
<td>1455</td>
<td>8</td>
<td>26</td>
<td>WRONG NUMBERS HERE. The 5000 billion tons is the mass of CO2 (including the mass of the oxygen atoms). The 10 trillion tons per year of CO2 is not counting the oxygen atoms. So, consistent with the data to have been used.</td>
<td>Thank you for your comment, this question was combined with the previous FAQ, and this section was deleted</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144722</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1455</td>
<td>1455</td>
<td>17</td>
<td>27</td>
<td>We think the number is more like 2.5 if one does a multiyear average. With the atmospheric perturbation growing each year to accommodate about 50% of the emitted carbon, one can come pretty close to the ppm increase by including the emissions (i.e., the 10 trillion tons of CO2 per year by 4.</td>
<td>Thank you for your comment, this question was combined with the previous FAQ, and this section was deleted</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144723</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1455</td>
<td>1455</td>
<td>12</td>
<td>12</td>
<td>“Cybernet” not well used to be using. Natural processes merely involve exchanges into and out of the ocean and into and out of the atmosphere, so when the evaluation is made of the effects of CO2 on the oceans, it is the chemical exchange going up by the equivalent of what would result from half of the emitted CO2 remaining in the atmosphere.</td>
<td>Thank you for the comment, “cybernet” was replaced with “biogeochemical”</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144724</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1456</td>
<td>1456</td>
<td>13</td>
<td>16</td>
<td>It doesn’t seem to me that you are comparing equivalent items—is I don’t understand.</td>
<td>Thank you for the comment, the sentence was edited for clarity</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144725</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1456</td>
<td>1456</td>
<td>17</td>
<td>17</td>
<td>Change “there” to “CO2 and” for clarity.</td>
<td>Thank you for the comment, the sentence was edited for clarity</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144726</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1456</td>
<td>1456</td>
<td>20</td>
<td>25</td>
<td>Yes, humans do add water vapor to the atmosphere, but breathing it out as well. However, the atmospheric loading is controlled by the atmospheric circulation, plus to the extent that we directly raise the concentration in the lower atmosphere, this reduces the pressure of water vapor concentration from surface to atmosphere, and so this suppresses evaporation. The typical lifetime of an atmospheric molecule in the atmosphere is of order 7-10 days, so it is hard to build up the concentration.</td>
<td>Thank you for your comment, the sentence was edited to include the life span of water vapor in the atmosphere.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144727</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1455</td>
<td>1455</td>
<td>12</td>
<td>12</td>
<td>It seems the answer should be “the share is starting to become possible with respect to the large-scale factors that influence the local climate.” The go to “With advances in computing power, AI, and so can start to be designed.” I really redo the question and use the word regions instead of communities.</td>
<td>Thank you for the comment, we repositioned some of what you suggested into the answer and changed “communities” to “regions”</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144728</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1457</td>
<td>1457</td>
<td>9</td>
<td>9</td>
<td>The examples of volcanic eruptions might be given.</td>
<td>Thank you for the comment, the sentence was edited for clarity</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144729</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1457</td>
<td>1457</td>
<td>10</td>
<td>14</td>
<td>Another example to list might be aerosol effects.</td>
<td>Thank you for the comment, we included aerosol effects as an example</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144730</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1468</td>
<td>1468</td>
<td>10</td>
<td>12</td>
<td>We should think of the chemical processes that we have discussed in the oceans, and to the extent that we directly raise the concentration in the lower atmosphere, this reduces the pressure of water vapor concentration from surface to atmosphere, and so this suppresses evaporation. The typical lifetime of an atmospheric molecule in the atmosphere is of order 7-10 days, so it is hard to build up the concentration.</td>
<td>Thank you for your comment, the sentence was edited to include the life span of water vapor in the atmosphere.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144731</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1471</td>
<td>1471</td>
<td>4</td>
<td>14</td>
<td>We are actually making climate projections, not predictions—so that means we are saying that if changes in non-human influences constant. There have been studies asking scientists to predict, so including what possible natural influences they think might happen and do, and the range of future temperature projections reflects in response. One Delphi study done by Granger Morgan perhaps 25 years ago.</td>
<td>Thank you for the comment, we changed “predict” to “forecast,” the second part of the comment is outside the scope of this question</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144732</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1473</td>
<td>1473</td>
<td>5</td>
<td>5</td>
<td>This is a pretty strong statement—it didn’t appear that may be the case due to some flaws in the observing network that have been found and fixed, and to the extent that we directly raise the concentration in the lower atmosphere.</td>
<td>Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144733</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1473</td>
<td>1473</td>
<td>17</td>
<td>18</td>
<td>And quite likely some warm biases in the ocean record from the years during World War II that have yet to be fully investigated and corrected.</td>
<td>Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144734</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1475</td>
<td>1475</td>
<td>20</td>
<td>25</td>
<td>It might well be important to explain how the increase in warm extremes and decrease in cold extremes if one compares what was happening in the mid-20th century, if one instead keeps updating our normal/baseline, there is still a bell-shaped distribution of decadal temperature anomalies, etc. So, when making the statement, we should also explain why the statement is being made.</td>
<td>Thank you for the comment, we included a statement regarding reference points in the answer</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144735</td>
<td>Appendix 5: Frequently Asked Questions</td>
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<td>1476</td>
<td>11</td>
<td>15</td>
<td>As Tham has noted, with as much influence as the increased CO2 is having, everything is at least being at least somewhat affected by human influences and nothing is truly natural. What the attribution studies look at is the contribution of the various factors to the overall warming in the present, and, indeed, there are events occurring now that seem very rare in the past, if they occurred at all.</td>
<td>Thank you for the comment, the sentence was incorporated into the second part of this statement into the answer. The first part of the comment is a bit out of the scope of this question</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144736</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1477</td>
<td>1477</td>
<td>14</td>
<td>16</td>
<td>If not then natural variability caused the event—is it then the Blackfriars of the current is about the cause of the event.</td>
<td>Thank you for the comment, the sentence was edited and revised to remove the word “caused” as it is the wrong word</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144737</td>
