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Dr. Joel Smith
Chair of the NASEM Committee to Review the Draft Fifth National Climate Assessment

On behalf of the entire NCA5 writing team, I want to thank you and the entire special committee convened by the National Academies of Sciences, Engineering, and Medicine (NASEM) for its thorough review of the Third Order Draft of the Fifth National Climate Assessment (NCA5). We value the review report generated by the convened disciplinary experts, particularly as it was conducted under tight deadlines. The peer review panel experts, all recognized leaders in the many relevant disciplines that comprise an expansive assessment like NCA5, provided thoughtful and constructive comments towards tightening the scope, ensuring scientific rigor and transparency, and improving the ways in which the NCA5 findings were communicated to a broad audience. We appreciate both the statements the committee made about the report overall and the detailed evaluation of where authors could further clarify and/or improve the text and figures. I am particularly grateful for the many helpful suggestions to improve consistency across the report, as those comments were especially instructive on how to bring 32 chapters written by separate authors teams together into one cohesive assessment.

The NCA5 writing team took the comments very seriously and extensively revised the assessment in response. A narrative response to the committee's overarching comments and recommendations (Part 2 of the NASEM review report) was generated by the NCA5 Federal Steering Committee, with support from the USGCRP staff. Chapter leadership for each chapter and section of the NCA5 have prepared short responses describing how they and their respective author teams dealt with the narrative comments from the NASEM review panel (Part 3 of the NASEM review report). In addition, author teams provided responses to each of the line-by-line comments provided in Appendix A of the NASEM report. Those responses are available for viewing here.

Finally, please note that the full report underwent several additional rounds of review after authors' responses were generated. Therefore, subsequent edits may have been made that are not part of the attributed set of comments included on the following pages.

WIth my sincere gratitude,

Allison Crimmins

**Chapter Narrative Responses** **3**
0. Front Matter 3
1. Overview 4
2. Climate Trends 5
3. Earth System Processes 8
4. Water 10
5. Energy 12
6. Land Cover and Land Use Change 14
7. Forests 16
8. Ecosystems, Ecosystem Services, and Biodiversity 18
9. Coastal Effects 20
10. Ocean Ecosystems and Marine Resources 22
11. Agriculture, Food Systems, and Rural Communities 24
12. Built Environment, Urban Systems, and Cities 26
13. Transportation 28
14. Air Quality 31
15. Human Health 33
16. Tribes and Indigenous Peoples 35
17. Climate Effects on U.S. International Interests 39
18. Sector Interactions, Multiple Stressors, and Complex Systems 42
19. Economics 44
20. Social Systems and Justice 46
21. Northeast 48
22. Southeast 51
23. U.S. Caribbean 54
24. Midwest 56
25. Northern Great Plains 59
26. Southern Great Plains 62
27. Northwest 64
28. Southwest 67
29. Alaska 69
30. Hawai'i and U.S.-Affiliated Pacific Islands 71
31. Adaptation 73
32. Mitigation 76
FB1. Compound Events 78
FB2. Western Wildfires 80
FB3. COVID-19 and Climate Change 83
FB4. Risks to Supply Chains 84
FB5. Blue Carbon 86
App3. Scenarios 87
App4. Indicators 89

# Chapter Narrative Responses

## 0. Front Matter

The majority of the comments from the committee on the Front Matter focused on making sure the reader understood the context around choices made in the structure and format of the report. To encourage that, some edits were made to more clearly articulate the various choices authors were empowered to make around what content to include in their chapters, including when selecting individual scenarios to assess. Additionally, more information was included to better clarify multiple elements, such as describing the target audience for the report and the purpose behind structuring chapters with a Key Message approach. While we appreciate the comments from the committee on detailing the process by which the report was developed, it was determined that most of that material was most appropriate from Process Appendix (App 1), and thus it was not added to the Front Matter. However, references to the Process Appendix and other relevant appendices were included to direct the reader where they might find more detailed information..

# 1. Overview

The author team thanks the NASEM reviewers for their comments.

The revised chapter provides a more integrated discussion of adaptation, covering current progress, potential future benefits, limits to adaptation, and the need for transformative adaptation. We have added a new figure showing recent progress in adaptation and mitigation actions by state. We have also made edits to increase coverage of additional opportunities for reducing net greenhouse gas emissions and added a new figure to highlight a range of mitigation options—for both reducing emissions and increasing carbon sinks—that are consistent with pathways to net-zero emissions. We have added definitions of adaptation, mitigation, and resilience in a text box in section 1.

We made edits to remove policy prescriptive language, particularly in section 5, and have removed “will” in a few cases where the confidence level did not align with the findings of the underlying text. We added text to make clear that climate change is part of the reason for increasing disaster costs, but that population growth, rising property values, and continued development in hazard-prone areas are also contributing. We have also added text on the effects of other drivers of environmental change on ecosystems and have improved discussion of the interaction between non-climate stressors and climate-related risks.

We added text on limited and transient climate change benefits in some sectors and regions. We have added text to clarify that some types of outdoor recreation have expected mixed or negative impacts. We added additional references to Ch. 17 (International) and Ch. 18 (Complex Systems), including text on the effects of global climate changes on US international interests. Finally, we have taken efforts in the Overview and across the report to improve geographic coverage as much as possible given the available information sources.

All section and subsection headers have been reviewed and revised to ensure consistency with the underlying text within each section. We have also refined text on how climate change exacerbates existing inequities and ensured consistent use of terminology across the chapter.

# 2. Climate Trends

**Narrative summary response:**

The authors of Chapter 2 (Climate Trends) thank the NASEM and the reviewers for a thought-provoking and thorough review of this chapter. While it is important to highlight the role of natural variability, and in cases where it is known to have played a role in extreme events it has now been discussed, a broader consideration of natural variability is out of the scope of this chapter. Where possible, cross-references have been added to Chapter 3, which discusses variability in the context of large ensembles and attribution. Similarly, while the chapter authors highlight and explain known regional differences in climate trends (for example, east-west differences in observed warming and precipitation and disparate amounts of sea-level rise), it is out of the scope of the chapter (and more appropriate for the regional chapters) to discuss regional trends in detail.

**Comments on Chapter Introduction:**

The authors appreciate the suggestion to coordinate with the Earth System Processes chapter and took advantage of the opportunity to do so in-person at the All-Authors' Meeting (Washington, DC, USA • 3-5 April 2023). After consultation, the chapter introduction has been edited to highlight the advances in “end-to-end” attribution discussed in Chapter 3. This has provided the Climate Trends chapter with a useful framework for the introduction, and a science-informed way to discuss the complex risk posed by climate change. The introduction now explicitly defines risk, discusses the social, economic, demographic, and political factors that shape exposure and vulnerability, and provides specifics for heat wave exposure and Hurricane Harvey. For readability and maximum benefit to a wide audience, the authors elected not to extensively discuss the structure of the report, divisions between Chapters 2 and 3, and which trends will be covered or left out.

**Comments on Key Messages:**

- KM 2.1: Authors have made minor edits but kept the key message largely as it was in the third-order draft.
- KM 2.2: Following the NASEM suggestion, authors have changed the title to “Extreme events are becoming more frequent and severe”.
- KM 2.3: Authors have changed the title to “Some further climate change is inevitable. How much depends on the choices we make now.”

**Comments on Text Supporting the Key Messages:**

- Following discussions with the Adaptation chapter, the authors disagree that “Adaptation can address climate change impacts” is a preferred message. “The Nation has no choice but to adapt” conveys that some climate change impacts are inevitable, without suggesting that adaptation is all that is needed.
- Discussion has been added about the role of natural variability in generating the observed trends in sea level during recent decades (particularly along the mid-Atlantic and Pacific coasts) and in the context of future changes in flood frequency and how these relate to ocean and tidal variability. The role of internal variability in, for example,

the Southwest drought has also now been highlighted. Authors have also coordinated with Chapter 3 to link to their discussions of internal variability, for example, their Large Ensemble and Attribution sections.

- To avoid overly caveating the language while still maintaining the simple and powerful message of this subsection, the title has been changed to "Sea level will continue to rise". It now leads with the 30-year projections then discusses the potential for continued acceleration under global warming levels above 2°C. Statements about likelihood, including calibrated language, are supported by projections, and authors have added citations to IPCC WGI AR6 which includes projections that are completely consistent with the NOAA technical report, particularly at short lead times (30 years). All calibrated uncertainty language has now been italicized.

**Comments on Traceable Accounts:**

The Traceable Accounts section follows the guidance given by NCA5 leadership, which include highlighting uncertainties and research gaps. The revised text of the Key Messages will be added by the Technical Support Unit to ensure consistency with the final text.

**Comments on Graphics and Boxes:**

Where possible, the TSU will include island projections. In most cases, TSU uses downscaled data from LOCA2, which does not include USAPI and USVI; when no data are available, the captions indicate such. Where possible, projections for Hawaii and Puerto Rico will be added using STAR projections based on station data. The authors of Chapter 2 do not have control over the content of any appendices to the report.

**Comments on Equity and Justice:**

- The Introduction now explicitly discusses contemporary policy, historical trends, and demographic factors that shape different populations' exposure and vulnerability to climate hazards.
- The authors have coordinated with Chapters 23 and 30 to ensure that observed and projected trends for the USAPI and USVI are reported in the text.

**Comments on Data and Analyses:**

All units of length have been changed to feet and inches. The chapter uses °F except where discussing global warming levels, which are presented in °C to echo the language used by the international policy community and the Paris Agreement ("well below 2°C", etc.). This has now been explicitly stated and explained in the text.

**Comments on Literature Cited:**

This chapter has been brought into agreement with the Sweet et al. (2022) NOAA technical report, the IPCC AR6 sea level projections, and Chapter 9 of NCA5. Figure 9.2 has been modified to incorporate sea level projections (across the "planning" scenarios) in terms of global warming levels. Chapter 2 now cross-references Chapter 9 and Figure 9.2 in various locations.

**Other Recommended Changes:**

The updated text now discusses the changes in exposure and vulnerability that also shape climate risk and includes the Iglesias et al 2021 citation.

# 3. Earth System Processes

**Narrative summary response:**

This chapter is rather different from other NCA5 chapters that focus on specific regions or sectors, which often refer back to this chapter on why or how Earth system processes respond to anthropogenic forcing. In NCA4, the topics covered by this chapter were discussed in a separate report, the Climate Science Special Report (CSSR, volume I of the NCA4). That said, authors agree with the review panel that combining key messages was possible and may improve readability. In the revised chapter, authors have combined the former KM3.4 through KM3.7 sections to become a new KM3.3, since these KMs focus on advances in climate science (observation, modeling, extreme events attribution, emergent constraints). Authors have also combined the former KM3.3 and KM3.8-KM3.11 sections to become the new KM3.4, since these KMs focus on changes in Earth system processes – with the exception of changes in specific types of extreme events, which is covered by the old KM3.12 (now KM3.5). With this reorganization, the chapter now has only five KMs. The titles of the key messages have been rewritten to be short declarative sentences. Although there are common topics covered by Chapters 2 and 3, Chapter 2 focuses on past and projected climate trends particularly over the U.S., while Chapter 3 discusses Earth system processes and more generally how/why they are expected to change. Together, the two chapters provide complementary information and serve as the keystone climate science chapters for the rest of the report.

**Comments on Chapter Introduction:**

The last paragraph of the introduction has been rewritten to describe what this chapter covers and how it is different from Chapter 2.

**Comments on Key Messages:**

Authors have tried to simplify some key messages (e.g., the new KM3.3 and KM3.4) and their content to provide technical information at a level that general audiences can understand. Authors have also made some changes to the extreme event attribution section to explain its importance and what one can learn from it. The consolidation of key messages reduced the 12 key messages in the third-order draft to five in the revised fourth-order draft, as follows:

- KM3.1: Human activities have caused the observed global warming.
- KM3.2: The estimated range of climate sensitivity has narrowed by 50%.
- KM3.3: New data and analysis methods have advanced climate science.
- KM3.4: Humans are changing Earth system processes.
- KM3.5: Humans are changing weather and climate extremes.

The specific responses about revisions to KM content in the third-order draft can be found in the accompanying line-by-line comments annotation.

**Comments on Text Supporting the Key Messages:**

Addressing some topics in the way suggested by the review panel, in particular the recommendation to include an 'explainer' type of section related to how the public should interpret extreme event attribution exercises, while certainly of high merit, would likely require a

different format and focus, such as a new cross-chapter box or an expanded 'Focus on Compound and Complex Events' (Cross-Chapter Box 1).

**Comments on Traceable Accounts:**
Authors have carefully read through the traceable accounts to make sure that likelihood statements are consistently used where quantitative evidence exists to support statements. Note that for the two new key messages KM3.3 and KM3.4, which combine many key messages in the 3OD, authors do not include likelihood statements because the new key messages make factual or general statements. Authors agree that the knowledge base described in the traceable accounts should emphasize data sources and papers rather than the opinion of scientists. Authors have added more citations in the traceable accounts for most key messages. Indeed peer-reviewed literature is the primary source of information used to support the key messages.

**Comments on Graphics and Boxes:**
Authors appreciate that the NASEM panel stated that chapter graphics were clear and well-chosen. Only three are undergoing minor revision based on NASEM and public comments. Authors have expanded the figure captions of many figures to provide more thorough and self-contained information, so that they can serve as standalone resources.

**Comments on Equity and Justice:**
Since this chapter is about Earth system processes, authors believe there is less utility in framing the chapter topics in the context of equity and justice, which is excellently covered by the regional and sectoral chapters, as well as the Overview chapter.

**Comments on Data and Analyses:**
Regarding the scenario descriptions, authors prefer to keep this content (the old KM3.4 and now part of KM3.3) in the chapter for completeness, as new scenario development and the new set of CMIP6 simulations driven by the new scenarios are important advances in climate science that support IPCC AR6 and NCA5. Together with the multi-model large ensemble simulations, the scenario descriptions support the new KM3.3.

**Comments on Literature Cited:**
Authors have added more citations in both the main chapter and the Traceable Accounts.

# 4. Water

**Narrative summary response:**

Thank you for the thoughtful comments. We agree with the vast majority of them, particularly comments about missing or inadequately covered topics. We devoted most of our word count to the existential threats of floods, droughts, and impacts to overburdened populations, and were unable to cover all the topics that we would have liked to. Thankfully, there are other chapters and focus boxes devoted to the topics listed as missing in the NASEM comments and our chapter now points to those report elements. Projections of hydrologic variables beyond 2100 are not currently available, so we could not meet that requirement, unfortunately. Following your feedback, we revised the Key Messages to include both confidence and likelihood, and revised the Traceable Accounts to cite evidence for those statements. We agree that we needed to reference climate change more and revised the text accordingly. Regarding good news vs bad news—as the comments have noted, there are differences in the magnitude of change across the Nation, and our projection maps demonstrate those differences. However, we do not consider a low level of change in a particular region and variable as a positive aspect to be highlighted; while regions have differing magnitudes of change, no region is expected to avoid climate change impacts altogether. Climate change impacts can be felt through changes to extreme weather, water supply and timing, or water quality. We are not aware of literature describing the positive impacts of climate change.

**Comments on Chapter Introduction:**

The intention behind the introduction was to set the stage for the Key Messages with a water quantity hazards figure and a water quality hazards figure. We agree that this was not successful—the introduction has been revised to set the stage more clearly and to include a brief discussion of changes since the NCA4.

**Comments on Key Messages:**

KM 4.1: We reorganized and revised the language in KM1 along the lines NASEM suggested to be more accessible, provide regional detail, and include likelihood and confidence statements.
KM 4.2: NCA5 guidance is that the term “frontline” or overburdened is preferable to “vulnerable.” The term frontline is defined in the glossary. We revised the key message to include impacts to water quality, and revised the text about the rate of adaptation.
KM 4.3: We revised the title of this key message to reflect that progress has varied by rate, location, and demographics. KMs do not have citations in them, so we cannot reference the Adaptation chapter in the message, though we do in the supporting text.

**Comments on Text Supporting the Key Messages:**

KM 4.1. We added information to the hydrologic variable discussions and captions and we added comments on the upper and lower ranges for variables where it was interesting. We cross-referenced the regional chapters where appropriate. We revised our summary of climate change impacts to groundwater and added text about natural variability. The projection figures represent interactions between temperature and precipitation, so it is a complicated attribution problem and may not be as relevant for decision-makers as the projections themselves.

KM 4.2. The water quality figure is in the introduction to emphasize that both water quantity and water quality are important. Water quality information is integrated into the supporting text for KM 4.2, with droughts and floods. To keep the chapter as compact as possible, we discuss Colorado River issues in KM 4.3. Explanation of why and how to address disparities in climate change impacts is beyond the scope of this chapter.

KM 4.3. We added more text regarding hazard mitigation and climate adaptation, and added pointers to the chapters. We revised the discussion of water disputes somewhat and point to additional information in Chapter 28. Climate change-related water quality issues are discussed with each hazard and with disproportionate impacts. We hesitate to devote any of our word count to describing what the reader will find in the chapter and where. It is a short chapter and we have to make choices about how to use the words. We agree that utilities' technical capacities limit application of available downscaled hydrologic data. We clarified that downscaled extreme events, key to much of water resources planning, are not available for most of the country.

**Comments on Traceable Accounts:**
We revised the Traceable Accounts extensively. They now include references to support the Key Messages and the confidence and likelihood statements. The water quality/climate change discussion is expanded and the water quality figure is now referenced throughout the chapter. Thank you for the snow references. If we are interpreting a comment correctly, we agree that spatial/temporal changes are important but cannot determine which is more significant.

**Comments on Graphics and Boxes:**
We strived to integrate the figures better within our limits. We added more interpretation to the captions; detailed information is available in the metadata. We considered developing a water quantity figure that could be parallel to the water quality figure, but we thought that it would be too complex. There is very little feedback to represent in a water quality figure, but a water quantity figure would have complicated feedback arrows and many more boxes.

**Comments on Equity and Justice:**
Impacts to the LGBTQ+ community and women from *water-related* hazards are not well documented. To keep within the word limit, we opted to discuss only the most-well documented, water-related hazard exposed groups. We linked to other sectoral and regional chapters where appropriate and discussed the lack of regional data in the Traceable Accounts.

**Comments on Data and Analyses:**
We made revisions in the text and Traceable Accounts that discuss the projection ranges.

**Comments on Literature Cited:**
We updated to more recent references, particularly in the supporting text for KM 4.1.

# 5. Energy

**Narrative summary response:**

In response to the valuable comments provided, the authors have made several modifications to strengthen the chapter, including expanding the traceable accounts to include additional citations and more details about how and why confidence and likelihood were determined based on the knowledge base. Perhaps the area receiving the most modification was that addressing the integration of issues of equity and justice inherent in the US energy system as well as language addressing recent policy actions, such as IRA and BIL. Throughout the document, technical language was clarified to ensure the text can be understood by the broadest audiences.

**Comments on Chapter Introduction:**

The authors have revised the text to address the issue of an enabling policy framework including recent actions and government interventions such as energy subsidies and other relevant government interventions (recently passed Bipartisan Infrastructure Law and Inflation Reduction Act), as well as mentioning actions such as state bans on the use of coal and natural gas. The introduction and the chapter have been revised to highlight international topics such as global energy supply chains and critical minerals and materials. The introduction does not get into any detail with regard to international tensions relevant to instability of Russian nuclear reactors, international trade of coal or natural gas, etc., due to lack of space and relevance to this chapter vs other chapters such as the mitigation and adaptation chapters.