<td>Appendix 5: Frequently Asked Questions</td>
<td>1479</td>
<td>1479</td>
<td>14</td>
<td>19</td>
<td>Actually, the projections do include situations where the same area could have both more floods and droughts (not at the same time), and this should be noted.</td>
<td>Thank you for the comment, the sentence was edited and revised to include the words “predicted” and “probability”</td>
<td></td>
</tr>
<tr>
<td>Michael</td>
<td>MacCracken</td>
<td>144738</td>
<td>Appendix 5: Frequently Asked Questions</td>
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<td>1481</td>
<td>14</td>
<td>14</td>
<td>A statement should be added to report a number of questions raised a decade ago (URF Foundation and Sigma Xi sponsored the activity).</td>
<td>Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.</td>
<td></td>
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</tbody>
</table>
First Name | Last Name | Comment ID | Comment Type | Chapter | Figure/Table Number | Start Page | End Page | Start Line | End Line | Comment | Response
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
Michael | MacCracken | 144759 | Text Region | Appendix 5: Frequently Asked Questions | 1482 | 1482 | 12 | 12 | I would suggest that what really matters is reducing emissions of short-lived species. If we do it, we can have an effect before 2050. For CO2, general, it is total emissions that matter – a fall in on the timing. | Thanks for the comment, we added a sentence about reducing short-lived species.
Michael | MacCracken | 144780 | Text Region | Appendix 5: Frequently Asked Questions | 1484 | 1485 | 24 | 32 | I was surprised not to see food and food prices on them. If there are food shortages, this will pull money out of being used for other purposes like funding the ongoing academy, and a global revolution or worse could result. | Thanks for the comment, in the body text we discussed it relates to agriculture
Michael | MacCracken | 144791 | Text Region | Appendix 5: Frequently Asked Questions | 1485 | 1485 | 17 | 24 | You mean answer leaves off the potential for geoengineering as a complement to mitigation and adaptation, both SRM for the short term and CDR for the longer term so SRM could be phased out. | Thank you for the comment, we incorporated your suggestions of including CDR and SRM in combination with mitigation and adaptation, then phasing out SRM
Michael | MacCracken | 144742 | Text Region | Appendix 5: Frequently Asked Questions | 1487 | 1487 | 10 | 10 | The answer is focused on using these approaches along, and no one advocates this. The question is whether they can complement mitigation and adaptation, not if they can do it alone. I would note that neither mitigation nor adaptation can do what is needed alone either – and so it is really important to be considering geoengineering approaches alone. Given where we are, we need a comprehensive approach that considers the potential role of each and relative costs, and I’d suggest when we does this, the geoengineering has a very important role to play and the answer here is just inappropriate. For example, there appears to be no practical way for mitigation to keep the temperature to 1.5 C, which will lead to impacts such as ongoing sea level rise that adaptation cannot possibly cope with except at very, very high cost. The global average temperature increase really needs to be below 0.5 C as rapidly as possible (see Hansen et al paper on consequences of being over this carbon given climate sensitivity from paleoclimate being of order 15-20 meters per degree at equilibrium). And there is no way mitigation and adaptation can do this. CDR can likely only in the coming decades, though there are efforts to find ways to get to negative emissions faster. But aggressive mitigation is also required. The notion is that one might use SRM to do it early and then phase it out as CDR takes over, so a much smaller role for SRM (global, or perhaps just regional) than is covered in most of the papers to date that are very exploratory as virtually no research has been funded. Basically, I think the position taken in this opening statement is not technically correct and does not even cover what is being suggested, which is a comprehensive approach using all possible and needed approaches. We are too far along to do anything else. | Thank you for the comment. The question is posed to introduce people to the idea of geoengineering, not to advocate the use of geoengineering alone. We have added the response to incorporate some of your suggestions, such as complementing geoengineering with adaptation and mitigation and noting that much of the geoengineering research is still in the developmental phase. We cannot, however, advocate for the use of any particular geoengineering method or even we need to use geoengineering as that would be policy prescriptive
Michael | MacCracken | 144763 | Text Region | Appendix 5: Frequently Asked Questions | 1487 | 1487 | 21 | 21 | Iron fertilization is only one of suggested approaches. There are a number of others that would have much more capability and could be done in the open ocean where little marine life is no present. Basically, what is said here is no up to date. And the question is, how the supposed “harmful consequences” would compare with not doing the harm from which it is apparently huge. | Thanks for the comment, we noted that this was one of the first proposed methods and that there are cost-benefits to all approaches.
Michael | MacCracken | 144744 | Text Region | Appendix 5: Frequently Asked Questions | 1487 | 1487 | 28 | 29 | This is simply wrong! (2) It is widely agreed that the cost would likely be far less than mitigation/economic past the lowest hanging fruit (and CDR through some researchers are working on it). One of the concerns is that it is so low cost that mitigation might not be pursued, which would be disastrous, as there are limits to how much SRM can be done without creating other serious issues and a very extended commitment. (2) There are limits in understanding as virtually no research has gone into it, but (2) I suggest that we would have more confidence in models simulations for SRM, which keeps the climate near to what we know and experience, then for ongoing GHG driven climate change, where the climate is headed to conditions for which we have no experience – the uncertainty situation is backwards compared to the other. (3) Indeed SRM is not perfect but the question is whether one would be better off with mitigation plus CDR and SRM or with mitigation without CDR and/or SRM. I don’t know anyone (well, except those with mirror based solar systems) would be upset if they just happened to be an ongoing series of minor volcanic eruptions going on to keep the temperatures a bit cooler that they otherwise would be – yet if this were done by humans, there is still this fear of unintended consequences. I really do think an appropriate consideration of the situation we face needs to be done and this is not even close to being the answer. | We modified the text to simply state what SRM is and that it is a under researched. This section of the report is not meant to go into detailed analysis of these techniques or what we should or should not do, it is here to engage the reader to hopefully use the resources suggested to learn more.
Michael | MacCracken | 144705 | Text Region | Appendix 5: Frequently Asked Questions | 1492 | 1492 | 15 | 15 | A very saying ‘the oceans have absorbed over 90% of 85%’ is too precise and there is no assurance this will continue in the future as emissions change, so we need to be changed. | Thank you for the comment, we revised the sentence to say ‘the oceans have absorbed...’
Michael | MacCracken | 144706 | Text Region | Appendix 5: Frequently Asked Questions | 1495 | 1495 | 15 | 15 | A qualifying phrase to be added, saying ‘growth, assuming other factors like water and nutrients are not limiting’ | Thank you for the comment, the text was revised to incorporate the suggestion.
Concern: With global ice melting far faster than predicted, our plight seems relatively tiny & the time to turn things around fairly short.