**Comments on Key Messages and Text Supporting the Key Messages:**

**Key Message 5.1. Climate Change Threatens Energy Systems**. The chapter text has been expanded to describe impacts of climate change on the United States energy system, including the electricity system, as well as how total demand for energy could change. In addition, the authors have added additional examples providing a greater historic, current and projected characterization of the impacts of climate change on the energy system. However, space does not allow the authors to address the distinction between natural variability and climate changes across the relevant climate hazards and energy system components, but the cross-reference the climate trends chapter was provided. The authors did address permafrost impacts including in Alaska and noted the impact on methane leakage. A discussion about what oil and gas are used for besides electricity was included to clarify that even in a "transitioned" world their development and delivery is still relevant. Greater emphasis was provided to demonstrate regional differences that exist across the country, such as electricity generation and water availability in the southwest vs sea level rise and storm surge in the gulf coast and southeast, and referenced relevant regional chapters, where appropriate. The authors did not agree with the comment to move oil and gas delivery language to traceable accounts.

**Key Message 5.2. Compounding Factors Affect Energy System and Community Vulnerabilities.** The discussion of vulnerable communities and equity was expanded to include communities that used to work in the traditional fossil fuel sector but have been displaced due to the energy transition. Cross-references to other chapters has been expanded (e.g., Chapter 19 [Economics; Chapter 32 Mitigation) and additional citations added. The text was expanded to acknowledge the CO2 affects in indoor settings on human cognition and cross references added such as Chapter 15 (Human Health). Additionally, the text was modified to better address critical minerals supply chains and the implications for the energy sector.

**Key Message 5.3. Efforts to Enhance Energy System Resilience are Underway.**

The reviewers requested that the authors define the term “resilience”. Recognizing that this term is used throughout the NCA5, the authors have deferred including the definition into the NCA

glossary to clarify this term. The text has been modified to clearly articulate that while progress is underway, the pace, scale and scope of current efforts is not adequate and will need to be enhanced to adequately address the climate challenge. The title of Key Message 5.3 has been modified in response to the NASEM suggestion to read: “Efforts to Enhance Energy System Resilience are Underway.” The authors have revisited the many claims in the key message and have confirmed the confidence and likelihood statements are appropriate.
The reductions in coal use in this country is addressed in the context of fuel switching driven by decreasing cost of renewables and low natural gas prices. Equity and effects on communities received additional attention. The text was also expanded to recognize the Inflation Reduction Act and implications for worker protections and vulnerable population. Language is added to address batteries and alternative materials beyond lithium, as well as recycling. The authors did not agree with the comment to move the “Automation, Information Technologies” and “Grid-interactive Efficient Buildings” text to traceable accounts.

**Comments on Traceable Accounts:**

Additional citations from the text have been added throughout the traceable accounts. The traceable account for Key Message 5.3 was modified to describe how authors arrived at the prescribed likelihood statements, as was done for the other key messages.

**Comments on Graphics and Boxes**

The graphics have been better integrated into the text. Captions have been expanded to assist the reader in understanding the figure. Many of the figures were modified to avoid distractions and focus on the key takeaways.

**Comments on Equity and Justice**

Equity and justice principles were expanded to address environmental injustices in the energy sector. The authors have defined energy justice and added characteristics of procedural justice, which was missing, in KM 5.3. The authors added language to acknowledge fossil energy industry workers (e.g., coal and mining industries) who will likely need to find new jobs. The chapter now touches on tax revenues, worker skills gaps, wage differentials, number of construction jobs, reuse of fossil fuel assets, regions most affected). In addition, the authors added language describing provisions of IRA to assist overburdened populations. The chapter now cross-references other chapters addressing equity and justice issues.

**Comments on Literature Cited**

This chapter cites literature from well-respected journals and agencies, most of which. were published since NCA4 but has added additional sources recommended by the Committee.

**Other Recommended Changes**

While space did not permit a discussion of regulatory barriers that impede the commercial buildout of new technologies, or a detailed discussion on mitigation and adaptation moving into the future, the authors have expanded the discussion of the role of mitigation and referenced Chapter 32 (Mitigation) where appropriate.

# 6. Land Cover and Land Use Change

**Narrative summary response:**

Assessment of short-term projections has been added to supplement the prior focus on century-scale scenarios. New assessment of the area of land system science is added in the Introduction, and that context is leveraged by adding text is the KMs addressing more complex interactions. Definitions of land cover and land use are made more explicit in the Introduction, and the use of these terms is made more precise throughout the text. A focus on changes in developed area is retained and text providing a more explicit justification for that choice is included. Extensive referencing has been added to key messages, figures, concepts, and quantities from other chapters. Rangelands and grasslands appear in multiple locations within the KMs, and new referencing has been added. The use of confidence and likelihood language has been made consistent across the KM and Traceable Accounts text. All assessment of scenarios within the chapter is based on the SSPs developed for CMIP6.

**Comments on Chapter Introduction:**

- Text was added introducing the main themes, and providing context linking main themes to risk-based framing. Text was added addressing the interactions of climate change and LCLUC, and references were added to other chapters where interactions are discussed.
- Text assessing the emerging area of land system science has been added.

**Comments on Key Messages:**

- KM 6.1. The title is revised to capture the ideas suggested, and text is added to clarify variability of impacts in space and time.
- KM 6.2. The title is revised to capture the ideas suggested. Resilience is defined in the supporting text, and the definition is consistent with the NCA5 glossary.
- KM 6.3. The title is revised to capture the ideas suggested. Natural climate solutions was added to the KM, which is broadened to include likelihood statements based on historical trends and short-term predictions.

**Comments on Text Supporting the Key Messages:**

- KM 6.1. Additional examples of climate change risks to agriculture and rangelands have been added. Cross-reference to many other chapters have been added to represent details that can't be covered in this chapter. Impacts on agricultural yield are included in KM 6.1, and other aspects of economic connections to LCLUC are included in KM 6.2.
- KM 6.2. Links to key messages in other chapters are added. The text related to interactions of climate and land cover was expanded. Developed areas are emphasized because the pace and impact of change is considerable, and because of the importance of this land use to people. Figure 6.7 is revised to clarify and streamline the concept.
- KM6.3. A discussion of recent historical land-use trends based on 4 different datasets is included. Managed pasture and rangelands are now included in the discussion of changes in grazing lands. Assessment of short term land-use projections are added, in addition to the longer-term scenarios.

**Comments on Traceable Accounts:**

- Traceable accounts text for all KMs are modified to standardize the use of confidence and likelihood language. More emphasis is placed on confidence statements than on likelihood statements, reflecting the state of the literature, which remains sparse on mechanistic predictions of LCLUC.
- Consideration of economic drivers of LCLUC has been added in the KM text, and Traceable Accounts are updated to reflect these additions.
- Distinction among drivers of LCLUC due to climate change, natural processes, and economic factors has been clarified in the KM text, and reflected in Traceable Accounts.

**Comments on Graphics and Boxes:**

- Several figures have been modified to improve clarity and add more direct connections to the key messages. Examples include Figures 6.7, 6.8, and 6.9.
- Figures 6.1 and 6.2 are being revised to include Alaska and Hawaii. Figure 6.2 is being modified to add cartographic elements for orientation.

**Comments on Equity and Justice:**

Discussion of equity and justice was added in multiple places in the chapter. Discussion was added related to how changes to infrastructure vulnerabilities will have inequal effects across populations KM 6.1. Text on justice and equity related to Tribal and subsistence communities was added in KM 6.2. Text on inequitable effects on rural communities was added in KM 6.2.

**Comments on Data and Analyses:**

- New text and citations have been added assessing the influence of yield changes and international trade on LCLUC.

**Comments on Literature Cited:**

- Text has been added assessing the area of land science and its relationship to LCLUC.
- Additional analysis has been added to assess multiple LCLUC data sources.
- While there are numerous drivers for LCLUC, the chapter focuses on those most directly related to climate change. New text and citations have been added assessing the influence of yield changes and international trade on LCLUC.

**Other Recommended Changes:**

- Connections between mitigation and adaptation are given increased emphasis in the revised text and figures, and with references to relevant details in other chapters.
- KM6.2 has been revised to include new assessment of interactions between climate change and land use change, including two-way interactions.
- The literature base naturally supports an assessment of simpler changes over more complex ones, but some additional detail has been added where possible.

# 7. Forests

**Narrative Summary Response:**

We thank the Committee from the National Academies of Sciences, Engineering, and Medicine for their review of the Forests chapter. We found the Committee's review encouraging and the comments helpful in simplifying language throughout the Forests chapter. We incorporated additional citations throughout the draft to bolster support for statements, and clarified and expanded the use of examples in the text, text boxes, and figures. We revised each of the key messages based on the Committee's recommendations, including a review of our confidence and likelihood statements, and additional suggestions on length from the USGCRP Technical Support Unit. We did a thorough review of the text supporting each key message to ensure consistency throughout the draft. We have been more direct in our use of examples and supporting text on equity and justice, including additional examples and references to Indigenous and tribal communities. We did not expand the use of the term mitigation in our chapter but we have provided several examples, including a text box on forest carbon that highlights the important contributions forests play in providing ecosystem services, including climate change mitigation.

**Comments on Chapter Introduction:**

We have provided additional text in the introduction on how climate change and climate-related disturbances, and associated variability, are affecting forests. This provided a basis for briefly describing and referencing each of the three key messages as a sort of chapter map as the Committee suggested. We have noted recent area burned and associated GHG emissions from forests and later in the chapter describe the decline in the net forest carbon sink in recent decades. We have more directly described relationships between forests and the goods and services they provide, including "spiritual renewal" with specific reference to Indigenous and tribal peoples.

**Comments on Key Messages:**

We have revised each key message title based on the suggestions from the Committee as well as guidance from the USGCRP Technical Support Unit. These revisions led to refinements in the text and confidence and likelihood statements for each of the key message descriptions which were also evaluated and compared with similar key messages and confidence and likelihood statements from other chapter drafts by the USGCRP Technical Support Unit.

**Comments on Text Supporting the Key Messages:**

The text supporting each key message has changed substantially as a result of the public and NASEM Committee reviews. While concepts and findings in the chapter associated with each key message remained unchanged, we expanded examples, clarified text, and added citations throughout the text supporting each key message. Once this was done we reevaluated each key message title and the confidence and likelihood statements to ensure consistency throughout and with similar concepts and key messages from other chapters (e.g., Ecosystems).

**Comments on Traceable Accounts:**
Noted inconsistencies on estimates of emissions and removes from the Committee have been reconciled throughout the Forests chapter. All estimates of emissions and removals reported (Domke et al. 2023) are disaggregations directly from the estimates compiled and reported in US EPA (2023). Further, while the author team has not explicitly used the term “mitigation” we have described the role of forests in sequestering and storing carbon throughout the Forests chapter and in much detail in the Forest and Carbon text box and associated figures.

**Comments on Graphics and Boxes:**
We have received copyright for several figures not available for viewing during the Committee’s review and have done a thorough review of additional data sources to expand characterization of information in figures beyond CONUS. We have also updated all figures on emissions and removals using the latest estimates reported in US EPA (2023) and in Domke et al. (2023).

**Comments on Equity and Justice:**
We have better integrated equity and justice throughout the Forests chapter, including in the introduction. We included specific examples in the text supporting key messages and describe successful adaptation case studies from Indigenous and tribal communities. We have also cross-referenced to other chapters to provide additional support for these issues.

**Comments on Data and Analyses:**
All estimates included in the chapter related to emissions and removals from forest ecosystem pools and harvested wood products come from Domke et al. (2023) which is a direct disaggregation of the estimates included in US EPA (2023) that facilitated the development of graphics and details by ownership in the Forests chapter. This is clearly stated in Domke et al. (2023).

**Comments on Literature Cited:**
We have added and updated citations throughout the chapter based on the suggestions from the Committee. We have also updated and included references to the US EPA (2023) when describing emissions and removals and used Domke et al. (2023) where disaggregations are referenced or used in figures throughout the chapter. This updated reference is a detailed disaggregation of the forest and harvested wood products estimates compiled by Domke and others as part of the US EPA (2023).

**Other Recommended Changes:**
We did not expand the introduction to indicate why forest ecosystems have their own chapter as other ecosystems have their own chapter (e.g., agriculture and oceans and marine).

# 8. Ecosystems, Ecosystem Services, and Biodiversity

**Narrative summary response:**

Thank you to NASEM for the helpful comments on our chapter. We strengthened our message that ecosystems are central to life and wellbeing in the introduction to the chapter as requested. We also addressed the concerns about needing more specific examples of adaptation in two new text sections: one in KM2 on “species adaptations” and one in KM3 on “ecosystem-based adaptation”. We also added in more reference to other chapters (particularly Oceans, Forests, Coasts, LCLUC, Adaptation and Water) as requested to allow us to focus primarily on the general trends regarding climate impacts on nature.

**Comments on Chapter Introduction:**

- We have revised to include a stronger and more urgent lead on the importance of ecosystems.
- We believe key concepts are well covered in the glossary, and so we did not revise to provide in-depth definitions as requested, but rather are planning to have hyperlinks to the glossary for readers for these terms. Ecosystem services was already included in the first paragraph (“the benefits received from natural systems”) and has been retained.
- We also added attention to kinship and relational values between people and nature in the introduction as requested.

**Comments on Key Messages:**

- KM 1. We revised the title to “**Climate Change is Driving Rapid Ecosystem Transformations”.** We respectfully believe our focus on transformation rather than degradation or collapse as requested is more reflective of the current literature and the multiplicity of systems we are analyzing. We revised the KM to include that transformation includes “loss and conversion to other states, and changes in productivity” with “serious implications for human well-being” to strengthen the message.
- KM 2. We revised the title to “**Species Changes and Biodiversity Loss are Accelerating”.** We simplified KM language by changing ‘phenology’ to ‘life cycles’ and adding a tangible example that species, “such as those that cannot easily relocate and those that are highly temperature sensitive”, face heightened extinction risks. Rewording of the final sentence also improved clarity that “Identification of risks will help prioritize some species and locations for protection and improve options for management”

**Comments on Text Supporting the Key Messages:**

- KM 1: We have added more specifics to the text as requested, including woody encroachment and that changes are being driven by $CO_2$ as well as temperature and extreme events. We have also emphasized that one way to avoid collapse is to strengthen ecosystem resilience, e.g through increased protection and reduced fragmentation, as well as strengthening adaptive governance and management.
- KM 2: We have added plants to our list of diseases being driven by climate change (and note that pests like bark beetles are covered extensively by ch 7). We added text emphasizing that habitat loss is still the major driver of species loss, and added a new

paragraph on protected areas to address the comment about species being unable to shift locations easily.
- KM 3. We have clarified the definition of nature-based solutions (that they by necessity involve biodiversity benefits) and added reference to natural climate solutions and their relationship to NbS. Agriculture was included as a sector for NbS in Figure 8.18 and we have clarified why it is not in Figure 8.19, which was from a paper focused on natural ecosystems, as well as adding additional reference to other chapters (Ch 6 and 11).

**Comments on Traceable Accounts:**

- KM1: We have included should include the need for adaptive ecological management to consider power and social equity issues specifically.
- KM2: We have included a statement of the uncertainties and risks related to climate refugia. We have deleted the sentence on assisted migration in TA and added more examples in the KM text.

**Comments on Graphics and Boxes:**

- TSU is addressing comments regarding scales and borders in our maps.
- We have added callouts to the specific regional chapters in our request for figure changes to Figure 8.2, and the caption notes that these were pulled from chapters to demonstrate a range of different examples but should not be taken as a comprehensive list of changes. We believe the comments on figure 8.3 actually meant to refer to 8.2 and we clarified the discussion of harvest of plants and how lake ice relates to ecosystem services (recreation benefits).
- We have included reference in the caption to the global data underpinning Figure 8.3
- Figure title and caption of Figure 8.4 have been changed, as has Figure 8.12.
- We have requested changes to Figure 8.18 and 8.19 based on recommended changes
- Table 8.2 has a new column providing specific examples of trends and impacts.

**Comments on Equity and Justice:**

- We have revised text to reflect comments received on being specific about environmental justice issues and benefit sharing, and have added text on Indigenous management and restoration practices. More text on protected areas has also been added, but as REDD+ is an international program we did not include in our US-focused chapter.

**Comments on Literature Cited:**

- All suggested additional references have been added to the draft chapter.

**Other Recommended Changes:**

We have added text on direct fertilization effects in KM1, added mention of OneHealth to KM2, and expanded KM2's section on species adaptation actions to include protected areas and connectivity, with additional specific examples (e.g. Salt marsh sparrow and red pine tree seeds).

# 9. Coastal Effects

**Narrative summary response:**

The chapter team appreciates NASEM's thorough review and suggestions for the chapter; most suggestions were addressed in the revisions to create the fourth order draft. Most notably, the author team held conversations with USGCRP leadership and authors of Chapter 2 (Climate Trends) to develop an approach that provides greater consistency across NCA5 on the use of sea level rise (SLR) scenarios, projections, trends, and likelihoods. Chapter 2 provides the foundation for climate trends including sea level rise, and references Chapter 9 for more detailed discussion on SLR scenarios and trajectories, including the newly added regional emphasis/numbers that support the regional chapters. Improvements were also made in Appendix 3 to provide a more detailed summary of the SLR scenarios and their relationship to AR6 projections.

**Comments on Chapter Introduction:**

A statement was added to communicate that SLR, coastal trends, and the associated impacts vary regionally and locally.

**Comments on Key Messages**

**Key Message 9.1**

- Ambiguous text, such as "rapidly" was removed from KM 9.1 and the chapter. The author team chose to retain the term hazards in the KM.

**Key Message 9.2**

- KM 9.2 was revised to focus on the impacts of the physical processes and climate responses.

**Key Message 9.3**

- After discussion with Chapter 20 (Social Systems), managed treat was retained.

**Comments on Text Supporting the Key Messages:**

**Key Message 9.1**

- The narrative of KM 9.1 was revised to provide a focal point for NCA5 relative to SLR, with cross-references to Chapter 2 (Climate Trends) and Chapter 3 (Earth System Processes).
- The author team re-focused KM 9.1 on the coastal climate trends and scenarios and added regional information to better support the regional chapters. Content related to the impacts to KM 9.2.
- The chapter maintained its focus on the US Interagency Sea Level Rise Task Force (Task Force) SLR scenarios but added information to Figure 9.1 connecting the Task Force SLR scenarios with the AR6 temperature-based projections. The narrative, and Appendix 3, include additional discussion on this relationship.
- The author team added information on natural variability, including the observed suppression of SLR along the Pacific Coast.
- The physically plausible, low-likelihood, high impact SLR scenarios were added and connected to the Task Force scenarios, with reference to AR6 for more information.

- For 2100, the author team used AR6 likelihoods associated with the current warming trajectory of 3 degrees C by 2100 to show it is 'likely' that the Intermediate Low scenario will be exceeded.

**Key Message 9.2**

- The recommendation to include the potential disruption of the Sacramento-San Joaquin Delta due to SLR was forwarded to Chapter 28 (Southwest) for consideration.

**Key Message 9.3**

- Revisions note that current adaptation approaches are likely appropriate for moderate SLR projections, and may be insufficient for the low-likelihood, high impact scenarios.
- Wang et al. (2018) was added to the chapter introduction and KM9.3 traceable account. The findings from the study are important; however, additional research may be required to assess if they apply more broadly to other estuarine and/or coastal environments.
- The authors removed the term marginalized and used overburdened and under-resourced.

**Comments on Traceable Accounts:**

**Key Message 9.1**

- The author team used the observation-based trajectories to provide the sea level rise amounts by 2050 and included the likely ranges in KM 9.1 and in its traceable accounts.
- More description was added about SLR under the higher scenarios and at 2150.