Solution: Remove all CO2 added to the air since the Industrial Revolution, in 1-10 years using a forest of Columbia University geophysicist Klaus Lackner's synthetic trees.

Abstract: Each of Columbia University geophysicist Klaus Lackner's High Volume Shipping Container synthetic trees removes 90 kilotons of CO2 per year. Roughly 600-900 Gigatons of CO2 have been added to the air since the Industrial Revolution (IR), thus needing 10 million trees to remove it all in 1 year, or 1 million in 10 years (1 Gigaton/yr, or 10 million in 10 years). Lackner says he can remove 1-15% of the CO2 from the air.

We appreciate this comment; however, revising the report to address this comment is outside the scope of the document. The aim of the National Climate Assessment is assess the state of understanding of climate change, the science underlying it, and current and potential impacts on the United States. The assessment is not aimed at assessing the viability and economics associated with promoting specific ideas for mitigating climate change.

We appreciate this comment, however, reversing the report to address this comment is outside the scope of the document. The aim of the National Climate Assessment is assess the state of understanding of climate change, the science underlying it, and current and potential impacts on the United States. The assessment is not aimed at assessing the viability and economics associated with promoting specific ideas for mitigating climate change.

We appreciate this comment and have corrected this reference where appropriate.
There is no global warming. Mostly northern hemisphere warming. You can see these NASA graphs here: http://cctruth.org/index.php/data/. 

The oceans will rise anywhere they once were. The satellite data shows the same rate. (You can see the EPA graph at cctruth.org at the bottom). Increased evaporation due to less salty water and warmer oceans is keeping the rate the same. This same evaporation increase in making more and more severe storms. These increase the clouds.

The clouds historically reflect 20% of the sun’s energy. With increased clouds more will be reflected until an equilibrium is reached. Also with Pearson regression we received a 0.10 factor for co2 emissions as the cause of the co2 increase. We received a 0.03 for destruction of the rain forest as the cause. That paper is under review at a climate journal. You can see all the truth about climate change on the reports page. CO2 does not go into the ocean. The diffusion coefficient in air is 10000 times that in water. It just waits in the atmosphere until a plant goes to it. You have many interesting exercises in MatLab illustrating climate change science. Also, I use ESRI ArcGIS. Data layers and predictions that could be used in ArcGIS also would be very useful. Great work. Thank you.

We agree with this comment as it is directly controverted by the scientific literature as summarized in NCA4 Volume 1. We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and ocean acidification. It is accessible at science2017.globalchange.gov.

We appreciate this comment and have corrected this reference where appropriate.

We appreciate this helpful and constructive suggestions. In Chapter 2, there is a box on the USGCRP climate indicators that provides more information, including additional resources. We have also revised the indicators figure in the Overview, which may address some of this commenter’s question. There is a history of USGCRP indicators as initially laid out in work such as this paper: https://link.springer.com/article/10.1007%2F10646-009-9989-3 More recently, the USGCRP indicator inter-agency working Group has re-focused their efforts and are implementing a new Indicators Platform: https://www.globalchange.gov/browse/indicators.

As far as the specific comparison between indicators and ECVs go, the ECVs were built to help define the observations and data streams needed to help refine our understanding and modeling of the climate system, and have an “observational inputs” origin. The climate indicators, while they overlap with the ECVs, are more intended to inform decision-making and understanding that includes, but is larger than, the monitoring of the climate system itself.

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Climate change is a false premise for regulating or taxing carbon dioxide emissions. Political leaders who advocate unwarranted taxes and regulations on fossil fuels will be seen as fools or knaves. Nature converts CO2 to limestone.

Climate change may or may not be occurring, but is NOT caused by human fossil fuels use. Temperature records relied upon by researchers are corrupt for many reasons. They used weak grates for periods prior to 1800. Actual temperature readings were tempered with. Evidence such as ice cores suffer poor chain-of-custody, and are altered by ambient conditions.

Temperature changes cause changes in an ambient CO2; not vice versa. Temperature caused by natural forcies cause changes in CO2. Since 95% of CO2 emissions are emitted by rotting vegetation, of course such emissions will be higher in high or temperature.

There is no empirical evidence that fossil fuels use affects climate. Likely and well-documented causes include solar cycles, earth's orbital changes, cosmic ray effects on clouds and tectonic plate activity. The further proof here is that earth naturally recycles all carbon dioxide.

Fossil fuels emit only 3% of total CO2 emissions. 95% comes from rotting vegetation and other sources. All the ambient CO2 in the atmosphere is promptly converted in the oceans to saline (bromine) and other compounds, mostly through biological pathways. CO2 + Cl -> ClO2 (anhydrois).

The conversion rate increases with increasing CO2 partial pressure. A dynamic equilibrium seeking mechanism.

The proponents that carbon dissolves in CO2 to dissolve all short Weapons. At the most basic level, they include pyrohydrogen and sea butterflies. Higher levels include coral, lilies and other crustaceans. An act of system or machines can create 500 tons of saline in a single season.

98.84% of all carbon on earth is already sequestered as sediments in earth's crust. The lithosphere is a massive hanger carbon sink that converts ambient CO2 to carbonate almost as soon as it is emitted. The Paris Treaty is now estimated to cost up to $100 trillion -- $13,333 per human being. Nearly two-thirds of humanity's cumulative savings over history. And will not affect climate at all.

A modern coal power plant emits few air emissions except water vapor and carbon dioxide. Coal removes the lowest cost and most reliable source of electric energy, along with natural gas. Coal has always operated effectively with natural gas.

I would put forth that there is no need to be concerned about this issue. Solar plus.

There is no global temperature. An average is a statistic that won't tell us anything. CO2, let alone man's 3% yearly contribution to it, does not determine climate. Climate is determined by location and by the planet as a whole which is controlled by its latitude and proximity to large bodies of water. We need to follow standard grade school education. CO2 does not control the jet streams. It does not control the ocean currents. It does not control the spinning of the planet, nor its orbit or its tilt as it orbits around the sun. It doesn't determine the input from the sun or cosmic rays. There are much greater forces at work, none of which we have any control over. It's time to put this foolishness behind us and deal with real world issues.

We disagree with this comment as it is directly controverted by the scientific literature as summarized in NCA4 Volume 1. We refer the reviewer to Volume 1 for more information on the scientific basis for temperature change throughout the planet, the use of globally averaged temperature as a metric, the contribution of natural and anthropogenic forcing to observed warming, and the latest scientific understanding on future projections and the relationship between climate change and atmospheric circulation. It is accessible at science2017.globalchange.gov.
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<td>NCA4 TOD Comments by Jan W. Davis PhD</td>
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<td>Therefore, claims of future impacts based on regional projections of climate models should be disallowed in the ‒ surface temperature.  As such, NA4 has no scientifically-defensible basis to go forward and use such projections to cause substantial damage to the U.S. economy.</td>
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<td>This text region has been edited to read: &quot;More intense weather and climate extremes, expected in a warmer world, without efforts to reduce greenhouse gas emissions and adapt to climate impacts, climate change is projected to cause substantial damage to the U.S. economy.&quot;  [1] The effects described here are not uniformly negative; no change.  [0] This text has been updated to better reflect mitigation opportunities.  [0] The suggested text is not appropriate for this section of the Overview, but similar text has been added later in the Overview.  [0] Actions not taken today will increase risks for future generations and limit their available options to reduce risks.  [0] This comment has been accepted and this sentence has been edited to read: &quot;The long-term warming trend observed over the past century can only be explained by the effects that human activities, especially emissions of greenhouse gases from burning fossil fuels and deforestation, have had on the climate.&quot;  [7] Not all impacts referenced here are negative. No change.  [8] This region of text has been removed.  [9] The authors have determined that this broad statement is not supported by the underlying chapters and does not fit in this context. However, this point is made elsewhere in the Overview, for example: &quot;[NCA4] concludes that the existence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans' physical, social, and economic well-being are rising.&quot; No change.  [10] This region has been removed. No change.  [11] This text has been moved to a different section of the Overview.</td>
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**Comment:** The University of Alabama in Huntsville This comment is narrowly focused on the issue of using regional climate model projections demonstrating that their use in NAAV fails the data-quality requirement. Due to our extensive agricultural research on climate change impacts in Alabama we have studied the fullness of the RCPs explained above and climate models regarding their applicability to agricultural productivity in the 21st century in our region. We performed similar but scaled-down analyses on the climate model output over the past century (and more) to determine the quality of the model simulations when compared with observations. These results were published in the American Meteorological Society's Journal of Applied Meteorology and Climatology (Christy and Miller, 2010). One key result is given in Fig. 12 and emphasized as part of this response (with annotations for clarity).

We examined 76 simulations for 1895 to 2013 from the CMIP-5 models for the state of Alabama as a test of their utility. (Though these runs utilized the rcp 8.5 forcing, the period examined (1895-2013) had common forcing in all of the top scenarios.) As can be seen, the output for model trends indicated all models produced very positive temperature trends (red) when in fact the observed trend was negative (-0.09 ºC decade-1) and virtually identical between the time series constructed by us in this paper and that of NCEI/NOAA). The climate model output over the past century can only be explained by the effects that human activities, especially emissions of greenhouse gases from burning fossil fuels and deforestation, have had on the climate. (Christy and McNider, 2016). One key result is given in Fig. 12 and emphasized as part of this response (with annotations for clarity).

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While we agree that the global CMIP models largely do not represent the observed temperature changes in Alabama and various parts of the Southeast (the lack of warming in parts of that region over the last century relative to the extensive warming of most other parts of the United States are discussed in Chapter 6 of NCA4 Volume 1), a major result from Volume 1 was high resolution downscaled evaluations of the regional climate changes that combine model results with observational data. There has been discussion in the science community of whether there is a compensating effect, or whether the lack of warming in the Alabama region remain uncertain. The downscaled analyses provide an enhanced evaluation of the past and projected future changes for the authors to use in the regional analyses in Volume 2. Since they have a strong track record to the observations at the local scale, there is more confidence in those analyses relative to just using the results from the global models at the local scales for regions. We refer the reader to this comment to the discussion of the downscaled products that can be found in Chapter 4 of Volume 2.
Brandon Davidson 142104 White Document