**Key Message 9.2**

- The author team has added citations to the traceable account to support the findings in KM9.2

**Key Message 9.3**

- In response to other comments, the KM was revised. The description of confidence and likelihood were modified accordingly, and the research gap in adaptation approaches under low-likelihood, high-impact SLR scenarios was noted.

**Comments on Graphics and Boxes:**

- Figure 9.1 was updated to provide a comparison of the Task Force SLR scenarios with the AR6 temperature-based projections to 2150.
- A new map was inserted (Figure 9.2) to depict regional differences in SLR.
- The terminology in Figure 9.3 was clarified and the high tide flooding frequencies were separated by region.
- Figures 9.4, 9.5 and 9.6 were revised extensively and include descriptive and annotated captions that are clearly tied to labels on the figures.

**Comments on Equity and Justice:**

Authors across multiple chapters met to clarify language related to equity, overburdened and under-resourced communities, and managed retreat. KM9.3 was revised to reflect these discussions, with additional citations and cross-references.

**Other Recommended Changes:**

The terms flooding and inundation were clarified.

# 10. Ocean Ecosystems and Marine Resources

**Narrative summary response:**

The author team of the 'Oceans and Marine Resources' chapter of the 5th National Climate Assessment appreciates the helpful and carefully prepared comments submitted by the NASEM. The team has addressed the narrative comments, as well as each of the 16 comments line-by-line comments with changes in the text and figures, including a proposal to revise the name of the chapter to "Ocean Ecosystems, Resources, and Communities." The NASEM comments have helped us sharpen and clarify the text and figures, think carefully about and address equity issues as possible, as well as include addition references and links to other chapters and issues.

**Comments on Chapter Introduction:**

We have edited the introduction to try to be more clear about the bounds of the chapter. We state that geographically the chapter focuses on the "areas beyond the US coast to the exclusive economic zone limit." In addition, we clarify that we build upon the physical ocean changes covered in Chapters 2 and 3 and focus on "ecological changes taking place in US marine waters and how they are impacting social, economic, and governance systems." As suggested, we also state that "terrestrial (Ch. 9), global and regional trends (Chs. 2, 3, 17) strongly influence US marine ecosystems."

**Comments on Key Messages:**

- We appreciated the review panel noting confusion created by citing specific geographies and habitats in KM1. As we tightened words, we removed this portion of the sentence.
- We were deliberately selective in our use of likelihood statements, as defined in the 'Front Matter' chapter. Studies from which likelihood of certain future outcomes can be quantified are typically species-specific, process-specific, or ecoregion-specific. Moreover, results are scenario-dependent, and studies may not use the same scenarios and few studies apply multiple scenarios. As such, it is hard to scale the results up to a likelihood rating that applies for general statements such as tour high-level key messages. Given this challenge, we did not feel like we could put a single definitive rating on our broad statements that are meant to apply generally across ecoregions. We have further explained our rationale in the Traceable Accounts.

**Comments on Text Supporting the Key Messages:**

We have revised the key message text as appropriate to reflect changes to the high-level key messages, line-by-line comments from NASEM, and public comments.

**Comments on Traceable Accounts:**

We appreciate the positive feedback on the traceable accounts, and we have adopted the suggestion to add additional citations as appropriate in the confidence, likelihood, and gaps section. We also added details on how the authors arrived at particular determinations.

**Comments on Graphics and Boxes:**

- We appreciate the need for references associated with many of our figures, particularly 10.1, 10.2, and 10.5. These figures draw from many references, which would be cumbersome to include in the citation. We will be working with TSU to include a list of references for each figure in the metadata.
- We are working with TSU to show Alaska, Hawaii, and US-affiliated islands in maps.
- Figure 10.5 was an original creation, led by an author from Center for American Progress but not created by that organization. We are working with TSU to devise a way of attributing authorship for original figures created for the NCA without mentioning individual organizations.
- We have expanded all of the figure captions to fully describe the content of the figures.

**Comments on Equity and Justice:**

- We appreciate the thoughtful comments on equity and justice. We have added several phrases to our high-level key messages (2 and 3) to emphasize the larger impacts that will be felt by communities that depend heavily on ocean resource, have few economic alternatives, and face existing and entrenched barriers.
- We have asked that “human well-being" be defined in the glossary for the full report, as it is used in many chapters and should be defined in a standard way. We have also asked for glossary definitions of resilience and adaptation to be consistent with IPCC usage, which encompass equity and justice considerations more clearly.
- We have noted that socioeconomic data are not fully sufficient to support quantitative analyses of community- or group-level differences in climate impacts and responses among marine-related sectors, which is important for understanding disparate and disproportionate impacts.
- We have cross-referenced several chapters (e.g., 23,29,30) to point to relevant equity and justice examples from other chapters.

***Comments on Data and Analyses:***

We appreciate the positive comments from the review panel.

**Comments on Literature Cited:**

We appreciate the favorable assessment of our literature base, and we have added additional and updated citations as needed and appropriate in the chapter.

**Other Recommended Changes:**

- We have added text and a reference (Hare et al. 2016) acknowledging the interplay between climate change and overfishing in causing observed trends.
- We have noted the need for additional remote sensing and in situ data and analysis to observe and investigate changes across multiple aspects of marine ecosystems.
- We have cross-checked our scenario names and referenced specific scenarios as appropriate, guided by specific points identified in the line-by-line comments.

# 11. Agriculture, Food Systems, and Rural Communities

**Narrative summary response:**
We are grateful for the thoughtful comments provided by the NASEM committee on our chapter. These insightful comments have helped us see important limitations with our current draft, resulting in several important improvements in our chapter. For example, we have reworked our Introduction to provide a better roadmap of our chapter, better articulated our use of the term Agroecology by adding a new call out box and figure that we believe will be a useful resource to those wanting to better understand this term and its application, and we have increased our discussion on Equity- and Justice-related issues throughout the chapter. We have also expanded our discussion of adaption and mitigation options. We have modified some of our figures and removed others in response to these comments.

**Comments on Chapter Introduction:**
- A description of each KM was added to the introduction to provide a better roadmap for the chapter.
- The importance of climate extremes on the topics covered in the chapter is better emphasized.
- Greater emphasis has been placed on equity and justice-related issues.
- Discussion on adaptation and mitigation was strengthened.

**Comments on Key Messages:**
- Balancing comments from NASEM, the public, USGCRP, and TSU, we decided that only minor modifications were needed to our key messages.
- Discussion of growing degree days remained in KM1.
- Key Message 11.2 emphasizes that food availability and affordability is PROJECTED to change in the future. Combined with our explanation in the Traceable Accounts that the U.S. has not seen such changes yet, we decided that the basic message should remain the same. However, clarifying changes were made in the text in response to this and other public review comments.
- We have increased our cross-referencing to other chapters and KMs to emphasize cross-cutting issues.
- We have modified KM3 to better reflect the variability in resilience of rural communities.

**Comments on Text Supporting the Key Messages:**
- Discussion of hardiness zones remains in text supporting KM1.
- A new call out box that describes how we have defined agroecology, examples of agroecological approaches, and a new infographic were added to text supporting KM1.
- Water use was not highlighted as it was thoroughly covered in NCA4.
- Discussion of adaption and mitigation options has been expanded in text supporting KM1.
- Discussion of TFP remains in text supporting KM2.
- In KM3 the relevance of BRIC to rural communities was drastically improved through changes to figures and text.

**Comments on Traceable Accounts:**

The Authors revised the language in the main document regarding Agroecology, including a box defining Agroecological Approaches. This better informs the discussions, including mentions of Climate Smart Agriculture and technology, which are not excluded from consideration.

**Comments on Graphics and Boxes:**

- Both the Hardiness Zones and Ecosystems figures have been retained as they help support our text
- Captions to all figures have been expanded to provide greater explanations.
- A new infographic that better captures and explains our definition and use of agroecology has been added. This has resulted in removal of Figures 11.6 and 11.8.
- We have been unable to find data on GHG emissions per protein source for US only, so we have retained the existing figure summarizing global data. We do note in caption that the data are global and that US numbers likely differ but given that the data do not exist we cannot state how different they would be for the US compared with the world.
- The Community Resilience Index and BRIC Index figures have been revised to better focus on rural concerns.

**Comments on Equity and Justice:**

- We have better framed our discussion of equity and justice issues in the Introduction and within the main text of our chapter.
- More cross-referencing to related equity and justice issues from other chapters were added where appropriate.

**Comments on Literature Cited:**

Several of the suggested references have been added

**Other Recommended Changes:**

- Word limitations prevent us from discussing biofuels and dual purposes of agriculture with wind and solar production in our chapter.
- Food loss and waste is discussed in Box 11.2

# 12. Built Environment, Urban Systems, and Cities

**Narrative summary response:**

The chapter authors express gratitude to the NASEM review panel for their deep and critical engagement of Chapter 12. The chapter authors appreciate the NASEM review panel for highlighting the strengths of our chapter and recommendations for improving our writing for a non-technical audience. The NASEM review panel remarked on the overall coherent, balanced, and robust approach to assessing recent science on climate change risks and impacts to the built environment across US cities and urban areas. We agree with the NASEM review panel that our chapter provides an important and timely contribution, and that our chapter's key messages adequately reflect the most up-to-date science. Our chapter revisions have taken on many of the constructive suggestions related to content of the chapter, including slightly rewording our chapter key message statements to better align with NCA5 style guidance, revising our more technical sections for a public audience, inserting definitions for 'built environment' and 'cities' in the Introduction section, incorporating more cross-references to other NCA5 chapters, and revising our chapter figures and tables to ensure clarity.

**Comments on Chapter Introduction:**

The introduction to Chapter 12 has been significantly rewritten as recommended by the NASEM review panel. The revision includes an elaborated definition of the built environment and a specification that the chapter mainly assess science pertaining to the many (large and small) cities and suburbs across the country. Assessments of rural communities is found in Chapter 11. The rest of the introduction has also been revised to reflect the more substantive changes to the main chapter text, and it now includes more cross-references to other NCA5 chapters.

**Comments on Key Messages:**

The chapter authors appreciate the positive evaluation of the chapter key messages, noting that they are effective and impactful. The KM titles have been rewritten as short, informative statements as suggested.

- KM12.1: The chapter authors have revised this KM title to: Urban Areas Are Major Drivers of Climate Change
- KM12.2: The chapter authors have revised this KM title to: Attributes of the Built Environment Exacerbate Climate Impacts, Risks, and Vulnerabilities
- KM12.3: The chapter authors have revised this KM title to: Urban Environments Create Opportunities for GHG Mitigation and Climate Adaptation
- KM12.4: The chapter authors have revised this KM title to: Community-Led Actions Signal a Shift Toward Equitable Climate Governance

**Comments on Text Supporting the Key Messages:**

The NASEM review panel notes the appropriateness of all four key messages found in the chapter. Some text from KM12.1 has been moved to KM12.2 to strengthen our assessment of the different attributes of the built environment that exacerbate climate effects on the ground. KM12.1 now specifically assesses the role of cities and urban residents in GHG emissions (both absolutely and relative levels). KM12.3 and KM12.4 retain the same content although much of

the text has been revised in response to NASEM and public comments. We have inserted more examples into the different figures although our ability to include diverse examples in the text is constrained due to word count limitations. The chapter authors have also inserted additional cross-references to other NCA5 chapters.

**Comments on Traceable Accounts:**

The NASEM review panel notes that the chapter's Traceable Accounts are clear and provide sufficient context for the embedded text that reflects the current understanding of the state of the science. The chapter's usage of confidence/likelihood statements are also adequately explained. The list of topical areas for the literature search has been rearranged as suggested.

**Comments on Graphics and Boxes:**

The NASEM review panel notes that many of the chapter's figures and graphics are sufficient and that they are self-contained and have good captions. Table 12.1 has been removed from the chapter entirely. Instead, the information contained in Table 12.1 is now written out in narrative form to better align with overall NCA5 guidance on the usage of scenarios. The chapter's national maps (Fig. 12.1 and Fig. 12.2) have been significantly revised to improve readability. Fig 12.2 has been changed to graphs for this purpose. The captions for all figures have been elaborated with more information.

**Comments on Equity and Justice:**

The NASEM review panel notes that equity and justice principles are adequately incorporated throughout the chapter. The chapter authors have thoroughly revised the chapter to pivot away from the use of deficit language. The one exception is in KM12.4 where we discuss the historic exclusion of certain groups from local decision-making and governance processes. Elsewhere, we refer to overburdened, under-invested, low-wealth, and other frontline communities. Sentences on managed retreat have also been removed from the main chapter text and now appear only in in Table 12.1.

**Comments on Data and Analyses:**

The chapter authors have reviewed all the data sources used in chapter and across all the figures to ensure that they represent the most up-to-date sources. Approaches to data analysis are detailed in the metadata for those figure that require it. The chapter authors have also made an explicit effort to include data from all US-affiliated territories, and in cases where this is not available, we have specifically noted this.

**Comments on Literature Cited:**

The NASEM review panel notes that the chapter accurately reflects the knowledge base and incorporates ample recent literature appropriate for NCA5. The chapter authors have thoroughly updated references as part of the chapter revision process.

# 13. Transportation

**Narrative summary response**

The document was updated to reflect the Public and NASEM comments as well additional information that the authors believed would reinforce the chapter Key Messages and supporting statements. We leveraged the body of knowledge and key messages of other chapters and cross-referenced those into our chapter's Key Messages and supporting information. Specifically, we added additional links to the chapters suggested (6-Land Cover and Land use, 12-Built Environment). We also already had links to 14 (Air Quality). Also added links to 5 (Energy), 6 (Land use), 7 (Forests), 9 (Coastal Effects), 10 (Oceans), 11 (Agriculture, Food Systems, and Rural Communities), 12 (Built Environment) 15 (Human Health), 16 (Tribes and Indigenous Peoples), 17 (Climate Effects on US International Interests), 20 (Social Systems and Justice), and the regional chapters 22 (Southeast), 24 (Midwest), 29 (Alaska). Chapters 31 (Adaptation), 32 (Mitigation) as well as Focus Boxes on COVID-19 and Climate Change and Risks to Supply Chains were also cross-referenced.

We have added an explicit reference to mobility, the interaction between land-use and transportation, alternative transport modes for multiple situations; and, added discussion of emergencies. In the introduction and multiple parts of the chapter, we have made more explicit the country's transition to low-carbon transport modes including the co-benefits and tradeoffs for doing so.

**Comments on Chapter Introduction:**

The author team revised the introduction to better reflect transportation as a sector with an acknowledgment of the advances since NCA4. We recognize future disruption and how that is likely to affect transportation and mobility. We also acknowledged the connection between land use and transportation. Finally, we made an explicit mention that adaptation and mitigation strategies will differ by location (rural or urban), with differing tradeoffs based on data to ensure impacts are not borne disproportionately by already overburdened communities.

**Comments on Key Messages:**

- We included confidence levels where they are lacking.
- KM 13.1 - The last sentence has been revised to reflect climate date and resilience best practices instead of simply stating "strategies".
- KM 13.2 - We updated the title and significantly updated the text to be more succinct and descriptive of issues, strategies, and solutions relevant to addressing the effect of disruptors to the transportation sector.

**Comments on Text Supporting the Key Messages:**

- We acknowledge the positive feedback to KM13.1, As suggested, we included references to interstate water systems and changed the category of these systems as "waterborne".
- In KM 13.2, we were able to maintain the key essence of technology and workforce challenges using more accurate words. We explicitly identified those challenges that

include the persistent underrepresentation of women and people of color. Supply chain constraints in auto manufacturing and inflation are not directly relevant to this and any of our KMs. However, we cross reference this Chapter to the Focus boxes on COVID-19 and Climate Change and Focus on Risks to Supply chains.

- KM 13.3 - We were not able to find evidence of tire and road wear on climate. We also discuss some relationships between EVs and the grid here and in 13.1. Related statements to co-benefits and tradeoffs were also added in KM13.3 and KM13.4. There is not a central issue in distinguishing co-benefits of moving from coal to natural gas vs. coal to renewables. This is not a central enough issue to focus on in this assessment.
- KM 13.4 - We discuss workforce transition challenges in 13.2. We acknowledge EV transition challenges in 13.2 and 13.3. While KM 13.4 mentions decreased need for maintenance for EV; displacement of workers. We have cross-referenced with other chapters on justice and equity, including Chapter 20: Social Systems and Justice.

**Comments on Traceable Accounts:**
We updated all of our traceable accounts statements to conform to current guidelines. We also made adjustments to the traceable accounts to better reflect the chapter content. We added references and statements to specific sections of the chapter, including those mentioned in the NASEM comment. We acknowledged additional research gaps, as appropriate.

**Comments on Graphics and Boxes:**
The Author team has been in close coordination with TSU on the figure, table, and caption content, format preferences of supporting information, and citations. Author team will work very closely with TSU if any particular updates need to be done, relative to NASEM comments.

**Comments on Equity and Justice:**
We cross reference to social justice chapter and discuss elements of equity and environmental justice throughout the chapter.

**Comments on Data and Analyses:**
The Traceable Accounts statements had been mostly reflective of efforts and information the authors had prior to the Third Order Draft. The statements in the Traceable Accounts have been largely updated considering responses to the Public and NASEM comments as well as new information that support the responses.

**Comments on Literature Cited:**
The overall goal throughout the document is to systematically lay out the evidence for all Key Messages, and sometimes as appropriate we use a well-established reference. Specific to this comment, we removed the reference to the White House fact sheet. We added multiple examples where appropriate.

**Other Recommended Changes:**
We added sentences in the Introduction and in appropriate Key Messages section to acknowledge the connection between land-use decisions and transportation. Where more

appropriate, cross-references to other chapters are included to reflect the concept. We included statements acknowledging the emerging evidence of the effect of CO2 on human cognition. We also incorporated the references cited in the NASEM document. We have updated the impacts of climate to water to a more expansive mode term “waterborne”. We have attempted to distinguish impacts of water both marine and other more freshwater environments, but only to the extent supported by evidence distinguishing such difference.

# 14. Air Quality

**Narrative summary response:**

We are grateful for the supportive and constructive comments from NASEM. We have made significant changes to the chapter. We changed the titles of Key Messages (KMs) to be brief informative statements, strengthened our KM text, adding a statement of likelihood where appropriate, and improved the text in Traceable Accounts that supports the KMs. NASEM questioned whether aeroallergens is given too much attention as its own KM. Rather than moving discussion of aeroallergens within one of the other KMs, which focus mainly on $PM_{2.5}$ and ozone air pollution, we feel that aeroallergens is different enough that it should stand on its own. This differs from dust, which is explored under KM 14.1 as an impact on $PM_{2.5}$, for which discussion has been strengthened. Wildfires comprise their own KM (14.2) because of the clear impacts of recent wildfires and much recent research. Meanwhile we have condensed the three figures on aeroallergens to one, and shortened the text in KM14.4. We also strengthened the discussion of health impacts of aeroallergens to better motivate this section.

In response to other general comments, we now give greater emphasis to petrochemical industry sources that are important for environmental justice issues, and air filtration as an adaptation, and we use the term clean energy transition. We similarly point out that adaptation through air filtration and masks is not equally available to people of low income. Regarding positive examples, the Introduction highlights how air quality has improved historically in recent decades, while KM 14.5 highlights the substantial opportunities for win-win solutions for addressing climate change and air quality simultaneously.

**Comments on Chapter Introduction:**

- The Introduction has been modified to identify key sources of air pollution and highlight improvements in recent decades.
- Climate change is discussed to better set up the five KMs.

**Comments on Key Messages:**

We have changed the titles of Key Messages (KMs) to be brief informative statements. We have also strengthened our KM text, adding statements of likelihood where appropriate, and have improved consistency in length, style, and statements of likelihood and confidence across our chapter.

**Comments on Text Supporting the Key Messages:**

- KM 14.1 has been modified to more clearly indicate that climate change will “hamper efforts to improve air quality.”
- A brief mention of impacts of air pollution on regional climate, including soot (black carbon) on water resources, has been included in the KM 14.5 discussion since this is an impact on climate (KM 14.1 discusses impacts of climate change on air pollution).
- KM 14.2 focuses on the air quality consequences of wildfire smoke, and so discussions of other impacts of fires on property and warning systems are found elsewhere (Ch. 7).
- KM 14.3 has been strengthened by discussing air pollution inequities in rural regions.

- Our author team supports keeping a separate KM 14.4 on aeroallergens, in part because its health impacts are substantial. The figures in KM 14.4 have been reduced from three to one two-panel composite that communicates more effectively and avoids an impression that aeroallergens are more important than $PM_{2.5}$ or ozone.
- Discussion of environmental justice concerns is focused in KM 14.3, to give it greater emphasis, and a brief mention of environmental justice with links to KM 14.3 has been added to KM 14.5.
- KM 14.5 now better clarifies the concept of co-benefits through more complete discussion, and Figure 14.10 has been revised to a single panel focused on the benefit:cost ratio that communicates findings from many studies more simply.

**Comments on Traceable Accounts:**

Traceable Accounts have been strengthened by including more references, particularly in the descriptions of confidence and likelihood statements.

**Comments on Graphics and Boxes:**

- The figure captions have been revised to more clearly communicate, and to explain when areas outside the continental US are not shown. In Figure 14.2, the full list of models is included in the Metadata rather than caption, in agreement with TSU.
- Figure 14.5 has been simplified by removing some fine land use detail on the figure, making it easier to interpret.
- The KM 14.4 figures have been redone as a single 2-panel figure.
- A discussion of the sources of information for Figure 14.1 has been added in the Traceable Accounts.

**Comments on Equity and Justice:**

- We have strengthened the discussion of environmental justice and air pollution exposure disparities in the Introduction.
- Additional links with other chapters that also discuss environmental justice have been added to KM 14.3.

**Other Recommended Changes:**

- Discussion of dust is now strengthened in KM 14.1, including dry lakebeds as a source of dust.
- Air filtration and wearing masks are now mentioned as adaptation actions to reduce exposure in KM 14.2 on fires, and KM 14.4 on pollen. In KM 14.3 we also say that these measures may not be available to some for lack of resources.
- In KM 14.5, we have expanded the discussion of indoor air quality consequences of GHG mitigation, referencing Ch. 12. While the NASEM comment emphasizes replacement of gas stoves, we chose to emphasize air-tight buildings for efficiency, and alternatives, which we expect to be a bigger influence on indoor air quality and health.

# 15. Human Health

**Narrative summary response:**

Thank you for your comments on our chapter. In addressing the comments, the authors have improved on the clarity and content of our chapter. We have adjusted our Key Messages to reflect your suggestions and believe they are now more succinct and reduce any potential ambiguity. Each Key Message is written in the active voice, and the message texts following each of the Key Messages has a confidence and likelihood statement. We have provided supplemental evidence throughout the chapter, as requested, and feel that these additions are critical to enhancing our understanding of the health impacts of climate change. While we have always approached this chapter with a lens toward systemic racism and discrimination, we have now ensured that populations that are disproportionately affected have been explicitly called out, and we have added evidence throughout. Additionally, we have worked to make sure that we avoid medical jargon and use only plain language all through the chapter as we fully anticipate sharing our chapter with local and state officials as well as community leaders.

**Comments on Chapter Introduction:**

Our introductory paragraph has been re-written and now provides a roadmap to the chapter by highlighting the extreme events impacting the US with a changing climate, the populations that are more affected by these extreme events, the disproportionate health impacts on the US population, and the role of systemic racism and discrimination in the disproportionate impacts.

**Comments on Key Messages:**

- KM15.1 remains unchanged as we like the simplicity and clarity of the message which reads, “Climate Change is Harming Human Health”.
- Our new KM15.2, which addresses environmental, economic, and social factors, now reads, "Systemic racism and discrimination exacerbate climate impacts on human health".
- Our new KM15.3 explicitly states ‘adaptation and mitigation’ so that readers are clear from the outset on what this section focuses. It now reads, “Timely, Effective, and Culturally Appropriate Adaptation and Mitigation Actions Protect Human Health”.

**Comments on Text Supporting the Key Messages:**

- Our KM15.1 message text has been amended to include ‘community health and well-being’ so that the message is more inclusive and matches language used in other chapters such as the Midwest chapter. We have also submitted a request for inclusion of a more targeted definition of ‘community health’ in the NCA5 glossary.
- Our KM15.2 message text now begins by noting that “Climate change unequivocally worsens physical, mental, spiritual, community health and well-being, and social inequities”. Additionally, in the KM15.2 message text, we call out specific populations that have been disproportionately affected by climate change including Black, Indigenous, and people of color (BIPOC), low-wealth communities and individuals, women, people with disabilities or chronic diseases, sexual and gender minorities, and children, among others.

- In the KM15.3 message text, we highlight that implementing any adaptation measures that align with our key message, creating resilient healthcare systems, and reducing GHG emissions will protect human health and improve health equity.

**Comments on Traceable Accounts:**

We have augmented our Traceable Accounts by including numerous peer-reviewed references for the evidence we provide indicating that the negative health impacts (KM15.1) of extreme heat, drought, wildfires, infectious diseases, food and water quality and security, mental and spiritual health, compounding hazards, and occupational safety will continue to increase.

- For KM15.2, we explicitly outline the evidence behind the disproportionate impact of climate change in specific areas and on certain populations.
- For KM15.3, we provide multiple lines of evidence to show that the health of people in the US can benefit when health is mainstreamed into policies that improve food, infrastructure, water, and sanitation.
- We also expanded the research needs and gaps section of each key message.

**Comments on Graphics and Boxes:**

All of our graphics have been adjusted in response to comments provided by both the public and the NAS. We have also rewritten captions so that we include clearer, more detailed descriptions of the graphics. For example, in our Heat and Health Equity figure, (Figure 15.1), our caption now refers to social and racial factors that influence who is most at risk from extreme heat exposure. Furthermore, we explicitly state that these impacts are disproportionately felt by BIPOC and low-wealth communities.

**Comments on Equity and Justice:**

Our chapter has, from the outset in our introductory paragraph, focused on equity and justice. Throughout the chapter in response to comments, we have more explicitly named specific populations that have been marginalized, over-burdened, and under-resourced.

**Comments on Literature Cited:**

Although the reviewers felt that the our chapter addressed the pertinent literature since the NCA4, we have opted to include newer references in response to comments from the reviewers, thus providing further evidence to support our statements throughout the chapter.

**Other Recommended Changes:**

The human health chapter relies on peer-reviewed literature, which uses a wide variety of risk framing. Some citations use specific emissions scenarios and/or time frames, while some do not. Because of this, we are unable to use consistent emissions scenarios to describe future health impacts for all climate-related hazards. The authors have strived to retain language specific to the citations, and have noted the specific global warming levels or emission scenarios where they are available.

# 16. Tribes and Indigenous Peoples

**Narrative summary response:**

We appreciated the depth and variety of comments provided by the NASEM reviewers. We interpreted the comments as covering a number of key aspects of the chapter, and the resulting chapter is significantly improved. First, we deepened the literature under review in this chapter and we expanded and provided more detail or examples in the areas requested of us to do so by the NASEM reviewers. The draft has much richer texture in its description of impacts and actions. Second, we fully updated the traceable account consistent with expectations for traceable accounts, ensuring that there are references to some hallmark sources of literature that would be important for readers to understand in relation to the content. Third, we made revisions to KM language based on NASEM reviewers' recommendations, and clarified the writing and concepts consistent with the recommendations – we are appreciative, again, of the recommendations. Fourth, there were several recommendations made that related to NCA policy, including the necessity of referring more explicitly to previous NCAs and to the statutory requirement to give projections. We stated, as NASEM reviewers recommended, to state that there is no acceptable way to project 25-100 years into the future for all Indigenous peoples. NCA staff also gave us guidance previously, and again, that we should not give a repetition overview of the materials of previous NCA chapters.

**Comments on Chapter Introduction:**

The introduction is an opportunity to, with great brevity, describe some of the key concepts of the chapter. We refined the introduction to make the concepts clear, and re-arranged some of the ordering of sentences to improve the flow at which the readers are able to digest the key concepts. One key improvement was to add information about the impacts of climate change on culture, which was not originally as present in the introduction. The excellent reviewers at NASEM had asked us about having a section at the beginning on the distinction between federally- and non-federally-recognized Indigenous peoples. While we do make that distinction throughout the chapter, and we understand the comments, it is also the case that our chapter is about all Indigenous peoples, and that Indigenous peoples' knowledge, culture, and experiences related to climate change should not be prefaced as being pivoting off of U.S. concepts of Tribal corporate organization. There is a glossary in NCA where key definitions are given, and that will be linked. It is also an achievement of this being the 4$^{th}$ time there is an Indigenous peoples' chapter in NCA and that we have a right to move directly into our concepts and terms, no different from other chapters, insofar as the other chapters are not required to define what a state is, what the federal government is, what county and municipal governments are, and so forth. We appreciate greatly, however, the NASEM reviewers' concerns about the readability and accessibility of the introduction.

**Comments on Key Messages:**

For all KM1-3: There was a really good question about including likelihood in the KM language. We chose not to do that because the type of information relating to diverse Indigenous peoples throughout the U.S. sphere does not produce probabilistic information that would give rise to likelihood ratings. We would be doing a disservice to describing the state of the information by

hazarding a likelihood rating. For KM2, the NASEM reviewers made a fantastic point about this KM, that there are at least 2 or 3 ways to read the directionality and grammatically causal relationships. We refined the KM so that the directionality and grammatical causality is less subject to variations of interpretation. For KM3, we made a couple of linguistic adjustments for clarity.

**Comments on Text Supporting the Key Messages:**

We are forever grateful at the level of rigor, the degree of patience, and the insightfulness of the NASEM reviewers' comments and points. We cannot emphasize enough how much better the chapter is thanks to the time that the NASEM reviewers dedicated to their assessment. There were many comments that referred to needed fixes, repairs, and adjustments. We made all of those recommended changes to the letter. In terms of some of the more game-changing issues advanced by the reviewers, we have responded in the following ways. We significantly improved the citations and references in the chapter, adding dozens of additional citations to support the information presented in the chapter. We emphasized cultural issues throughout the chapter, doubling down on the importance of that theme in terms of its centrality to the literature on the topic of Tribes, Indigenous Peoples, and Climate Change. We clarified that the literature and data on our topic does not give rise to 25-100 year projections. Given the many hundreds of Indigenous peoples, and given that Indigenous land-holdings are complex in terms of how they map on to the geographical areas of climate assessments, there is no feasible way to make projections for Tribes and Indigenous peoples, despite the worthiness of the very idea. It is not in the scope or capacity of this author team or the resources of the NCA to be able to pull off that type of assessment, and there would be accountability issues given that any information relevant to particular Tribes or Indigenous peoples would have to be sufficiently accurate to be of guidance to aid their planning processes. The NASEM reviewers made an excellent suggestion to connect NCA4's chapter on the same topic with ours. While an excellent suggestion, we were not, early on in the writing process, instructed to do so, and were actually instructed to lead off from where the previous chapter left off. We did make sure it is clear in our chapter that there are findings from NCA4, but we focused our attention on new information, literature, and knowledge that is available on the topic. The NASEM reviewers had critical points to make, often shared by some of the public comments, about missing areas in the chapter. We enriched and strengthened multiple areas that were too weak: We featured more information about "Alaska"; we made more connections across other chapters; we improved the health section, especially the issues related to sport and COVID-19; we increased coverage of major examples of Indigenous climate action; we did a major revision of the economics section; and a number of other important revisions recommended by the NASEM reviewers.

**Comments on Traceable Accounts:**

The NASEM reviewers made good points about the importance of tightening the connection between Traceable Accounts and the chapter text. The Traceable Accounts have been revised to that end, and the good insights of the NASEM reviewers allowed us to identify some gaps and problems in how the traceable accounts had been presented. One of the recommendations from the NASEM reviewers went beyond the expectations of NCA, and hence we did not follow through with addressing it. This was the comment that we needed to include all of the citations

in the text in the traceable accounts. NCA gave us the guidance that we ought to include notable citations in the traceable accounts, but no further references.

**Comments on Graphics and Boxes:**

We agree with NASEM reviewers' comments that Figure 16.2 would be strengthened by panels showcasing specific areas where US federal land interacts with Federally Recognized Tribal land. We look to include two boxes next to this figure that provide this "zoomed in" perspective. The caption of 16.4 will provide an explanation of figure's dot size. Additionally Figure 16.5 will be revised to not only be enlarged but also include Alaska, Hawaii, territories and commonwealths where data is available.

**Comments on Equity and Justice**

The chapter itself, originally becoming part of NCA in NCA1, has been an effort to ensure that Indigenous peoples' situations and knowledge of climate change are equitably included in NCA. In terms of the information in the chapter, the chapter itself describes, in clear terms, the equity and justice issues that Tribes and Indigenous peoples face in terms of facing political and social barriers to being able to adequately respond to climate change, and that these barriers often arise from the colonial relationship the U.S. maintains with Tribes and Indigenous peoples, whether that colonial relationship is the U.S. not acknowledging the sovereignty of some Indigenous peoples or official doctrines and policies of the U.S. such as "congressional plenary power" over federally-recognized Tribes. One of the innovations of the chapter, which we improved upon in response to the NASEM review, was to include more examples, and further enrich, the ways in which Tribes and Indigenous peoples are being proactive to address climate change, which is essentially the measures they are taking to achieve equity and justice in climate change response.

**Comments on Data and Analyses**

We did make myriad micro-revisions to our presentation of the analysis of the data. Our chapter has a special place in NCA. For reasons of inequity and injustice, there is not a strong tradition of available data that would support the many hundreds of Tribes and Indigenous peoples in a way that can be summarized in the word limit boundaries of NCA, which is just a few thousand words. It has been a success of the NCA to have created space for a chapter that is able to compile and summarize data from interdisciplinary and multi-media sources of information and knowledge, and present a profile of some of the issues, context, and actions relating to how Indigenous peoples interpret and respond to climate change. In the future, the growth of this chapter, and it's importance, will likely someday lead to a more equitable situation regarding the availability of robust and significant data that can be expressed in the needed specificity to be of support to Tribes.

**Comments on Literature Cited:**

The NASEM reviewers made both specific and general recommendations about the literature cited. We made the specific changes to the letter, including requests to include specific articles and sources. We also did an additional layer of literature review, especially given the timespan

between our first wave of literature review and the current editing process we are in right now. There are many new citations in the report.

# 17. Climate Effects on U.S. International Interests

**Narrative summary response:**

- Recognized need for better representation of international chapter in the Chapter 1, overview and will work with USGCRP to address.
- We did not attempt to take a granular look at differentiated regional climate impacts as they map to US interests given space limitations; rather we selectively provide examples of regional differences in the National Security and Sustainable Development Key Messages.
- Other comments in the narrative section are addressed in sections below.

**Comments on Chapter Introduction:**

- Revised introductory text for clarity. Authors disagreed that the language was policy prescriptive as it is a factual statement.
- Addressed national security comments in security key message.

**Comments on Key Messages:**

- All KM titles expanded but modified from suggestion.
- 17.1 Text adjusted in response to suggestions to clarify key messages and confidence levels. Adjusted last key message to reflect approaches are being applied, rather than that approaches are alleviating risks (due in part to lack of evidence).
- 17.2: Recommend keep National Security broad category header aligned with NCA4. Authors have retained 'high confidence' assessment in lieu of 'virtually certain' recommendation.
- 17.3: Text and confidence levels adjusted in response to suggestions. (First sentence broken in two to distinguish global/regional vs. US impacts. Edits more clearly distinguish statements about physical climate risks vs. adaptation and mitigation responses. "Significantly" deleted; "Enabling environments" replaced with explanatory text. Consulting Economics Chapter authors re: examining losses vs. global output.
- 17.4 Authors considered, but rejected suggestion to split section. There is sufficient research regarding the negative impacts of climate change on achieving sustainable development to warrant high confidence of this first statement.

**Comments on Text Supporting the Key Messages:**

- 17.1 reference to population growth as a compounding stressor is provided, reference to the crosscutting box on Compound and Complex Events is included. The connection of climate change to food insecurity, complex risks has been strengthened.
- 17.2: National Security. National Security has added verbiage for migration.
- 17.3: Edits tone down "optimism", reduce use of "significant" and "increasing", beef up support for conclusions. The authors believe it is important to begin with a discussion of global economic impacts, to frame the discussion of US impacts, which has been revised to better reflect the challenges of imputing global to U.S. economic impacts. Cite to Swiss Re corrected and contextualized. Edits reflect lack of consensus on attribution of increased losses from disasters. Implications of inadequate global financing addressed.

Discussion of carbon offsets expanded, including reference to Paris Article 6 rulebook. Consulting with Economics Chapter authors to further assist with comments

- 17.4: The chapter intends to frame sustainable development as a US interest. Language added to the introduction and first statement under this KM. Language was added to further demonstrate the interlinkages between climate and development pathways and the impact of various stressors/shocks, which complements Section 17.1 reference to COVID-19 and Ukraine war. Clarifications on lack of finance for climate action were included, although the suggested challenges related to military, supply chains, instability, and displacement were mentioned in other sections of the chapter. Table 17.2 was removed to add space to incorporate additional text to cover topics above.

**Comments on Traceable Accounts:**

- Added and agreed with comments and need for an International Climate Assessment to support the evidence base surrounding the effects of climate change outside US borders on US interests; expanded recommendation to consideration of response measures.

**Comments on Graphics and Boxes:**

- Addressed comments on graphics and climate service box.

**Comments on Equity and Justice:**

- Authors connected with other chapters and have cross referenced the adaptation and mitigation key messages.

**Comments on Data and Analyses:**

- *Referenced satellite data.*

**Comments on Literature Cited:**

- 17.2 National Security has added verbiage and literature for migration and geoengineering.

**Other Recommended Changes:**

- Authors decided not to focus on impacts of climate change in the U.S. on commitments with neighboring countries, due to space limitations. Transboundary issues were well covered in NCA4.
- Economics section revised to note regional vs global climate impacts, to reflect U.S. re-entry to Paris Agreement, and adoption of Paris Agreement Article 6 rulebook re: carbon offsets. While a broader discussion of how international treaties and commitments would be valuable, space limitations do not allow a comprehensive discussion of other international agreements such as GATT, Basel Convention, or carbon border mechanisms.
- Chapters brought population growth into the narrative 17.1, and 17.4; added more information on migration under 17.2 and 17.4; Arctic under 17.2
- Added in clarifying language where terminology was problematic, and reviewed imprecise use of impacts/risk/hazards.

# 18. Sector Interactions, Multiple Stressors, and Complex Systems

**Narrative summary response:**

Building from the detailed NASEM feedback, we have made many refinements to improve our chapter. Overall, we now better communicate what complex systems are, how and why interactions and interdependencies are important, and how to think about complexities in an integrated context relevant to climate change. We now extensively integrate our chapter with other chapters of the report, through cross-referencing and examples. Throughout, we have reduced jargon and written for the broadest possible audience. We have better integrated figures into the text to clarify complexities discussed. Adjustments made in specific sections, in response to the detailed NASEM comments, are described below.