As this is the fourth NCA it would be fitting to include a review of predictions from previous reports to see how well or badly they played out. The 1st NCA in 2000 predicted that the US would warm between 0.3 and 0.6 deg per decade. 10 years later the 2nd NCA-1 predicted similar figures. 1-2 deg per decade later, the USGCRP NCA4 Volume 1 project states that the climate will warm by 0.18 deg C per decade. We disagree with the statements made in this comment or its suggestions for additional discussion for a variety of reasons. First, regarding the first paragraph, the assessments are not making predictions, they are projections based on various factors, including the emissions assumptions made about the future. Secondly, the analysis of climate change are made on 10-year time scales not 10-year time series. It is important to actually use the time scale of climate (using the definition of the World Meteorological Organization). Third, by focusing on the period since the pre-industrial period, the author of the comment is only referring to the slow down period, which is discussed extensively in Chapter 1 of NCA4 Volume 1 – there we also explain why the models would not be expected to capture the trend for that shorter period. Fourth, the understanding of the science does evolve over time – there is no need to evaluate the findings of this assessment relative to prior NCA's.

In the opening paragraph of the comment, there is intensive discussion of the effects of ENSO in NCA volume 1. The analyses in Chapter 2 use trends over 30-year periods or longer (to capture climate timescales as mentioned above) where the effect of ENSO events are more limited (not to mention that 2017, a neutral to slightly La Niña year, was found by the same NASA analyses to be the 2nd warmest year on record). So our analyses are representative of long term trends and are not tied to years when there was a particular ENSO event. As is reviewed for climate sensitivity in this assessment, including the full range of analyses of climate sensitivity, not just those preferred by this reviewer (see NCA4 Volume 1 for more detail on climate sensitivity). The references preferred by the reviewer have been chosen by other papers to have stronger projections and their limitations and their findings have been over taken by other recent references. These are discussed in NCA Volume 1.

Erica Brown 142202 White Document

We have updated references to current amounts of warming, as allowed by the science - and have excused inserted numbers when the same reference periods involved different numbers are compared.

Erica Brown 142306 White Document

On the point regarding length, scope and digestibility, the report is a result of extensive consultation across the government and with the general public. Indeed, a public call for input on a draft Table of Contents, coupled with a first round of public review (i.e., a Federal Register) resulted in the Table of Contents that we have. Recognizing the desire to keep such assessment reports as concise as possible a tractable page limits were imposed on the authors: 6 pages for the National-level Topic Chapters and 20 pages for the Regional Chapters. Naturally, the inclusion of reference lists, as well as the methods and results sections, contribute significantly to these limitations. Notwithstanding, this is evident in the first chapter of NCA4 Volume 1 – there we explain why the models would not be expected to capture the trend for that shorter period. Fourth, the understanding of the science does evolve over time – there is no need to evaluate the findings of this assessment relative to prior NCA’s. We disagree with the statements made in this comment or its suggestions for additional discussion for a variety of reasons. First, regarding the first paragraph, the assessments are not making predictions, they are projections based on various factors, including the emissions assumptions made about the future. Secondly, the analysis of climate change are made on 10-year time scales not 10-year time series. It is important to actually use the time scale of climate (using the definition of the World Meteorological Organization). Third, by focusing on the period since the pre-industrial period, the author of the comment is only referring to the slow down period, which is discussed extensively in Chapter 1 of NCA4 Volume 1 – there we also explain why the models would not be expected to capture the trend for that shorter period. Fourth, the understanding of the science does evolve over time – there is no need to evaluate the findings of this assessment relative to prior NCA’s.

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Erica Brown 142306 White Document

We have provided visibility to a number of case studies throughout this report to highlight a multitude of local actions being taken to address climate risk throughout the nation.

Erica Brown 142303 White Document

Key messages should be consistent in that the confidence level for the statement should be noted in each key message, or not, across all. It would be best to keep it in the traceable account section for each chapter. Calibrated confidence and uncertainty language is NOT included in the Key Messages as they appear in the chapter text itself. However, each independent clause of each Key Message contains the calibrated confidence and uncertainty language in the Traceable Accounts.
The City of New York (City) fully supports the Third Order Draft of Volume II of the Fourth National Climate Assessment (NCA4) and the work of the USGCRP. The City utilizes the National Climate Assessment Report in concert with the New York City Panel on Climate Change (NPCC) report for research and technical analysis to better understand the frequency and magnitude of extreme events, the impacts of these events on City infrastructure, and how these impacts can be measured and monitored. The NCA4 science will drive and inform the City’s climate policies, including climate-resiliency planning and sustainability initiatives. The National Climate Assessment Report projections are integral to the implementation of all the climate resiliency initiatives implemented by City agencies across the New York City area and beyond. The City’s reliance on the National Climate Assessment Report and this important update ensures that citywide resiliency investments take into account accurate climate change projections based on the best available climate change science, including heat, precipitation and sea level rise.

Finally, if there are sections of NCA3 that are no longer relevant or are outdated, the NCA4 should explicitly identify them.

We appreciate this comment and hearing from stakeholders how USGCRP products are used to inform decisions.

The Natural Resources Defense Council (NRDC) would like to express its support for the Fourth National Climate Assessment (NCA4) effort. The NCA4 represents the most comprehensive scientific report on climate change in the United States. It provides a clear, stated, reliable source of information for policy makers, business leaders, and the public, in addition to those within the scientific community. As such, it represents a vital link between current scientific understanding of the observed changes in extreme weather and environment, climate change, and the well-being of Americans. We strongly urge the Administration to honor the scientific integrity and transparency embodied by the NCA process and content, and to do so in a rigorous scientific and public review process that has been strengthened and clarified since its establishment under the Global Change Research Act of 1990.