**Comments on Chapter Introduction:**

- The introduction has been revised to provide a roadmap to the chapter, more clearly specifying what is covered versus not.
- We now use direct clear language accessible to a broad audience.
- We define, in use, core concepts including complex systems and multiple stressors.
- We now provide ample references to other chapters, connecting topics across the report in introducing the key messages of this chapter.
- The specific language edits recommended are no longer relevant, as we have reworded the text for greater accessibility to a broad audience.

**Comments on Key Messages:**

- We now make sure the most important information is highlighted in each key message, supported by key message titles that are now short, informative statements.
- Each key message now has confidence specified for each individual assertion.
- In KM18.1, we have reordered the sentences as suggested.
- In KM18.2, we now say less in simpler words as suggested.
- In KM18.3, we now use clearer, more specific language and simpler sentence structure.
- In KM18.4, we have considered and eliminated unneeded words.

**Comments on Text Supporting the Key Messages:**

- We now better integrate information across the chapter, connecting supporting text more clearly back to key messages with improved cohesion across subsections. We have achieved this through simplification of wordings, focus on topic sentences, and improved cross-referencing, rather than use of sub-headers.
- Within KM18.1, we have better connected the text to figure 18.1 and box 18.1. We have clarified that increasing vulnerability of systems results from both increasing linkages and changing climate.
- Within KM18.2, we have increased specification of the relevance of complex systems in findings and examples provided.
- Within KM18.3, we have reduced the use of jargon, ensuring text for a broad audience; increased cross-referencing of other chapters; and improved the discussion of effective approaches for understanding and managing complex interactions.

- Within KM18.4, we have increased cross-referencing of other chapters and specified most-relevant literature sources in the introductory paragraphs.

**Comments on Traceable Accounts:**

- We have now included citations from Reed et al. (2022) for KM18.1 and added additional specifics and citations for KM18.3.
- For each key message, we have ensured that the confidence level for each claim is discussed with specification of which references support each confidence assignment.

**Comments on Graphics and Boxes:**

- We have ensured that figure captions stand on their own as self-contained descriptions of what the figures show, complementing the text referring to each figure.
- We have made small adjustments to figures 18.1 and 18.2 to better illustrate how complex relationships across systems, peoples, and other non-climate stressors affect vulnerability to climate change.
- Figure 18.4 has been redesigned to include more tangible specifics. It now clearly shows the iterative nature and the path-dependent evolution of decision making under deep uncertainty, as well as potential future outcomes. It is better integrated with both KM18.3 and KM18.4.
- Box 18.2 has been revised to clarify the importance of dynamics through time and the additive effects of wildfires and other disruptions over multiple years.
- Box 18.3 has been revised to focus on a specific case example, also with cross-references to other chapters. This box now additionally refers to the role of chief resilience officer positions. The phrase megalopolis has been eliminated.

**Comments on Equity and Justice:**

- We have maintained a focus on equity and justice throughout the chapter and specifically in KM18.2.
- We now better cross-reference other chapters on equity and justice.

**Comments on Literature Cited:**

- We have added more literature citations in all locations requested, within the key messages' text, boxes, and the traceable accounts.
- We have ensured that the citations supporting confidence assignments are clear in all cases.

# 19. Economics

**Narrative summary response:**

We thank NASEM for their favorable review of our chapter and for their many constructive comments which have made our chapter stronger. In response to NASEM comments, we have expanded the number of cross-references to other NCA5 chapters. We have also expanded our discussion of inequality, both in KM 19.1 and in our figures and captions.

**Comments on Chapter Introduction:**

- We have added a paragraph clarifying that our chapter does not assess the economics of climate change mitigation and associated technological options. We have included cross-references to key messages in other chapters that discuss these issues.

**Comments on Key Messages:**

- We have modified KM 19.1 to use the present tense to reflect the fact that climate is already affecting the US economy.
- We have modified KM 19.2 so both the title and the text are in the present tense, reflecting that markets and budgets are already responding to climate change.
- We have replaced the use of the term “disrupt” in KM 19.3 with the term “alter.”

**Comments on Text Supporting the Key Messages:**

- KM 19.1: We have expanded the discussion in the “Adaptation” section to include economic conditions when adaptation is likely to occur. We have also added estimated costs and benefits of existing adaptation investments.
- KM 19.3:
    - We have added citations to both Chan and Wichman (2022) and Gellman et al. (2022), noting that climate impacts to recreation have both negative and positive benefits, and have included the Chan and Wichman results in Table 19.1.
    - While we agree that many regions and groups already see diverse levels of personal and food insecurity, we feel that our discussion under KM 19.1 highlighting that lower-income households both face greater risks from climate change and have fewer resources available to them addresses this point.

**Comments on Graphics and Boxes:**

- We have re-written the caption to figure 19.1 to include more information about where the data in each panel came from and how it was processed to create the figure. We have also expanded the figure’s metadata to be more descriptive.
- We have re-written the caption to figure 19.2 to include more information and description, including cross-referencing chapters 20 and 22.
- We have re-written the caption to figure 19.4 to clarify that the numbers used are illustrative. We have also added citations to the caption to identify the sources of the methods illustrated.

- We have corrected the conflation between RCP4.5/8.5 and degrees of warming in Table 19.1. We are working with TSU to address further aesthetic concerns and make the table more readable, including making the icons more readable, incorporating a key for the icons, and presenting multiple scenarios more clearly. These edits will not be incorporated until the final version of the chapter. We view the presentation of Table 19.1 as 3 joint panels as scientifically important, as our intention is to show both the breadth of known projected climate impacts as well as highlighting areas for future research. We thus will keep the table together, rather than breaking it up into panels.
- We have added specific examples to Box 19.1.

**Comments on Equity and Justice:**

- Given how general and high-level our introduction is, we have elected not to include equity and justice framing in the introduction.
- Results on the unequal impacts of heat mortality and public health are displayed in figure 19.2, now with expanded discussion in the figure caption. Unequal impacts on air quality across regions are displayed in figure 19.1.
- We have expanded the Economic Vulnerability and Inequality section under KM 19.1. Changes include referencing unequal air quality impacts discussed in KM 14.3, referencing unequal health impacts as discussed in KM 15.2, adding further citations, and mentioning gaps in the literature.
- We have determined that including discussions of intergenerational and distributional equity as they pertain to the social cost of carbon are beyond this chapter's scope, though the chapter text acknowledges the important "analytical and ethical judgements used in its construction". Similarly, addressing the distributional consequences of transitioning to a zero-carbon economy is outside of scope as noted in the Introduction.

**Comments on Literature Cited:**

- We have added various citations in response to NASEM's review and to public comments. The vast majority of these were published after NCA4.

**Other Recommended Changes:**

- We have clarified in the introduction that this chapter does not address mitigation.
- We have added a reference to the Fed's 2020 financial stability report as well as a note about abrupt price adjustments.
- We reference the Focus on Risks to Supply Chains in several places throughout.
- The Strategy to Develop Statistics for Environmental-Economic Decisions will develop data to enable new science that can be included in future NCA reports. Due to the preliminary state of the Strategy, we have not included it in our chapter.

# 20. Social Systems and Justice

**Narrative summary response:**

The author team thanks the NASEM reviewers for their comments and have substantially reorganized the chapter in response to their concerns. The two most significant changes to the chapter were in reference to two comments. The first was that the key messages were inconsistent and unclear. We have reorganized our original six key messages into three more straightforward key statements. These new key messages highlight how social systems structure climate change drivers, impacts, knowledge, communication, and justice. They are straightforward and inclusive of the vast social science literature on climate change. The second comment was that the chapter should be written in less technical language. We have revised the language within the chapter to better meet the goals of the NCA to appeal to a wide audience.

**Comments on Chapter Introduction:**

NASEM reviewers asked that the introduction do a better job of providing relevant context and background information. Because this is a new chapter, the introduction now introduces the concept of social systems and why this research is a critical part of climate change science. Additionally, the NASEM reviewers asked us to include a list of the disciplines that we are drawing from. We do this, and believe it provides a critical insight on the disciplines that we draw on in the chapter.

**Comments on Key Messages:**

**KM 20.1** is now made up of what was previously KM 20.2 & KM 20.3. We have added NASEM's suggestion to better discuss the relationship between local, state, and federal governance structures. We have also added a figure that better describes the complexity of governance. We have also better aligned how governance influences climate impacts and climate change drivers.

**KM 20.2** is now made up of what was previously KM 20.1 and KM 20.4. We have changed the paragraphs on epistemology significantly, including the last paragraph. The section has been revised to avoid policy prescription. There were no comments from the NASEM reviewers on KM 20.4

**KM 20.3** is now made up of KM 20.5 and KM 20.6. NASEM reviewers had no comments on KM 20.6. We have significantly revised the section on migration to include many references and examples of social systems that structure migration decisions. We have also noted the many ways climate change-related disasters intersect and drive migration and mobility. There is also some qualification between planned retreat and climate migration.

**Comments on Traceable Accounts:**

Traceable Accounts were significantly rewritten. Most critically we made changes to qualify confidence statements. Additionally, the reviewers had a comment that KM 20.1 over-relied on examples from Indigenous communities. While we continue to lean on examples from Indigenous communities when thinking through co-production of knowledge and epistemological assumptions, we focus on other overburdened communities throughout the rest of the chapter.

**Comments on Graphics and Boxes:**

NASEM reviewers felt that figure 20.2 was not effective. While it is simple, the authors decided to keep the figure as a simple rendition of how to improve climate change communication. Reviewers felt that figure 20.3 (now 20.4) suggested that migration would exacerbate injustice. We have redrawn the figure to better focus attention on the fact that migration may lead to justice or injustice – depending on context and governance.

**Comments on Equity and Justice:**

NASEM reviewers commended us on keeping justice as a core concept. They did ask us to include intergenerational justice, which we have identified in figure 20.1.

**Comments on Literature Cited:**

NASEM reviewers did not think the chapter represented the “breadth of knowledge on human systems and justice in relation to climate change.” We saw this comment as accurate, and thought provoking to the author team. We added more clarifying language in multiple places of the disciplines we were covering. We additionally tried to broaden the key messages to capture some essential findings from the social sciences. Finally, the author team has talked extensively about our own limitations for covering “the breadth of knowledge on human systems,” and are happy to see the NCA grow to include more specific chapters on key parts of human systems.

# 21. Northeast

**Narrative summary response:**

The Northeast chapter authors appreciate the thorough and thoughtful comments from NASEM. In response, our authors added additional detail with significant revision to the structure and content Key Message 21.1; some requested changes were addressed by cross-citation with Chapter 2. Authors ensured that each use of the term “mitigation” that does not refer to “greenhouse gas mitigation” is modified appropriately to reflect “hazard mitigation” or “heat mitigation,” which are terms used in the literature and by federal funding programs described. We suggested adding “hazard mitigation” to the NCA5 glossary, given its specific meaning in FEMA programs and the Stafford Act. Additionally, authors looked for opportunities to include agriculture with some limited content added. The authors also revised Traceable Accounts. The captions will continue to be improved. Although not all the suggested citations could be accommodated, the entire list was reviewed by our team and strategic inclusions were made when possible. Where possible, additions were addressed by cross-referencing other chapters; new citations were included, particularly with KM 21.5.

**Comments on Chapter Introduction:**

- The authors agree that the chapter introduction was too subtle in introducing the content of the chapter. The final two paragraphs of the introduction will be edited for length to accommodate the added paragraph outlining the key messages of the chapter.

**Comments on Key Messages:**

- The authors looked for opportunities to increase the discussion of mitigation in the chapter and cross-referenced other chapters when available.
- The author team considered when likelihood statements could be added, but in consulting with several other chapters on mitigation and adaptation progress determined that assigning likelihoods to mitigation and adaptation actions is premature, especially recently enacted actions that will need years to decades to evaluate success.
- The authors will continue to look for opportunities in the drafts to condense the length of KMs 21.1 and 21.2 while also adding the additional content requested for those key messages. Better cross-referencing was helpful, but refinement will continue.

**Comments on Text Supporting the Key Messages:**

- **KM1:** Impacts of extreme heat added. Consulted with Chapter 2 authors and have not found recent research suggesting extreme heat itself (not the impacts) in the NE is increasing more than in other regions.
- **KM2:** Modified text to use “climate change” instead of “warming” in the ocean acidification sentence. Clarified connection between oxygen loss and nutrient enrichment by linking it to algae production. Removed the word “mitigation” and replaced it with “to reduce potential climate change impacts”.
- **KM3:** Accepted reviewer suggestions on word choice. Added additional references on redlining, including context on the racial basis for redlining. Updated language to avoid deficit framing and be more intentional about disproportionate impacts.

- **KM4:** Added text describing context is to provide direct decision support to practitioners and policymakers rather than a traditional lit review. Inserted text in Box 21.1 to explain focus on mid-sized cities, but included references to Boston, NYC, and Philadelphia climate action plans. Included new paragraph discussing RGGI. Included reference to the NYS Environmental Bond Act in Table 21.1.
- **KM5:** Corrected lack of citations in first two paragraphs. Added discussion of finance access and how stacked finance improves the sharing of both burdens and benefits from climate finance. Added discussion of land trusts in public financing section.

**Comments on Traceable Accounts:**

- All Key Message teams continue to add citations which influenced confidence and likelihood statements are included in their Traceable Accounts during the final rounds of revisions. Discussions expanded to support the confidence and likelihood statements.

**Comments on Graphics and Boxes:**

- Authors are continuing to refine the captions. Authors will continue to work with TSU to address graphics quality and ensure that captions clarify ambiguity.

**Comments on Equity and Justice:**

- **Introduction:** for space, additional framing was not added in favor of more clearly outlining the roadmap of the chapter. The authors focused attention on improving equity and justice framing within key message text and cross-referencing other chapters.
- **KM5:** Added sentence discussing historical lack of flood data for Tribal Nations and organizations and disadvantaged communities and linked this to flood insurance discussions in KMs 16.1 and 20.5. Added sentence describing affordability issues in flood insurance and linked to flood insurance affordability discussion in KM 9.3.

**Comments on Literature Cited:**

- **KM4:** Added citations: RGGI coverage (Yan 2021); NYS Environmental Bond Act (State of New York, 2022b); suggested citations (Molino et al., 2020; Powell et al., 2019; Reckien & Petkova, 2019).
- **KM5:** Added citations: private sector needs for climate financing (Tall et al 2021); need and benefits of finance stacking (Hyman 2022; Heuberger & Stadelmann 2021); access to private capital for climate mitigation and adaptation (Shi & Moser 2021); limitations of FEMA flood maps and lack of data around Tribal Nations and disadvantaged communities (GAO 2023); NFIP policy limits vs. median value of existing homes (FEMA 2022d; National Association of Realtors 2023); increased flood insurance offerings from private insurers (Frank 2019); public vs. private infrastructure funding (Congressional Budget Office 2020); role of land trusts (Levitt and Navalkha 2022).

**Other Recommended Changes:**

- The authors addressed the recommendation on limitations to assessing updates since NCA5 through the Appendix A line corrections.

# 22. Southeast

**Narrative summary response:**

The Southeast author team would like to thank the NASEM panel reviewers for their thoughtful and helpful comments on our Third Order Draft. We have made numerous changes in response to these comments, including (1) improving the writing consistency throughout the entire chapter by seeking to reduce jargon where possible; (2) improving the communication around our confidence and likelihood statements throughout the chapter as well as in our Traceable Accounts; and (3) including more discussion on natural climate variability as well as climate stressors unique to the Southeast in our chapter. We have also revised all of our Key Messages to be more animated, punchy statements instead of overview titles. Throughout our chapter, we have found new ways to cite other topic and regional chapters' content where applicable to deepen our conversations around equity and harm to Southeastern livelihoods and landscapes. Lastly, we have made more explicit that the Southeast's infrastructure undergirds several of our Key Messages' content areas and that it is uniquely at risk from climate change threats, formally building on messaging presented in the NCA4. There are some instances where the author team has elected to reject the NASEM review's suggestions on the basis that 1) the suggested edit was already incorporated into the narrative as part of our public comment revisions or 2) the author team deemed the existing text or narrative sufficiently rigorous and complete with respect to the NASEM comment.

**Comments on Chapter Introduction:**

- All regional chapters will now include maps that describe the region's geographic boundaries at the outset of the narrative.
- Where appropriate, we have included citations to the Climate Trends chapter (2) that deal explicitly with the reversal of cooling trends within the region. We have retained our previous focus on increasing knowledge of climate stressors since NCA4.
- We discuss infrastructure risks due to climate change throughout our chapter, and have retained our original text here.

**Comments on Key Messages:**

- We have made changes to the KM titles as suggested. New titles are listed below:
  - KM 22.1 - Regional Growth Increases Climate Risks
  - KM 22.2 - Climate Change Worsens Human Health and Widens Health Inequities
  - KM 22.3 - Climate Change Disproportionately Damages Southeastern Jobs, Households, and Economic Security
  - KM 22.4 - Agriculture Faces Growing Threats, but Innovations Offer Help
  - We have also standardized the inclusion of likelihood and confidence statements across our chapter's KMs.

**Comments on Text Supporting the Key Messages:**

- We have edited our KM 22.1 to better align the text of the KM to the evidence and data provided in the proceeding narrative.

- We have also edited KM 22.1's main text to better align with references to Ch. 31 (adaptation).
- We have expanded our discussion on co-benefits of health adaptations to climate change supporting KM 22.2
- We have edited KM 22.3 to include likelihood statements where appropriate and replaced "marginalized" with "frontline" communities.
- We have added references to recreation where appropriate in our discussion of KM 22.3.

**Comments on Traceable Accounts:**

- We have substantially updated our Traceable Accounts to better match TSU/USGCRP guidance and explain the how and why of our assessments of likelihood and confidence.

**Comments on Graphics and Boxes:**

- We have rejected the suggestion to remove Figure 22.5 as many of these techniques are being used by SE communities to build resilience and adapt to climate threats.
- We have worked with the Air Quality chapter to better understand and describe the projections and meaning of Figure 22.10.
- We have significantly updated our explanation of Figure 22.16 to be more explicit about range of values, reorganized the plots, and sought to walk the reader through the implications in the caption.

**Comments on Equity and Justice:**

- We feel that additional definitions that need to be added to reflect the reviewers' comments would increase a considerable amount of text as well as break up the flow of our narrative, which we feel isn't necessary to communicate the several injustices experienced by residents of the Southeast. We have, where possible, referenced the social systems and other chapters which provide additional equity and justice frameworks and information throughout our narrative.

**Comments on Literature Cited**

- We have updated several references in our narrative to mostly reflect those publications since NCA4, and have updated our discussion of hurricane responses to reflect the most up-to-date publications including those for Ian (2022).

**Other Recommended Changes**

- Where appropriate, we have edited our narrative to provide particularly important climate impacts results related to infrastructure, largely in our KM 22.1 and 22.3.
- We have added a mention to hypoxia in our KM 22.2 and KM 22.3.
- Our third order draft did include discussions of sea-level rise impacts including salinification of groundwater. We have added additional focus to other communities in Florida as well as the Gulf coast.

# 23. U.S. Caribbean

**Narrative summary response:**

Thank you for reviewing and commenting on our US Caribbean Chapter. Below are our responses to NASEM's suggestions and recommendations. We also outline how we further clarified our chapter content.

All NASEM comments were discussed in depth with authors during our weekly meetings. Working groups responsible for co-leading the narrative in each key message also had discussions and came to agreement regarding edits to make in response to comments. In some specific cases, these comments were discussed with other NCA5 chapters to coordinate messages, language, and narrative accordingly. We searched for clear and actionable information to improve the US Caribbean chapter. Our team used different communication strategies to address all these comments such as exchanging emails, virtual meetings with other Chapter Leads, and meeting in-person during the All-Authors meeting in DC April 3-5, 2023.

**Comments on Chapter Introduction:**

- Authors discussed the NASEM request to include a brief statement noting topics that are not covered in the US Caribbean Chapter. However, because this request would require adding more text to the narrative or significantly modifying the original structure of the chapter, we decided not to make this change.

**Comments on Key Messages:**

- Infrastructure
    - KM title was updated and modified based on NASEM comments.
    - As suggested by NASEM, authors decided to delete Figure 23.11 and modify the text accordingly.
    - Authors made the corresponding changes to update the text requested for Figure 23.10.
    - Figure 23.10 was modified to reflect flooding and potential effects to coastal PR infrastructure. References were also inserted.

- Health
    - We agree that the title could be more explicit. Our team reviewed the titles suggested by NASEM and TSU and agreed to modify the title to make a clearer statement.
    - NASEM suggested adding one reference; however, after reading the paper, our team believes the reference suggested is not appropriate for this KM.
    - Citation for Figure 23.4 was added to the narrative.

- Food and Water

    - We agree that the title could be more explicit. Our team went over the titles suggested and proposed a new title to reflect the focus of the KM and the narrative.
    - Please visit our Chapter to see the updates.

- Planning and Adaptation
    - We agree that the title could be more explicit. The authors considered this comment and made some modifications to the title.

- Ecology and Biodiversity
    - We agree that the title could be more explicit. The authors considered this comment and made some modifications to the title.

**Comments on Text Supporting the Key Messages:**

- N/A

**Comments on Traceable Accounts:**

- The traceable accounts for each key message have been updated with references in response to NASEM comments.

**Comments on Data and Analyses:**

- Our team did not receive any comments on analyses; however, we did receive comments on data.
- The US Caribbean are undeserved territories where, in most cases, there are insufficient data and information available. We have included all information currently available to the author team. We also added a box about missing data in the region.

**Comments on Literature Cited:**

- Some new literature was included.

# 24. Midwest

**Narrative summary response:**
Authors thank NASEM for their expeditious evaluation of the Midwest Chapter and NCA5 report. Authors are pleased that the committee found the framing around risks, impacts, and adaptation/mitigation effective. The team deliberated the suggestion to change the word “risk” as a subtitle within our key messages but decided to keep it as it is a widely used and accepted term in the literature on the impacts of climate change. Authors made additional cross-chapter references to link closely with sector chapters. With a stronger focus on green infrastructure, our built environment key message title aligns well with the full report. Additionally, authors refined text to increase cross referencing to other chapters (i.e., Ch. 2 and 3) that utilize the IPCC scenarios detailed Appendix 3 and make additional distinctions between natural variability and human attribution where appropriate. Finally, the usage of *natural climate solutions and climate-smart agricultur*e, is largely discipline dependent. Those focused on natural resources and ecosystems tend to use *natural climate solutions* while agriculture has quickly adopted (yet are still defining) *climate smart*. We have incorporated the distinction in the introduction in the way that we utilize them, leaving formal definitions of these two terms to the report's glossary.

**Comments on Chapter Introduction:** Authors revised the Introduction to connect with sector chapters and made equity justice more prominent throughout the introduction. The Introduction now highlights outcomes associated with the key messages in a way that should aid the reader in understanding the approach taken for the Midwest and entice continued reading.

**Comments on Key Messages:**

- Agriculture: Authors adjusted key message to refine likelihood and confidence attribution and added additional topics addressed in the body that speak to the complexities between climate change and agricultural impacts.
- Natural Resources: Authors made no change to the key message text.
- Health and Community Well-being: After thorough discussion with the Health Chapter, the key message was changed to refer to individual and community health.
- Built Environment: Authors made no changes to the key message text.
- Water: Authors made no changes to the key message text.

**Comments on Text Supporting the Key Messages:**
**Agriculture:** Authors refined the complexities between climate change and agriculture and reevaluated where emphasis could be placed on natural vs human influence. Specialty crops information was adjusted slightly, though the team suggests in traceable accounts that more work is needed. Discussions on biofuels and animal livestock has been expanded and authors have added additional potential climate-smart strategies including agroforestry.
**Natural Resources:** Authors carefully revised statements on climate change increasing the odds that impacts will occur (e.g., ice loss) and referenced other key messages and chapters throughout the report. Information on Midwestern grasslands, peatlands, and forests was added. Additional language and references on future projections and warming conditions for

ice-covered lakes and winter recreation we added since authors agree this is a priority for the Midwest and helps weave the story of the Great Lakes throughout the chapter as well.
**Health:** Authors collaborated closely with Health Chapter authors to refine how community well-being should be discussed. It was decided to use the terms individual and community health, and this chapter follows the national lead in that regard. The team highlights examples of other sectors outside of Health that have a role in addressing climate impacts on the social and environmental determinants of health that are inherent in a broader framework of health.
**Built Environment:** Authors refined Midwest specific economic impact values where necessary. Electrical infrastructure and expansion of renewable energy across the Midwest landscape were bolstered. Discussion on green development and further enrichment of this topic was added to the body and made prominent in the key message title.
**Water:** Authors discussed pulling all Great Lakes materials into a box versus keeping the integrated approach. Authors deemed that former would break the flow and logic of other sections. Authors bolstered Table 24.1 to refine the status of the Great Lakes and include additional indicators, expanded discussions and citations on the Great Lakes, and increased cross chapter references to the Great Lakes in other parts of the report.

**Comments on Traceable Accounts:**
Authors have added key citations where appropriate.

**Comments on Graphics and Boxes:**
The team has received clearance on all figures and have added information to captions and are confident they help convey the key messages and weave together the chapter text.

**Comments on Equity and Justice:**
The authors have made equity and justice connections more prominent in the Introduction. Terminology has been refined to be specific with Chapter 2. As for consistency throughout the Chapter, a lack of information on climate and agricultural impacts to BIPOC communities has been noted in the traceable accounts, but the authors have discussed equity and justice issues as they pertain to individual and community health, urban centers, and low income farmers.

**Comments on Data and Analyses:**
Authors refined language where references to projections of hazards on biophysical indicators could be made and included additional statements to support assessment.

**Comments on Literature Cited:**
Authors added citations in response to review including in the Traceable Accounts.

**Other Recommended Changes:**
Authors have noted additional connections to other regions and chapters in the report, refined the complexities and attribution of human influence, and added statements in the traceable accounts regarding where knowledge gaps exist.

# 25. Northern Great Plains

**Narrative summary response:**
The authors would like to thank NASEM for the thorough and helpful review of our chapter. We appreciate your acknowledgement of text quality, attention to current developments, and balance of positive and negative aspects in the narrative. We have rewritten our key message titles as short statements, carefully balanced detail and breadth, and edited where needed. We identified opportunities to bolster our treatment of mitigation and reframe how energy transitions are occurring, however we believe that we adequately cover this topic appropriately for our region, with significant attention to mitigation in KM 3 and 4. We do not see a conflict with other chapters, rather there is a difference in the focus we have as a regional chapter. We have been unable to locate literature on emergent technologies (ex. carbon sequestration/storage) that we could integrate for this region, although we expect it will be a topic for NCA6. We have addressed specific language concerns, added cross-referencing where appropriate and significantly improved our traceable accounts.

**Comments on Chapter Introduction:**
- We have added a sentence to define the states within our region.
- We have added a sentence to address the distinction between natural variability and climate change in the introduction.
- We decided not to reorganize the introduction to parallel the sequence of key messages. Given the multiple reviews we have received, our decision not to reorganize was based on a tension between this comment and significant edits of vetted text. We did add a guide at the end of the introduction to introduce our key messages and sequencing.

**Comments on Key Messages:**
- Our region has inherent natural variability and is experiencing climate change. Our KM's address the impacts of climate change. This is most relevant to KM1, which described increased extremes. We use "unprecedented" and "rising temperatures" to show this is due to climate change.
- Each KM title has been rewritten as a short informative statement (see text).
- KM 25.3 We have reframed the key message text to state "drive shifts away from fossil fuel sources" to acknowledge that this movement isn't only to renewable sources. We have attempted, but are unable to find literature assessing the viability of CCUS in our region. We expect this to be a topic for NCA 6 as assessment catches up with deployment. We have considered the concern about lack of alignment with other chapter's KMs but we feel like our message is aligned but focused on a different scope and scale. We have cross-referenced to relevant chapters where appropriate.
- KM 25.4 This key message does address mitigation, but through the lenses that are actively used and accepted in policy discussions in the NGP region. Our primary intention in this KM was not to highlight mitigation, and we feel that the suggested shifts would compromise what we see as the most critical issues that this region is facing. Mitigation has not been a focus of this region and little supporting science exists to assess mitigation efforts for us to justify adding this to our key message.

**Comments on Text Supporting the Key Messages:**
- KM 25.1 We adjusted the text to focus on how increased temperatures will lead to increased evapotranspiration. We chose not to focus on the nuances of evapotranspiration across the region, but did add a sentence in the caption of Figure 25.4. We agree that the trend in increased corn production is important, however this shift is due to a suite of reasons and not just climate change. In addition, most of these

shifts happened before the focal period of this assessment and were covered in the prior NCA4.
- KM 25.3 We have shifted the language of the KM to be more specific and accurate, and we have added some key citations of how mitigation policies are impacting energy-dependent livelihoods.
- KM 25.4 Please see response above to KM 25.4 Key message. We have reframed sub-headers to reflect our two primary tensions: 1) navigating barriers to mitigation and adaptation and 2) land use conversion. We feel like these accurately represent the themes in tensions/tradeoffs that we see in this region.
- KM 25.5 Adaptation in the energy sector was not a focus of this KM. We have added the citations and information we could to KM 25.3, where it was a more logical fit.

**Comments on Traceable Accounts:**
- Authors have significantly improved this section and added specific references to support each confidence and likelihood statement.
- Citations were added where needed in the summary text if used in traceable accounts.
- The paragraph related to productivity originally in KM 25.1 was moved to KM 25.3 due to better flow with this content and citations were added.
- Mental health discussion was revised to carefully frame in terms of national and regional implications. This is also addressed in the traceable accounts.

**Comments on Graphics and Boxes:**
- Changes to graphics and boxes were made as suggested except when noted below. [Slash was added to 25.1, state boundaries were added where needed, changes to 25.3 (now 25.4 caption), request for change from brackets to lines (25.3--now 25.4), changes to caption of 25.6 (now 25.7) added counties and figure 25.10 (now 25.11) caption was changed and moved.]
- 25.5--now 25.6 We chose not to make this change because we felt the difference would be most important to readers.

**Comments on Equity and Justice:**
- We have added framing of equity and justice-related issues in the introduction as well as vulnerable populations and systemic context and cross-references where needed.
- We have added some information about the vulnerability of energy-sector livelihoods.
- We feel we have integrated information about vulnerability of low-income rural communities throughout.
- We have checked our narrative to make sure we are utilizing consistent language across and have added cross-referencing where possible.

**Comments on Literature Cited:**
- We have revised the water rights discussion in “Adaptations to Agriculture” and have clarified use of the Charnley reference in the “Navigating Barriers” section.
- We have added clarification where needed to distinguish national vs regional trends.
- We have supplemented the water quality section with newer references, but have kept some of the older ones that are still relevant.

**Other Recommended Changes:**
- We have added transitions where needed and edited for active voice.
- Our text currently discusses trends, and without significant revision and reorganization we did not feel we should shift the narrative to discuss additional trends

- Justification for our attention to mitigation and corn expansion are addressed in the sections above.
- We cover snowpack in KM1. We could not find recent literature from our region on flash floods and debris flow, but we cross-referenced the fire focal box, which talks about this. There were no recent citations about fire/albedo in our region although this physical process is well established.

# 26. Southern Great Plains

**Narrative summary response:**
Thank you for your accolades. We appreciate hearing that our chapter resonated. We have worked with the Technical Services Unit to update our headers. We have replaced one of the football photos to vary the examples. We have not replaced additional football references in the text, as we know its importance to the region — from rural towns to large cities. We have added content on equity and justice issues beyond Key Message 26.4, which focus on equity and justice. We added more examples related to what tribes are doing but also have referenced Chapter 16 in other parts of the text. We also added text to reference the impact to workers of the transition from fossil fuels to zero and low-carbon technologies.

**Comments on Chapter Introduction:**
- The Technical Services Unit (TSU) has planned to add figures of the regions at the start of each regional chapter. We also added a list of our three states at the onset of our introduction.
- We will be adding a box to highlight new information since NCA4 as well as note topics that will not be covered in the chapter. We have asked the TSU for a replacement figure for Figure 26.1. We will update our text accordingly once we have the new figure. A
- Agriculture is a valuable contributor to the economy of all three states; however, it is not in the top ten sectors (by gross domestic product) in Oklahoma or Texas, and it is ninth for Kansas. We have chosen not to change our text, as agriculture is featured prominently in the chapter.

**Comments on Key Messages:**
- We have updated titles of all key messages.
- Wildfires were addressed in Key Message 26.5, and they were covered in NCA4. Hence, we have not changed the text to add this content in Key Message 26.1.
- We have added a statement on the distributional impact on those workers who used to work in the fossil fuel industry. Because of space limitations, we have chosen not to add the examples provided for the agriculture sector. This decision was based on the solid overview of the subject, including discussion of the Ogallala aquifer in the Fourth National Climate Assessment.
- Although the reviewers deem football to be a stereotype of the region, we have agreed that its importance should not be understated in the chapter. In particular, the link between climate change impacts and football may bring increased attention to these impacts across the region. The example of relocation of families, as suggested by the reviewers, is not germane to the subject of Key Message 26.3.

**Comments on Traceable Accounts:**
We will work with the TSU to determine if repeating the literature cited in the main text of the chapter should be included in “Major Uncertainties and Research Gaps.”

**Comments on Graphics and Boxes:**
We are working with the TSU to update the graphics, titles, or captions of Figures 26.1, 26.2, 26.4, 26.10, 26.14, 26.17, 26.19, and 26.23.

**Comments on Equity and Justice:**
We are finding additional examples of equity and justice for the chapter. We will reference equity and justice descriptions in other chapters to help tell our story.

**Other Recommended Changes:**
We are attending to the two line-by-line changes noted.

# 27. Northwest

**Narrative summary response:**

Our chapter is grateful to the NASEM Review Committee for providing constructive comments to strengthen our chapter. The NASEM review provided several broad suggestions on how we can improve this chapter and many specific comments on chapter elements and in-line revisions. Our chapter team has incorporated these comments into the chapter.

The NASEM review suggested that the chapter dives deeper into the different ocean-atmospheric dynamics that affect the regional climate of the Northwest. Chapter authors have included additional narrative content in the Introduction that acknowledges the natural variability within the regional climate and climatic patterns, such as in our discussion of atmospheric rivers and sea level rise. Additionally, authors have further built on this topic in some of the specific key messages, such as KM 27.2 on ecosystems, where authors have built upon how these dynamics affect regional ecological systems such as the California Current ecosystem.

The NASEM review also suggested some substantial revisions to ensure that KM 27.4 on infrastructure systems is acknowledging the interdependency of these systems and how they link to planning and design. Authors have added narrative content in the key message's introduction to connect how this is relevant to land-use planning. Additionally, authors have increased connections to demonstrate the interdependency of infrastructure systems. For example, we have added citations that connect how water systems are related to energy systems; or included citations that demonstrate how efforts to electrify transportation systems may increase energy load on energy systems. Finally, we have amended our "Urban Areas" to focus more on housing structures. Finally, the NASEM review suggested our chapter leverages the efforts of other chapters in the NCA. The authors have done an in-depth review and have added relevant cross-references to other chapters whenever relevant.

**Comments on Chapter Introduction:**

The authors decided not to highlight what topics are not covered in this chapter, as that would be extensive and probably exclude topics that authors did not think of. Rather, the authors added language in the introduction that draws parallels on climate change in the Northwest directly to the chapter's key messages. Additionally, a table was added in the Traceable Accounts section that details how this chapter builds on prior NCAs, which could provide insight on why some topics were not covered.

**Comments on Key Messages:**

- All key message titles were amended to be short statements. Not all literature used consistent terms or likelihood framings, and many KMs use a mix of qualitative and quantitative evidence. Thus, authors did not ascribe likelihood language.
- KM 27.2: Authors coordinated with other chapters, such as Forests, Oceans, and Adaptation, and included those cross-references in the narrative text.
- KM 27.3: Authors amended the second statement to reflect NASEM's suggestion.

- KM 27.4: The second sentence was revised to reflect NASEM's review.

**Comments on Text Supporting the Key Messages:**
Chapter authors generally agreed with NASEM's comments and suggested revisions. We have included text revisions to reflect them.

- KM 27.1's text was revised to say "green gentrification" after coordination with Chapter 20: Social Systems and Justice. While the authors appreciated the example provided by NASEM in King County, WA, authors decided to focus on other examples (i.e., rural and Idaho examples) based on public comments.
- KM 27.2 's text was revised to include invasive insect species and climate-mediated migration and dispersal. While the authors agreed that more discussion of regional dynamics – such as how they affect atmospheric rivers – is important, authors deemed that that content was more relevant for the introduction, and thus added the content there.
- KM27.3's text was revised in a few ways. Primarily, we took the tribal examples in our call-out box and integrated into the narrative text in response to NASEM suggestions.
- KM 27.4's text was revised to include how infrastructure impacts could be used in planning and design. We also referenced Figure 27.8 throughout the KM. Additionally, authors refocused the "Urban Areas" section to be on housing, per NASEM review.

**Comments on Traceable Accounts:**
Our traceable accounts were amended to reflect changes in our KM and NASEM comments.

**Comments on Graphics and Boxes:**
Authors have worked with the Coastal chapter to ensure that our SLR projections are consistent with the Sweet et al. (2022) projections, however, we complemented those with the Miller et al. (2018) projections because of local relevance. The authors revised the table to be more legible.

**Comments on Equity and Justice:**
Authors appreciate the acknowledgment of how equity and justice was integrated. Authors integrated cross-references in how different climate change dynamics interact with each of our key messages. Authors believe that the key messages do a comprehensive synthesis of the different dimensions of equity and justice as it relates to their respective topics. Concepts of the dimensions of equity and justice were integrated throughout the key messages; for example, multiple KMs highlight the distributional burden of climate change and a few KMs highlight intergenerational justice and resilience conferred (or not conferred) because of it.

**Comments on Literature Cited:**
Authors appreciated NASEM's acknowledgment of our literature cited. We have added additional literature based on additional comments to support text changes.

**Other Recommended Changes:**
Authors have integrated tribal examples, including federal-tribal examples (e.g., prescribed burning) throughout most of our key messages.

# 28. Southwest

**Narrative summary response:**

We appreciate the NASEM review and helpful suggestions to improve NCA5 Chapter 28. As noted, the NASEM concludes that the chapter meets the requirements of Section 106 of the Global Change Research Act, but with the recommendation to focus on conditions 25-100 years from now, similar to other NCA5 Chapters. The NASEM concluded that the chapter key messages are well written with appropriate supporting details, and the findings are written at the appropriate level for intended audience. In response to the review, we made significant revisions to the chapter to improve flow, clarity, and readability. We improved the coordination with and reference to other NCA5 Chapters that discuss key issues in greater detail.

**Comments on Chapter Introduction:**

- We have revised and restructured the introduction to introduce and prepare the readers for the chapter. We have included new text to recognize mitigation efforts in the region.

**Comments on Key Messages:**

- We revised all KM titles to short informative statements.
- KM 28.2: We include reference to Ch. 10 The Oceans and Marine Resources in the narrative supporting information. We have reviewed likelihood and confidence statements in the Key Message and coordinated with TSU on calibrated language.
- KM 28.3: We revised the KM to address new adaptations or methods and strategies. While the recommendation to address forestry issues in the key message highlights a good example, the authors feel the existing KM is appropriate and adequate. We discuss the specific forestry concerns in the supporting text and cross-reference Chapter 7.
- KM.28.4: We revised the title to reflect the order of topics.
- KM 28.5: We revised the title to note that not all wildfire is undesirable. We have added text to the narrative to address nuances of wildfire in forested vs. non-forested ecosystems.

**Comments on Text Supporting the Key Messages:**

- We revised the wildfire section to address the review comments by reorganizing and strengthening the text as recommended.
- KM 28.2: We added references to Ch. 9 and Ch. 10.
- KM 28.1: We improved coordination with Ch. 4 and included cross references. We revised the KM, supporting text, and Box to clarify the effects of climate change, warming, natural variability, and precipitation on the current observed megadrought and projected changes. We added discussion of extreme flood events.
  KM 28.4: We clarified that disparities in PM 2.5 remain a concern for the health of people living in the Southwest. We emphasized that, while there are currently no heat standards at state or federal level, they would be critical for health adaptation. We revised to discuss increases in flooding risks in the region and its effects on water-borne diseases and access to clean drinking water. While we have already mentioned the CDC program

citated by the reviewer, we added the information that this program is currently available in 10 cities across the country.
KM 28.5: we reorganized this section as recommended. We added several sentences and references to ensure that impacts and trends in non-forested systems of the region are adequately addressed. We did not expand our discussion of public barriers to implementation of prescribed fire in order to stay within word limits. We could not address adaptation to reduce human mortality because we found no research reporting the efficacy of potential policy or engineering innovations.

**Comments on Traceable Accounts:**

- Regarding SLR: The authors have reviewed the recent literature and found that while SLR was suppressed, the current rate of rise for the SW tracks closely with the global average (Hamlington et al. 2021).
- 28.1: We clarified the text and added recommended new citations.
- KM 28.5: In our discussion of Indigenous cultural burning we limited our citations to three works with Indigenous authors.

**Comments on Graphics and Boxes:**

- 28.2: We significantly revised the figure to address the comments.
- 28.5 mention of Delta: we removed from figure; we added mention of SLR threat to water infrastructure in KM 28.1

**Comments on Equity and Justice:**

- KM 28.1: We expanded our discussion of equity and justice for additional frontline communities beyond Indigenous Peoples.
- KM 28.5: We added references to indigenous knowledges.

**Comments on Literature Cited:**

- KM 28.2: After review, the authors decided not to include Wang et al. 2018 given space issues; however, we reference Ch.31 where many of the challenges present for adaptation, including the conclusion taken from this article, are covered in detail.

# 29. Alaska

**Narrative summary response:**
Thank you for the kind words about the chapter. We appreciate the suggestions to provide more context so that readers outside Alaska will better understand what we have written, and have endeavored to add that context where we can.

**Comments on Chapter Introduction:**
We appreciate the concern about the length of the Introduction, but we want to set the stage for the KMs that follow. The guidance we received was to focus on the human or societal aspects of climate change, which is what our KMs do. We felt it necessary, however, to set the climatological context as well as to provide an introduction to Alaska. Additionally, the most updated guidance from USCGRP is that word counts for the introduction will not be enforced. We asked whether it was possible to add a new KM at this stage, and were told no. We do appreciate the kind words about Table 29.1. We have added a mention of previous NCAs.

**Comments on Key Messages:**
We have retained the use of “Our” in the KMs. In trying this out on various readers, we have found that the reaction is positive rather than the exclusion that the NASEM comments feared. We have not included likelihood because that requires a quantitative basis that is lacking for the statements in our KMs. We have revised the KM titles to be short, informative statements that are accessible to broad audiences

**Comments on Text Supporting the Key Messages:**
KM 29.1: These points were also made in the line-by-line comments. We have provided detailed responses there.
KM 29.2: We have looked at how we use the term “communities” and made adjustments where we thought it appropriate. We considered “climate gentrification” but decided that that is too speculative at this point and outside our scope.
KM 29.3: Fisheries are a major part of livelihoods in Alaska so this section reflects that. We have endeavored to bring more balance to this section by adding text on subsistence fisheries. Agriculture is discussed in the “Our Communities” section and tourism (specifically climate impacts on the Denali Park Road) are discussed elsewhere.
KM 29.4: We have added mention of the legal/financial responsibilities for relocation.
KM 29.5: We have added the requested references.
KM 29.6: We have defined security in the opening sentence of this section and reorganized the section to make it clear that we are talking about national, state, and community security.
KM 29.7: Thank you. The topic of complicated governance is now introduced in the Introduction, and has been woven throughout the chapter. We have also added more details to this KM, including more about ANCSA in a figure caption.

**Comments on Traceable Accounts:**
Per guidance also from USGCRP, we have added references to the Traceable Accounts.

**Comments on Graphics and Boxes:**
We are attempting to revise the figures to include scale bars, etc. Other figure revisions are underway, per the line-by-line comments. We have elected to not include an overview map at the beginning of the chapter but have added additional geographic contact to boxes to help readers orient to our large state. We appreciate the kind words about the boxes. We have added some details where possible, but the boxes are also intended to be short, so we cannot expand them much. Other comments have been addressed in the line by line responses.

**Comments on Equity and Justice:**
Thank you. As requested in the line-by-line comments, we have emphasized in the Traceable Accounts the dearth of studies on climate change and racial and ethnic identity other than the extensive work done on and with Alaska Natives.

**Comments on Literature Cited:**
Per the line-by-line comments, we have added citations where needed and included Dannenberg et al 2019 in the text of the health section where we discuss forced displacement inland.

**Other Recommended Changes:**
We address the implications of changes in the fossil fuel industry on the state economy in our "security" section, and we have edited it to make it more clear. We have reviewed the chapter for how we use adaptation and mitigation and made changes where appropriate. We have added a paragraph about mitigation efforts into KM 29.7.

# 30. Hawai'i and U.S.-Affiliated Pacific Islands

**Narrative summary response:**

The author team would like to thank the NASEM reviewers for their thoughtful and helpful comments. We have made numerous changes in response to these comments, including (1) improving our references to other chapters so we are not as siloed in the NCA report; (2) improving our confidence and likelihood statements throughout the chapter and descriptions of Traceable Accounts; (3) better linking the SLR scenarios with IPCC scenarios; and (4) including more discussion on natural variability in our region. We have also renamed all Key Messages as brief, informative statements. A new table figure has been developed in the introduction to help the reader to understand different climate change impacts across the region. This table has each jurisdiction listed as rows, and our five Key Messages as the columns; each cell describes a specific impact that has happened or a change that is expected. We believe this table will help improve equity across our region in that each jurisdiction has a specific example in each Key Message. We have also made new edits to our figures to improve clarity (Figures 30.1, 30.2, 30.3, 30.4, and 30.10). We met with Chapter 2 "Climate Trends" to discuss improving their coverage of our region, and we now can reference Chapter 2 more throughout our chapter.

**Comments on Chapter Introduction:**

- Our introduction now cites Chapters 2 and 3.
- We provided an expanded description of PDO and ENSO, including additional references. We mention longer-term tidal processes and land subsidence as well as emphasize the large role of natural variability in our region. Since NCA4 included a Box on ENSO impacts in our region, we did not want to duplicate this same box in NCA5 – but we refer to it here.
- Our restructured introduction takes inspiration from the Alaska example as suggested.

**Comments on Key Messages:**

- We have made changes to the KM titles as suggested. New titles are listed below:
  - KM 30.1: Climate Change Impairs Access to Healthy Food and Water
  - KM 30.2: Climate Change Undermines Human Health; Community Strength Boosts Resilience
  - KM 30.3: Rising Sea Levels Threaten Infrastructure, Local Economies, and Exacerbate Existing Inequities
  - KM 30.4: Responses to Rising Threats May Help Safeguard Tropical Ecosystems and Biodiversity
  - KM 30.5: Indigenous Knowledge Systems Strengthen Island Resilience

**Comments on Text Supporting the Key Messages:**

- We systematically evaluated our use of the word "will" in our text and where appropriate substituted in confidence language based on our understanding of the evidence base.
- Figures 30.2 and 30.3 are now referenced throughout the chapter.
- We have paid particular attention to improving our citations of other NCA5 chapters throughout our chapter. We now cite Chapters 2, 3, 4, 7, 8, 10, 11, 12, 15, 16, 19, 20, 23, 29,

the *Focus* on Supply Chains, the *Focus* on Blue Carbon, and Appendix 3. We have also added a new box in the introduction to cite jointly with the Caribbean chapter.
- We have removed the phrase “increasingly negatively impact”.
- To address the SLR comments in KM 30.3, we provided a range of timeframes when the specific levels of SLR referenced in the text could occur under a different ITF SLR scenarios (Intermediate and High) described in Sweet et al. 2022. To ensure proper context is included for the ITF SLR scenarios with regard to emissions scenarios, pointers were added to direct the reader to information on the likelihood of the SLR scenarios under different warming levels, which will be presented in Appendix 3.

**Comments on Traceable Accounts:**
- We have ensured that our traceable accounts section directly addresses the statements made in each KM. For each claim we provide additional context, information, and references to better describe our assessment of confidence and likelihood.
- We appreciated the distinction between quantitative (likelihood) and qualitative (confidence) statements, and have made adjustments throughout. In many cases, we deleted the likelihood statements where no quantitative assessments were available.
- The ENSO text in the traceable accounts was moved to the introduction, and assessments of confidence and likelihood for ENSO were added to traceable accounts.
- In KM 30.1 we added “lack of island-specific groundwater models,” which also pointed out which islands do have groundwater models focused on water resources availability.
- In KM 30.3 we added text about the lack of high-resolution topobathymetric information.

**Comments on Graphics and Boxes:**
- To better synthesize the myriad impacts across our diverse and vast region we developed a new table that describes impacts related to each KM across each island region (Table 30.1).
- Additionally, we reviewed each photo throughout the chapter. We are following guidance presented by NCA5 leadership to include photos that are critical for the readers to understand and connect with the text; most readers likely have no connection and may not even know of the existence of many of the places we are discussing.
- We updated Figure 30.3 to address the issues raised by the reviewers, and added two new panels to show SLR under different scenarios for Honolulu and Guam locations.
- We have made the suggested changes to Figures 30.4 and 30.10 and Box 30.1.
- We reviewed our Blue Carbon Box 30.4 and determined that the content is very region-specific, with details not contained in the larger Focus box. We think this information is complementary (not repetitive) and that it makes sense to keep it. We already refer to the larger Focus on Blue Carbon, and we have added a reference to Chapter 8.

**Comments on Equity and Justice:**
- We did a systematic search and removed any instances of deficit language.
- We now specifically reference Chapters 16 and 23. Together with the Caribbean chapter, we have added a new box in the introduction to discuss how historical under-resourcing has resulted in data inequities in our regions.

# 31. Adaptation

**Narrative summary response:**

Thank you for your thoughtful and actionable review. We acknowledge the positive comments received, including the importance of adaptation given changes our climate has already experienced in the U.S. For any NASEM reviews that provided line comments, we have addressed those within the spreadsheet of responses.

We have redeveloped the chapter's Key Messages (KM) as titles consistent with NASEM guidance. To call out the work that assesses the current state of adaptation, we now have a KM synthesizing the state of adaptation in the U.S. per the GCRA Section 106 requirement. We have reworked the formatting, ordering, and use of KM titles throughout the chapter to address the comments related to chapter focus and adaptation urgency. We appreciate the review of the KM findings overall being consistent with the current scientific understanding and timely, rigorous research.

We have chosen not to include likelihood statements because they require quantitative probabilities; in our synthesis of the literature, the author team agreed that qualitative confidence statements were more appropriate given the state of the literature and the current state of data availability and consistency related to adaptation.

We have also worked to create a more hopeful tone in the introduction and throughout the chapter while continuing to emphasize the state of the science, lack of action relative to the magnitude of the problems we are already experiencing and will continue to experience.

**Comments on Chapter Introduction:**

- We have revamped and shortened the introduction considerably to start with referencing Chapters 2 and 3, define adaptation, the urgency, and the many benefits adaptation offers if implemented intentionally and equitably.
- We leveraged the content related to the current state of adaptation previously in the introduction to populate our new KM31.1.

**Comments on Key Messages:**

We have reordered the KM related to priority, given them more descriptive titles, and added a new KM 31.1 to summarize the state of adaptation in the U.S. based on this review:

- **KM31.1. Adaptation is Occurring but Insufficient in Relation to the Pace of Climate Change**
    - We decided that an additional KM at the front end that details the state of climate adaptation in the US was useful based on feedback from NASEM. This KM pulls much of the material already in the original introduction into a cohesive KM and supporting text.
    - We have provided a KM on adaptation progress (now KM31.1); we have not focused it on success as this is a subjective interpretation that is not well supported with the evaluative literature as it exists now. We have highlighted some examples of adaptation progress and discuss adaptation indicators.

- **KM31.2. Adaptation Requires Centering Equity**
    - We reorganized our KMs to reflect the NASEM comments and have placed this equity KM before transformative adaptation given the importance of it but also the flow of our KM titles to better reflect the GCRA Section 106 requirements.
- **KM31.3. Transformative Adaptation is Needed to Address Climate-related Risks**
    - We added an early paragraph that emphasizes that there have been a number of adaptation actions occurring throughout the US but it is not enough and more needs to be transformative. We have also reorganized this section to make this statement clearer, and added lines about why both incremental and transformative actions will need to increase in future.
- **KM31.4. Effective Adaptation Governance Empowers Multiple Voices to Navigate Competing Goals**
- **KM31.5. Adaptation Requires More than Scientific Information and Understanding**
    - This KM (previously KM 31.4) has been significantly rewritten to address the unintended interpretation that these services are only appropriate for well-resourced communities and emphasizes that such services for adaptation are more than science and technical services. See below for details on the revision of this KM.
    - We decided given the timeliness of the Fast-track Action Committee (FTAC) report on climate services and other contemporary literatures, that this was an especially important time to include a KM that adequately reflects the authors synthesis of the research and review of the FTAC report. KM 31.5 was revisited given the comments provided in the text supporting KM below. Other chapters have also indicated an interest in cross referencing this section in their chapters to support their syntheses.
- **KM31.6. Adaptation Investments and Financing are Difficult to Track and Likely Inadequate**

**Comments on Text Supporting the Key Messages:**

Below we provide responses to each KM given the original KM numbering in NASEM review.

- **KM 31.1:** We have reworked KM 31.1 to better tie across chapter KMs. As noted above, this KM is now KM31.3. The KM title has been edited to help strengthen
- **KM 31.2:** We have kept the KM on equity early in the chapter and the synthesis of the evidence (we moved it up further in the chapter). Every paragraph now contains one or more specific examples of the issues, concepts, or approaches described. Because of the lack of evidence for quantitative and probabilistic statements, likelihood statements have not been used in the Adaptation Chapter. We have removed the unintended policy prescriptive language here and throughout the chapter.
- **KM 31.3:** We appreciate the comments related to this section. Because of the lack of evidence for quantitative and probabilistic statements, likelihood statements have not been used in the Adaptation Chapter. We have revised the “medium to high” confidence to “medium” to reflect the current level of agreement in the literature regarding collaboration’s ability to overcome inequitable access.

- **KM 31.4:** The KM on climate services has been significantly rewritten to address the unintended interpretation that these services are only appropriate for well-resourced communities and emphasizes that such services for adaptation are more than science and technical services.
- **KM 31.5:** The first section of KM 31.5 (economics and financing) has been reorganized and rewritten to incorporate more principles of risk-based framing, particularly within the context of determining how and when to invest. We are planning to add more content from the literature on the risks/costs of inaction for the next draft.

**Comments on Traceable Accounts:**

- We are revising our traceable accounts to be more consistent and use confidence statements to describe the degree of scientific consensus and understanding.
- The ordering of traceable accounts has been fixed to be consistent with the updated key messages, and we fixed the incorrect numbering.

**Comments on Graphics and Boxes:**

- Figure 31.1 will be updated to reflect a thorough QA/QC and final numbers from the sources cited.

**Comments on Equity and Justice:**

- We reorganized our equity KM and placed it immediately after the first KM on the state of adaptation science, integrated equity across our entire chapter, and we further cross-reference other chapters where possible.

**Comments on Literature Cited:**

- We have prioritized citations of contemporary literature in the chapter and appreciate the acknowledgement of an appropriate review inclusion of literature for the NCA5.
- Where there are seminal papers where fundamental concepts are critical to cite (e.g., pg 31-44, line 2) and source our content, we kept these in.
- For the new KM 31.5 (previously KM 31.4) on climate services, since the public release of the draft NCA5 there have been several key climate services papers and reports that have been released that further allow us to reference the most up-to-date literature in this field.

# 32. Mitigation

**Narrative summary response:**

The authors very much appreciate the thoughtful and constructive comments from the NASEM reviewers. We have carefully considered each comment and suggestion, and have made substantial changes to the key messages, supporting text, and figures in response. In general, we have sought to ensure the key messages are not overly simplified, include more detail in the traceable accounts, remove jargon, include in-text definitions and context of concepts and terms that may be unfamiliar to the public, and to make clear the timescale of mitigation consistent with national goals. On this last point, the revised text clarifies the policy-consistent timelines and relationship of cumulative global emissions and level of global warming, but mitigation will be cost-effective and beneficial whether we reach net-zero $CO_2$ emissions in 2050 or 2080: Faster is better but later is better than never.

**Comments on Chapter Introduction:**

- In response to the NASEM comments, we have reordered the sentences to first define mitigation in contrast to adaptation, followed by a straightforward statement of the timescale to reach net-zero emissions that is consistent with the international goal of avoiding 1.5°C.
- Taking NASEM's suggestion, the revised introduction also includes a brief summary of the chapter's key messages.

**Comments on Key Messages:**

- **Key Message 32.1.** After careful consideration of NASEM's suggestion, the key message title remains as originally written. Adding details of timing reduces the punch considerably, and implies that "Successful Mitigation" should be narrowly defined as the US reaching net-zero $CO_2$ emissions in the same time frame as global emissions would need to meet Paris goals. However, as mentioned above, we prefer a broader and perhaps less prescriptive definition of success. The message itself is very clear about the rate of annual reductions and timing of net-zero to meet national and international mitigation goals.
- **Key Message 32.2.** Despite NASEM approbation, we have revised the message (not the title) in an effort to make our points more clearly.
- **Key Message 32.3.** Although we understand the NASEM's suggested edits to the key message title, we again demur. Although further work is necessary for us to understand which options will be most helpful to reaching net-zero emissions, there is little question that we could reach net zero (in a sub-optimal way) without such exploration. Also as with KM 32.1, we philosophically object to wordy, heavily-caveated key message titles for the public audience, and prefer to express important nuances in the following message. Thus, we have further revised the message to make clear the purpose of exploring options. The revised message also applies calibrated language to specific phrases, as suggested.
- **Key Messages 32.4 and 32.5.** No critical comments, and only very minor changes.