We appreciate this comment and would re-doubled our efforts to ensure our confidence in findings is stated clearly and accurately and that all findings have adequate support as found in the peer-reviewed scientific literature or other resources that fulfill Information Quality Act Requirements (see Appendix 2).
There are several instances where a single number is used to describe the magnitude of an impact. For instance, a single value of sea level rise is used for the Northwest region. We recommend using a range where possible. Additionally, at the beginning of the document and again in the regional chapters please emphasize that trends occurring at the regional scale may not be consistent with local scale studies.

The purpose of this document and how it can be used by stakeholders should be addressed at the beginning of the document. This should appear in every chapter.

We have addressed this in the front matter to be taken into account and intended audience of the report.

As a water utility managed within local government, the Portland Water Bureau is strongly supportive of the value of this report to drinking water managers and city planners. The Fourth National Climate Assessment and its authors are to be commended for summarizing the state of the science and adaptation responses for different regions and sectors of the nation.


These books have recently been selected for addition to the library of Congress.

We disagree on almost all of the diverse statements made in this comment. The comments by this reviewer really relate almost entirely to NOAA Volume I (which was extensively reviewed before publication in November 2017), but the reviewer must not have actually read Volume I or perhaps did not understand it, or the commentary provided on Volume II would have been much different. First of all, the reviewer would have noted that the discussion of past changes in climate are entirely based on observations, that the models were then evaluated relative to those observations throughout the assessment, and that the analyses of future changes were analyzed further than predictions by weighting the models relative to how well they represent observations.

Then, regarding the authors, there is act actually a small overlap between authors in NCAs and those in NOAA (of the 52 authors of NOAA Volume I 20 authors of the science sections for NCAs). There was no selection of the author selection process. The authors were selected after an open process for nominations (through a Federal Register announcement). This was the case for both NOAA Volume I and Volume II. The selection of the authors by the Federal Committee (a committee that considered a variety of criteria, the most important of which were the accomplishments of the prospective authors and their expertise, and their likelihood for accurately assessing the state of understanding of the changes in climate and resulting impacts for the chapters they were selected for as an author). Most of the commentary relates to the state of models used for the future projections. First, it should be noted that Chapter II in Volume II is a short summary of findings from the new published Volume I. Uncertainties of the science are extensively discussed in Volume I.

It is important to recognize that volume II builds on Volume I and does not replace it. Volume I does discuss the issues raised by the reviewers related to the science of climate change, including the concerns about models and associated uncertainties (for example, note that for the first time in an assessment a weighting was applied to the models in NOAA based on how well they represented observations that have not been found in any previous assessment – see Chapter 4 and Appendix B of NOAA Volume I).

Comments about models overwhelming the observed trends in globally averaged temperature primarily relate to the slowdown in the rate of temperature increase that occurred between about 2000-2013. Figure 1 in the commentary is a distinct look at the comparison of temperature with observations, largely because it only
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| Sarah      | Miller    | 143387     | Whole Document |         |                     |            |         |            |         | Thank you for the opportunity to review the U.S. Global Change Research Program Forth National Climate Assessment (NCA4) provide comment. The Society for Historical Archaeology (SHA) has increased its attention on heritage at-risk in an effort to raise awareness within our discipline and the communities we serve on the impacts of climate change on cultural resources.

SHA is the world's leading scholarly society devoted to the archaeology and material culture of the modern world (AD 1400-present). Most of our 2,300 members are professional archaeologists who teach, work in museums or consulting firms, or who have government posts. We have a close relationship with the Advisory Council for Underwater Archaeology and our members include many of the world's leading underwater archaeologists.

The Society for Historical Archaeology supports the NCA4 attempt to integrate cultural resources into the regional chapters, adaptation, and complex systems discussion. The assessment mentions archaeology only once but archaeological sites are alluded to under cultural resources and heritage. We appreciate the assessments attention in the overall document to tribal and indigenous communities, as well as maritime heritage in the northeast chapter.

SHA recommends a cultural resources section under national topics or increased content on the impact of climate change on cultural resources in the coastal effects, oceans and marine resources, rural communities, built environment, and tribal and indigenous communities chapters. Other areas where research on impacts to archaeological sites can impact the effectiveness of the assessment are economics. For example, in Florida heritage tourism is a $6 billion dollar industry, and a majority of the sites are threatened in the coastal zone. Another area where research on archaeological sites can provide meaningful content is condition of archaeological sites themselves as indicators of climate change. Groups like SCARP in Scotland, CHERISH in Ireland and Wales, and OTCAH in England are currently using condition of submerged and coastal archaeological sites as indicators of climate change. The assessment looks to historical data on climate change, but archaeologists also collect data on the interaction of human cultures with the environment in the United States over 14,000 years and these data can be useful in adaptation and mitigation planning.

SHA requests the editors to consider inclusion of an archaeologist in each regional chapter to contribute to the final draft. Data are available for the eastern seaboard that can be included in this report. In November of David

| Adam        | Carpenter | 143388     | Whole Document |         |                     |            |         |            |         | The draft Fourth National Climate Assessment addresses a great deal of important scientific information as well as considerations for taking action on mitigation and adaptation. We strongly support the continuation of the National Climate Assessment. The draft outlines the myriad of ways climate change has and could increasingly affect the lives of virtually all Americans and sectors of the economy. In general, we believe that this draft assessment does a good job of balancing the need to provide scientific information specific enough to encourage reasonable action and laying out the limitations and uncertainties contained within the assessment. A thorough analysis of uncertainties and limitations is exceptionally important to the water sector, as its infrastructure projects are often in place for many decades and the entire range of plausible futures must be known to those designing them to make the most informed decisions possible.

However, we believe that the assessment could improve in how it discusses implications to, actions taken by, and other aspects of the water sector as portrayed in the report. Several specific suggestions are described here to follow the best available information. The water sector is working to address climate-related issues and vulnerability to extreme events, while recognizing that there are also many other public health, environmental, and social issues that the sector must also address with its limited resources. AWWA supports the water sector's role in the integration of information on the effects of drinking water quality on human health and wellbeing. We believe the NCA is a valuable assessment that prepares action and research across many sectors. AWWA would like to offer the following comments to enhance the effectiveness of the assessment.

We appreciate the opportunity to provide comment on this matter. Please feel free to contact myself or Adam Carpenter at AWWA (202-628-8300, acarpenter@awwa.org) if you have any questions regarding these comments. Respectfully,

S. Tracy Melton, III
Executive Director of Government Affairs
American Water Works Association
About AWWA: AWWA is an international, nonprofit, scientific and educational society dedicated to providing total water solutions ensuring the effective management of water. Founded in 1881, the Association is the largest}

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We thank the Society of Historical Archaeology for their comments. These comments about enhanced involvement will be considered for future assessments.

We thank the AWWA for their comments to expand the discussion on water. This will be considered in future assessments.
Thank you for the kind comment.

Care has been taken to ensure that percent changes are pegged to a baseline to provide clarity for the reader. The primary recommendation here is to include "roll-up summaries that address biodiversity and habitat impacts of each Sector topic." Since the scope of this report is focused on climate change (both human-induced and natural), having such a section in each chapter is deemed to be outside the remit for the particular assessment.

The commenter is directed to other assessment efforts (e.g., IPCC - including that organization’s recent America’s Regional Assessment) for coverage of these issues. Also, we appreciate the praise for the Coastal chapter. Finally, we note that the concern raised about the Ecosystems chapter (i.e., that the fact that its focus was too constrained) has been addressed through fairly substantial reformatting of the content around issues beyond those considered there.

The Front Matter explains what the Traceable Accounts are, how they are developed, and the information they are intended to relay. Greater attention has been given by authors to the Traceable Accounts in this stage of the review process to focus on activities not covered in the main body of the text, as adequately as possible.

We have been pleased to see this important report advance through the review process. This report is positioned to provide the American public, the private sector, and decision-makers with critical information to manage risks, and ensure a future that is safe and prosperous for this country. We are pleased to see such a prominent set of authors, and welcome the platform that the report provides for the consideration of diverse perspectives from across the country through, for example, this review process.

John Fleming

Thank you for the kind comment; we have responded to the comments you submitted on Chapter 7.

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| Michael   | Murdoch   | 144077     | Whole Document | Chapter 1 | Page: 849 | 10 | 11 | 103 | 105 | The NCA draft provides an excellent and comprehensive synops of the major issues facing the Nation as a result of climate change. The report has also improved as a tool for decision support over past versions, although many decision-makers will take the time for 1500 pages of information. Some suggestions:
  a) The traceable accounts sections should be pulled from the text and published as a second report or as an appendices. The chapter-by-chapter sections on uncertainties are my favorite addition to the assessment, but the overall traceable account section intrinsically contains some redundancies with the core report, and the text is too cumbersome at its current length, so splitting out the traceable accounts and shortening the core report makes sense.
  b) I realize the authors were trying not to tell the research community what to study, but hints at critical gaps in key or understanding occur throughout the report (e.g. pg 1036, lines 12-14; pg 433, lines 35-36; pg 550, lines 26-31) and Chapter 29 has a unique format with a section on “Directions for Future Research.” The chapter authors must currently have a strong sense of what the critical gaps are in data and understanding that, if corrected, would significantly improve uncertainties in NCA-5. It is a shame not to capture that knowledge in a form that allows us to improve and/or defend both our research and our long-term monitoring over the next 4 years.
  c) That said, a synthesis of the traceable accounts sections, with a set of overall recommendations for critical new or existing research, essential studies or monitoring under threat of termination, and recommendations for core measurements to track change in whole systems, are highly needed in the current report. The knowledge just gathered by the NCA-4 authors provides a short-term opportunity to generate that synthesis and... | The Traceable Accounts are an indispensable component of NCA Vol II as they provide the reader with greater transparency of the deliberative process taken by the authors to come to the conclusions they did. As a result, though many decision-makers may take the time for 1500 pages of information, some suggestions:
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| Susan     | Shrestha  | 144083     | Whole Document | Chapter 1 | Page: 123 | 50 | 52 | 130 | 132 | This is an important document that gathers current, relevant science and makes it available to the people who shape the future (including policy-makers, educators, researchers, farmers, land managers, business people, community organizations and the public). Society will benefit from this report and from efforts to make the data and conclusions accessible to everyone. Thank you to the researchers and authors who have prepared this report. | Thank you for this comment. |
| Susan     | Shrestha  | 144094     | Whole Document | Chapter 1 | Page: 245 | 10 | 12 | 102 | 104 | The Climate Science Special Report (U.S. Partnership for Global Climate Change, 2013) stated with high confidence that assessing the governance challenges, technical feasibility, risks and cost-benefits of climate intervention/geoseengineering strategies must be conducted before the benefits and risks of these approaches can be determined.

In addition to updating the current cross-references to SOCCR-2 in NCA, please conduct a thorough assessment of carbon and SOC2-2 pertinent sections in NCA Vol 2 to ensure proper cross-referencing and consistency of information between both reports. Where more cross-referencing is not enough, boxes summarizing pertinent SOC2-2 information could be developed and inserted strategically in relevant sections of NCA-4 Vol II chapters, incl. current or new appendices, as needed. A quick check of the NCA Vol II public draft revealed only 8 instances of the cross-references to SOC2-2: Pages 419, Page 429, Page 438, Page 1535, Page 1185, Page 1190, Page 1493, Page 1599.