**Comments on Text Supporting the Key Messages:**

- We again thank the NASEM for their review, and comments that have undoubtedly improved the revised text.
- In response to the comments, we have revised the reported numbers for the US forest carbon sink and other land-related emissions, drawing from the most recent EPA inventory (2023) and reconciling our explanation of the trends with the Chapter 7 (Forests) and recent literature. We appreciate the NASEM call-out of our unclear interpretation and have deleted all text regarding “agricultural abandonment.”
- Related to the prior point, we do discuss the need for ongoing and improved monitoring of the forest sink, and cite some recent literature about novel monitoring techniques—and record boreal wildfire emissions in 2021.
- The revised text includes the suggested reference to Schaeffer et al, 2020, and explicitly notes the need to maintain emissions at net-zero or net-negative in the future. Relatedly, we also note in the traceable accounts that there is a paucity of literature on this topic.
- We now include a bit more discussion of water required by various technologies as well as supply chain concerns, including new references to the literature and relevant executive orders.
- The Paris Agreement is now defined on the first page of the chapter, and discusses the IRA and other recent legislation and rulemaking in KM 32.5.

**Comments on Traceable Accounts:**

- As noted above, the traceable accounts have been substantially expanded, and include extensive references to relevant literature and datasets.

**Comments on Graphics and Boxes:**

- We very much appreciate the NASEM’s detailed comments here and have endeavored to make all the suggested changes.

**Comments on Equity and Justice:**

- Equity and justice are now introduced in the chapter introduction.

**Comments on Data and Analyses:**

- We have reconciled reported numbers of land-related emissions and sinks with the latest EPA inventory and Chapter 7 (Forests).

**Other Recommended Changes:**

- We now briefly mention solar radiation modification in the CDR box (32.2), with a reference to the NASEM report of 2021.
- We also mention pending SEC rules around corporate reporting and a number of the related challenges for science and GHG accounting practices.

# FB1. Compound Events

**Narrative summary response:**

We thank the NASEM Committee for the thoughtful feedback and comments. We have edited the title, incorporated a discussion equity in the introduction and have provided more specific examples of compound events, where possible. We also thank the committee for sharing references that we had missed.

**Comments on Key Messages:**

- Given the limited length of the Key Message, we have edited the introduction to emphasize the challenges in defining compound events.
- We have changed the titled to Compound Events.
- Confidence and likelihood statements have not been changed because of the format of the CCB that do not include calibrated language.

**Comments on Text Supporting the Key Messages:**

- In bullet point 3, we now state that “simultaneous megafires across multiple western states and a record number of back-to-back Atlantic hurricanes in 2020 that contributed to unprecedent demand on federal emergency response resources”. We have expanded on how disaster response is strained in the “Impacts of Recent Events” section”.
- We have added a discussion of hydroclimate whiplash under the modeling section, with references to Swain et al. 2018.
- The additional example of the increased wildfire risk from the compounding of wet years followed by dry years has not been included due to space constraints.

**Comments on Traceable Accounts:**

- Traceable accounts and number of references for CCB’s are much more limited than for the individual chapters. We have discussed the relevant literature in the supporting text.

**Comments on Graphics and Boxes:**

- The figure has been reorganized to incorporate NASEM suggestions. We have made the snapshot a different panel and made changes to the figure structure to add clarity. Caption has also been updated and the figure is referenced in more than just recent examples.

**Comments on Equity and Justice:**

- As recommended, we have added equity and justice language in the initial introduction section.
- Policy prescriptive language has been edited to be non-prescriptive and language has been edited to acknowledge the challenge communities might face in making investments and improvements.

**Comments on Literature Cited:**

- We have elaborated on the relevance of compound events for first responders, where possible. We have incorporated a reference to Gerlak et al. 2021. However, we could not fit in the other references because they would require additional text. We were also unable to located some of the suggested references eg. Albano et al. 2016 and Toland et al. 2022.

**Other Recommended Changes:**

- The feedback and recommendations have been very helpful in helping us add more clarity to the box. Additional impacts of compound events such as transportation disruptions, access to basic food and water resources, and energy infrastructure. We have also included text to emphasize the water quality impacts of wildfires.
- The impact of events to "*disrupting the ability of utilities and first responders to address the initial impacts and/or to safeguard vulnerable residents of hospitals and nursing homes*" is very important. However, that is not specific to compound events alone and would be relevant to the discussion of flood impacts in general. We were unable to directly include this in the discussion though aspects of it have been added.

# FB2. Western Wildfires

**Narrative summary response:**
We appreciate the NASEM review and helpful suggestions to improve NCA5 Chapter 51. The NASEM review team concluded that the focus feature key message/long title was clear and understandable and at the appropriate level for the intended audience. The NASEM review also communicated that the author team accurately characterized the dynamical system leading to, and associated effects of wildland fire and western socio-ecological systems. Consistent with input from the public review, the NASEM review team suggested a major revision to the figure of this focus feature. The western wildfires author team initiated a request to update the figure with TSU before the NASEM formal review and expect to have an update within a reasonable period of time. Yet in response to the review, we increased content and made other revisions to the chapter to improve flow, clarity, and readability. We improved the coordination with and reference to other NCA5 Chapters that discuss key issues related to wildfire in greater detail.

**Comments on Chapter Introduction:**

- We included an outline of events and dynamics that have produced an increase in wildfire activity that is chronologically presented.
- We updated the text to note the role of climate change on wildfires in forests vs non-forested systems like those in the intermountain west and southern California. This involved more clearly outlining the associated fire effects in forest vs non-forested systems (i.e. grassland and shrublands) and noted where or what ecosystems are seeing increases in fire activity due to some degree to climate change (fuel driven forested systems) vs due to human ignitions (So Cal shrublands).
- We provided text to communicate expected future projections of wildfire activity in western forested ecosystems, and noted the uncertainty in these projections.
- We noted that reductions in forest cover due to climate driven changes and wildfire will reduce the capacity of some western forest lands to function as carbon sinks.
- We included a statement to communicate that the area burned by high-severity wildfires (e.g., stand-replacing fires) has increased in the West by about eightfold since 1985.
- The chapter provides measures that can protect human health and safety in the final paragraph.
- We updated the language to better articulate the role that electrical grids have had in causing large fires.
- We opted not to comment on what the NASEM review noted as the controversial role that public power shut offs have/translate to for rural and other overburdened communities. The authors felt that this would be an interpretative overstep - and trigger significant policy implications.
- We did mention that uncertainties exist in terms of how climate change is expected to facilitate either the current pace or increase fire activity in the last sentence of the second paragraph. We chose not to expand on the nuance of uncertainties either in terms of climate futures or ecosystem responses because it is first beyond the scope of this focus feature and second more appropriate and currently considered in Ch. 3 – which we included a cross reference to in our text.

**Comments on Key Messages:**

- Per the suggestion of the NASEM review we updated the text of the key message, which is effectively the long title, to be clear that this chapter treats impacts and effects of wildfires in the western United States and not the entire country.

**Comments on Text Supporting the Key Messages:**

- Per above.

**Comments on Traceable Accounts:**

- We have added citations as referenced in the text within the traceable accounts section as suggested.
- We have added several statements around potential key knowledge gaps that if understood would aid investments in ecosystem and community resilience.

**Comments on Graphics and Boxes:**

- The NASEM review concluded, consistent with the feedback from the public review, that our figure was difficult and even illogical to follow. We have updated the figure per the feedback and have created a ticket with TSU to update our figure.

**Comments on Equity and Justice:**

- We have referenced chapter 15 and have better highlighted that vulnerable populations are at increased risk of wildfire impacts.
- We have cited Mendez et al. 2020.
- We added text in the final paragraph to highlight adaptation measures to reduce risk to vulnerable populations.
- We have added text to communicate generally the need to focus and target evacuation notices and support to all members of the rural communities. However, a detailed treatment of the composition of the population within rural communities across the southwest where fires are possible and how different messaging and resources could be crafted to those different groups is important but beyond the scope of this feature focus. This topic is better suited for the chapter on rural agriculture, food systems and rural communities (11) and/or tribes and Indigenous peoples (16).

**Comments on Literature Cited:**

- We have cited the following chapters as suggested: Forests (7), Built environment and urban systems and cities (12) Human health (15), Economics (19).
- In terms of better making the case of increased area burned at high severity we also noted a cross reference to Ch 7 and 28 and included another citation Williams et al. 2023. Williams, J. N., Safford, H. D., Enstice, N., Steel, Z. L., and Paulson, A. K.. 2023. " High-Severity Burned Area and Proportion Exceed Historic Conditions in Sierra Nevada, California, and Adjacent Ranges." Ecosphere 14( 1): e4397. https://doi.org/10.1002/ecs2.4397 AND Mueller et al. Mueller, S. E., Thode, A. E., Margolis, E. Q., Yocom, L. L., Young, J. D., & Iniguez, J. M. (2020). Climate relationships with increasing wildfire in the southwestern US from 1984 to 2015*. Forest Ecology and Management, 460.*
- We included the reference of Mendez et al. 2020 as noted above.
- We have included the citation of Bradley as noted but did not include the citations of either Fusco et al. or Nagy et al. 2021. The Kerns et al. 2020 and reference to Ch. 28 are adequate and appropriate, rather we included what we believe among the most seminal and foundational paper on the grass-fire-cycle. D'Antonio, C.M., and Vitousek, P.M. 1992. Biological invasions by exotic grasses, the grass/fire cycle and global change. Annual Review of Ecology and Systematics 1992 23:1, 63-87 AND Brooks et al. Brooks M.L., D'Antonio, C.M.,. Richardson, D.M., Grace, J.B., Keeley, J.E. DiTomaso, J.M., Hobbs, Pellant, M., and Pyke, D. (2004). Effects of Invasive Alien Plants on Fire Regimes, *BioScience*, Volume 54, Issue 7, July 2004, Pages 677–688,

https://doi.org/10.1641/0006-3568(2004)054[0677:EOIAPO]2.0.CO;2. These are foundational and seminal papers that treat the invasive grass/fire cycle in terms of global change.

# FB3. COVID-19 and Climate Change

**Narrative summary response:**

We appreciate the comments from the NASEM reviewers. To address these comments we have provided a more tempered version of the top-line for the COVID-19 focus box. In addition, we have added additional content to the traceable accounts to better reflect the growing body of knowledge related to COVID-19 and climate change relationships. Further, we have included a discussion of the broader impact of climate change on pandemic threats. We appreciate the reviewers comments on increasing specificity and have added statistics where we were able to do this succinctly. The focus box figure has also been revised to include a stand-alone caption.

**Comments on Key Messages:**

- There is no key message in the focus boxes, however we did receive a comment to reduce the strength of our opening statement. This has been revised to read: “Climate change can increase the likelihood and exacerbate the impacts of pandemics, like COVID-19.”

**Comments on Text Supporting the Key Messages:**

- We have included statistics where possible
- We have included additional information on actions that can be taken to prepare for the climate change and the next pandemic
- We have reformatted some of the text to be more appropriate for web viewing

**Comments on Traceable Accounts:**

- We have included additional research on the links between climate change-related weather events and COVID-19 transmission
- We added a discussion of how we arrived at our top-line
- We added discussion around the links between climate change and pandemics more generally

**Comments on Graphics and Boxes:**

- We have developed a stand-alone caption for the Figure

**Other Recommended Changes:**

- We were also asked to include likelihood statements but this is not within the scope of the focus boxes, therefore we did not include these statements

# FB4. Risks to Supply Chains

**Narrative summary response:**
The author team appreciates the comments assessing the adequacy of the focus topic as well as some omissions and suggested clarifications. The responses below address each section and topic area.

**Comments on Key Messages:**
The author team appreciates the comments assessing the adequacy of the key message. Focus features will remain separate parts of the report, distinct from the chapters. This focus feature was not part of the original chapter list determined by the Federal Steering Committee. The authors of this feature were pulled from existing authors and did not follow the same vetting process as new chapter authors would. As a result, confidence and likelihood statements will not be added to the key message. Text has been added to the Front Matter to clarify the process for Focus Feature development, and how that process differed from chapter development.

**Comments on Text Supporting the Key Messages:**
The author team appreciates the comments assessing the adequacy of the text supporting the key message.

- The text has been revised to add discussion of seaports and their vulnerability to sea level rise and proposed reference added.
- The text has been revised to add discussion of heat waves on global supply chain and proposed reference added.
- The text has been revised to add discussion of disclosure of material risks chain and proposed reference to the U.S. Securities and Exchange Commission Proposed Rule added.

**Comments on Traceable Accounts:**
The author team appreciates the comments assessing the adequacy of the traceable accounts.

- Text has been added to the Front Matter to clarify the process for Focus Feature development, and how that process differed from chapter development.
- The authors added text to clarify the lived experience during the ongoing pandemic across the author team, their households, neighborhoods and communities and states.
- Per comments to the key message above, confidence and likelihood statements will not be added to the key message.

**Comments on Graphics and Boxes:**
The author team appreciates the comments assessing the adequacy of the graphics and boxes.

- Caption is revised to be a standalone explanation of the material and explanation of the different arrow colors across the figure.

**Comments on Equity and Justice:**
The author team appreciates the comments assessing the adequacy of equity and justice.

- Wording is revised to align with the guidance on inclusive language.

**Comments on Literature Cited:**

The author team appreciates the comments assessing the adequacy of literature cited.

- Because this feature was not part of the original chapter list determined by the Federal Steering Committee, and the direction for Focus Features is to stay aligned their original intent and remain separate parts of the report, distinct from the chapters. Confidence and likelihood statements will not be added to the key message or to write full Traceable Accounts.

# FB5. Blue Carbon

**Narrative summary response:**

The chapter team appreciates NASEM's thorough review and suggestions for this focus box. Most suggestions were addressed in the revisions to create the fourth order draft, including the addition of citations, and discussion of the negative climate feedback loop associated with continued degradation of blue carbon ecosystems. Confidence statements were not added to this focus box at the direction of USGCRP.

**Comments on Key Messages:**

- The key message was shortened and the revision to the third sentence was accepted in the revised document.

**Comments on Text Supporting the Key Messages:**

- We have added a definition of marine for clarity, as suggested.
- We added discussion and citations related to the negative feedback loop associated with continued degradation of blue carbon ecosystems.
- Details on specific US blue carbon ecosystems were not included. This is an area where cross references to regional chapters will benefit this box, and these cross references are in discussion. We did note a handful of areas along the coast with the highest blue carbon potential (Florida Everglades, San Francisco Bay, and Chesapeake Bay), and added a citation that notes that the US has one of the highest global rates of BCE loss.
- The chapter lead is completing outreach to regional chapters to improve cross referencing across NCA5.

**Comments on Traceable Accounts:**

- Confidence statements were not added based on direction from USGCRP.
- The process and rationale to compose the author team followed a different process, and based on direction from USGCRP, this process will be discussed outside of the Focus Boxes.

**Comments on Literature Cited:**

- We added additional citations regarding the effects of extreme events on blue carbon ecosystems.
- We have also reviewed literature published in 2022 and 2023 after the third order draft was completed and added select citations where appropriate to support the Focus on Blue Carbon Box more fully.

**Other Recommended Changes:**

- The chapter lead coordinated with Chapter 30, and the Focus Box on Blue Carbon is intended to remain in NCA5 and will be cross referenced, as necessary. Chapter 30 may include additional regional details, which will be cross-referenced in the fourth order draft if appropriate.

# App3. Scenarios

**Narrative summary response:**

Thank you to NASEM for the thorough review and for connecting concepts within this appendix to other chapters within the NCA5 report. Members of the Appendix 3 team met with leadership from Chapters 2, 3, 9, and 32 to align messaging on the use of sea level rise scenarios and projections across the report. The Appendix 3 team added Dr. Benjamin Hamlington as an Author for his contributions in expanding the appendix's sea-level rise section (section A3.3) to clarify the difference between sea-level rise projections and scenarios, as well as provide an adapted table of probability of exceedance for NCA5 authors and readers to reference. To align with report-wide guidance, no new or combined calibrated language specific to sea level rise was introduced in this appendix.

**Comments on Chapter Introduction:**

Our introductory paragraph has been re-written and now provides a roadmap to the chapter by highlighting the extreme events impacting the US with a changing climate, the populations that are more affected by these extreme events, the disproportionate health impacts on the US population, and the role of systemic racism and discrimination in the disproportionate impacts.

**Comments on Graphics and Boxes:**

Thank you for the comment. After discussing planned and recommended changes, Figure A3.1 was removed and the IPCC AR6 figure is now referenced inline (Figure TS.2, Arias et al., 2021). The replacement figure shows the process of transforming (downscaling) CMIP6 model output to higher resolution and biased corrected output, i.e., LOCA2 and STAR data. The flow chart also shows when weights were added to the higher resolution data based on global equilibrium climate sensitivity, and when impact-relevant metrics were derived from downscaled precipitation and temperature values (e.g., days over 95°F, growing season length, precipitation over 2 inches; Figure A3.1).

**Comments on Data and Analyses:**

The Appendix 3 team added Dr. Benjamin Hamlington as an Author and he expanded the appendix section Sea Level Rise (section A3.3) to clarify the difference between IPCC sea level rise projections and the Interagency Task Force (ITF) sea level rise scenarios. Members of the Appendix 3 team also met with leadership from Chapters 2, 3, 9 and 32 to align messaging on the use of the IPCC sea level rise projections and ITF sea-level rise scenarios across the report.

**Other Recommended Changes:**

Members of the Appendix 3 team have coordinated updated phrasing for scenarios with Chapters 2, 3, and 9. Appendix 3. Author, Ben Hamlington, discussed the differences between the IPCC sea level rise projections and the ITF Sea Level Rise Scenarios with Chapters 2, 3, 9 and 32.

Appendix 3 points to Chapters 2 and 9 in the following statement: "NCA5 authors were provided with Interagency Task Force (ITF) sea level rise (SLR) scenarios from the 2022 Sea Level Rise

Technical Report (Sweet et al., 2022). Chapter 2 introduces the ITF sea level rise scenarios and Chapter 9 uses both the IPCC projections and ITF scenarios to provide details connecting the sea level rise dynamics to regional sea level rise."

Appendix 3 has added wording to frame other scenario choices made by authors throughout the report, including the SRES scenarios in the Midwest Chapter:
"For certain topics or impact studies,  scenarios that preceded the RCPs may be relevant, such as those from the Special Report on Emissions Scenarios (SRES; Nakicenovic et al., 2000). Similar to the RCPs and SSPs, the SRES scenarios include a set of consistent assumptions that translate into a range of carbon emissions and carbon dioxide concentrations, however the SRES do not include a net negative emissions scenario (Figure 33.19 in Walsh et al., 2014)."

# App4. Indicators

**Narrative summary response:**

- **Better integrating the Indicators Appendix throughout the draft NCA5 report:** The Indicators Appendix leadership coordinated with authors from several NCA5 chapters to coordinate on cross-cutting topics and to more consistently and thoroughly reference the Indicators Appendix figures across the NCA5 chapters (sector, regional, and response chapters). In addition, the authors of the Indicators Appendix have implemented more cross-references to observed change found in figures and Key Messages throughout NCA5. This includes the addition of relevant key messages in Figure A4.2 (regional map of observed changes), and references in the text to many indicators featured elsewhere in the report.
- **Billon Dollar Disasters and socio-economic factors:** The authors have revised the description of the Billion Dollar Disasters indicator to explain that socioeconomic factors (including population density, placement of high value property, and assets) also play a significant role in increasing the exposure and vulnerability to these hazards, therefore increasing the costs observed in billion-dollar events (see line-by-line comment response for details). The authors do note that there is sufficient evidence (e.g., elsewhere in the NCA5 and in NCA4) that the frequency and severity of some of these events are climatically driven.