It is beyond the scope of NCA Volume II to go into more detail on geoseengineering strategies until the science specifications are better understood. That may require a special assessment. Regarding the second point, a detailed cross-check between the content of SOC2-2 and NCA Vol II has been undertaken to ensure consistent and accurate characterization of the science in both reports. | A detailed cross-check between the draft SOC2-2 report and the draft NCA was conducted to determine where one report’s findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented. |
| Michael   | MacCracken| 144075     | Whole Document | Chapter 1 | Page: 380 | 10 | 12 | 143 | 145 | A couple of other editorial suggestions: Always capitalize “Earth” when referring to the planet. There are no proper nouns that begin with capital letters of “contiguous” and “conterminous” (and the correct usage of “contiguous” vs “conterminous”).

In Chapter 29, the term “carbon cycle” is used where “carbon” is also used (e.g. pg 505, lines 22-23). This could create confusion, especially for those familiar with the term “carbon budget” which is not used here. | Be the capitalization of “Earth”, we agree with this comment and the change will be made as part of the regular copy editing process. The degrees of certainty, we understand the concern, and when appropriate, the language will be changed to be consistent with Volume I of the NCA, which uses the phrase, “extent of uncertainty.” Be “contiguous” vs “conterminous”, we agree with this comment and the change will be made as part of the regular copy editing process. |
| Syam      | Shrestha  | 144090     | Whole Document | Chapter 1 | Page: 438 | 10 | 12 | 134 | 136 | There really is very little coverage of the Caribbean Islands in the sectoral chapters of this document, so about Puerto Rico, Virgin Islands, etc. Inserting some examples of the problems they are facing would likely be beneficial.

We have sought to provide greater and more consistent regional coverage and references in the sectoral chapters, as well as in the Overview. In some instances, however, a lack of data, science, or other information precludes a more holistic coverage of some regions for some sectors. This is particularly true for the US Caribbean (Puerto Rico, US Virgin Islands, and US territories in the Pacific such as American Samoa and Guam). | We appreciate this comment and agree that this was a valuable addition to NCA-4! driven in large part by public comments suggesting we include such content! |

| Michael   | MacCracken| 144098     | Whole Document | Chapter 1 | Page: 550 | 10 | 12 | 101 | 103 | If you have special attention paid to tribal issues in each of the regional chapters was very helpful and allowed a rich presentation of specifics and the differences among regions.  | We appreciate this comment and agree that this was a valuable addition to NCA-4! driven in large part by public comments suggesting we include such content! |
As both NCA4 and SOCCR-2 are USGCRP reports, scheduled to be released at least 6 months apart (SOCCR-2 first, issue of beyond 2100, perhaps in a box somewhere--and references made from the chapters to that box. It is useful to be aware of what the worst case might be for 2100, but in presenting such information, it needs to be recognized that the level rise in 2100 in the report is rarely accompanied by mention that sea level rise will continue thereafter. Yes, we really need to be provided clear information on this.

I would urge inclusion of a box explaining what the terms “drought” and “drought conditions” are for those unfamiliar with them. As well, I would urge a clarification of how the term “drought” is used in this report versus in the broader scientific community. This might be a useful way to communicate both the trend and short-term variations, and decision makers and resource managers can use this and then encouraging authors to be using the appropriate terms, because right now, drought is the word being used to explain both the trend and short-term variations, and decision makers and resource managers really need to be provided clear information on this.

As for the issue of climate engineering (CDR and SRM in chapter 29), I think this is a very well-done report with lots of well-documented information--congratulations to all. On the issue of CDR and SRM, they need to be treated as the entirety of what is happening, since pre-industrial times (or mostly human-induced), and that the phrase “climate changes” is not used to refer to specific changes in the climate that might affect a particular sector or even the current climate state. If I suggest “changes in climate” in SOCCR-2, I suggest “changes” in a more inclusive way, so that the weather induced by climate change) to describe changes in the array of climate parameters. It just seemed to me that the use of the phrase “drought changes” gets confusing—some use “scenarios of climate change”, etc. (also, I suggest not saying “future scenarios of climate change” as scenarios are about the future and we have these scenarios now: I do realize that there are complaints about using “climate change” generally to refer to human-induced climate change because there have indeed been naturally induced changes in the past, so it might be that when referring to human-induced climate change that this whole phrase might need to be used, even though this does seem to rule out consideration of the full natural influence on recent climate also receiving consideration. Perhaps a box is needed early on to discuss those changes in terms because terms are going to mean.

Specific additional wording guidance for the authors in light of this (and related comments) providing examples of how to avoid the use of “future conditions” as such, “may” or “could”. The revised draft, therefore, has far fewer instances where those unhelpful and vague phrases are used. We also took care to ensure the acknowledged uncertainty language (e.g., “likely”, “very likely”, etc.) were not used in the text unless it was specifically in the context of the calibrated uncertainty language as presented in the Front Matter. This needs to be provided and that the text got reflected in the traceable accounts.

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In addition to updating the current cross-references to SOCCR-2 in NCA4, please conduct a thorough assessment of all carbon and SOCCR-2 pertinent sections of NCA4 Vol 2 to ensure proper cross-referencing and consistency of information between both reports. As a resource to help you with this process of cross-referencing, please see the Preface in the SOCCR-2 Public Draft, specifically the SOCCR-2-NCA4 cross-walks figure which was developed in response to the Committee of the SGCR Principals’ request in year 2016 and presented to them accordingly. Please also refer to the SOCCR-2 Preface Venn Diagram, developed based on an earlier iteration conducted by NCA-4 staff, encompassing overlapping topics among the concurrently developing USGCRP Assessments (CSSR-NCA4-SOCCR2).

We agree, thank you for this helpful comment. We agree, thank you for this helpful comment. A detailed cross-check between the draft SOCCR-2 report and the draft NCA4 was conducted to determine where one report’s findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented.