FRAMEWORKS FOR EVALUATING THE NATIONAL CLIMATE ASSESSMENT:

WORKSHOP REPORT

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Workshop participants vote on evaluation topics and questions they would like to discuss during day 2 of the workshop (*photo courtesy of Bryce Golden-Chen*).

1. EXECUTIVE SUMMARY

The U.S. Global Change Research Program (USGCRP) Workshop on Frameworks for Evaluating the Third National Climate Assessment (NCA3) was held June 19-20, 2014.[1] Seventy participants represented federal agencies, NCA authors, the National Climate Assessment and Development Advisory Committee (NCADAC), NCA staff from the USGCRP National Coordination Office (NCO) and the NOAA National Climatic Data Center Technical Support Unit (TSU), the National Climate Assessment network NCAnet[2], users of the NCA, and evaluation experts.

The goal of the workshop was to identify potential approaches for evaluating the NCA3 processes and products. The USGCRP may consider using these approaches to document, analyze and understand NCA3 successes and identify areas needing improvement. Specific objectives for the workshop were to identify:

1. Key audiences for evaluation of the NCA and the types of evaluation that would be most appropriate for those groups
2. Potential topic or thematic focus areas that could be used in evaluating the NCA
3. Potential metrics that could be used to evaluate the NCA within these topic or thematic focus areas
4. Potential methods for undertaking evaluation of the NCA, including identifying potential types of evaluators (e.g., internal vs. external), methods for data collection and analysis, and mechanisms for delivering evaluation results
5. Potential ways to promote adaptive learning within the sustained assessment process and incorporating the lessons learned into ongoing assessment activities

To meet these objectives, the workshop used participatory voting processes, plenary panels and discussions, and topical breakout groups. The sections below summarize key inputs and suggestions arising from the workshop. Additional details can be found by reading the full workshop report. It is important to note that this report does not constitute a comprehensive plan for evaluation, but instead is intended as a reference for individuals or a team of evaluators who will craft more specific questions and methods.

[1] Workshop website: https://sites.google.com/a/usgcrp.gov/nca2014-evaluation/home. For additional information on the U.S. Global Change Research Program and the National Climate Assessment, please see the section of this report "Panel: National Climate Assessment 101" or visit www.globalchange.gov/about.

[2] NCAnet is a network of organizations working with the NCA to engage producers and users of assessment information across the United States. http://ncanet.usgcrp.gov/

This Executive Summary provides a high-level overview of the major themes arising during the workshop's panels and breakout sessions. The body of the workshop report goes into greater detail, in many cases providing specific questions, metrics, and potential methods for evaluation.

1.1 Overarching principles

Participants suggested a number of key principles for an effective evaluation. These are collected here:

- **It is important to initiate evaluation of NCA3 as soon as possible and to build evaluation into the framework for future assessments.**
  - There are many decisions to be made for the next quadrennial report and for the sustained assessment, especially if USGCRP is to meet the requirement of the Global Change Research Act of 1990 by completing an assessment in 2018.[3] The decision-making process is already under way for NCA4 and the sustained assessment process. The results of evaluation will provide valuable information to enable adaptive management of the process.
  - Evaluation that is planned for and conducted throughout the entire assessment process supports ongoing learning and improvement in the assessment enterprise. There is an opportunity to embed such planning for NCA4 and beyond.
- **We have much to learn from evaluations of previous assessments.**
  - There have been three national climate assessments to date, and all were different (the way they were conducted, political leadership, etc.). An effective evaluation would include consideration of what was different and what the tradeoffs were in each case.
- **An integrated evaluation plan provides for coordination across all evaluators, evaluation methods, and aspects of the NCA process being evaluated.**
  - Effective evaluations include all aspects of the process (inputs, activities, outputs, and outcomes), compare the results to the original goals, and consider outcomes in relation to the resources it took to produce them.
  - There are multiple frameworks for evaluation, and multiple possible methods used within each framework. Each method requires identifying the audiences for evaluation and the intended uses of evaluation results.
  - A combination of quantitative and qualitative evaluation approaches will provide a more

comprehensive, nuanced understanding of the NCA3's successes and failures.
- **Given resource constraints, it is necessary to prioritize among potential topics for evaluation.**
- **Although this workshop focused primarily on the NCA, the discussion about the "who, what, where, when and why" of evaluation is relevant to the entire USGCRP.**

1.2 Audiences

Possible audiences for evaluations of NCA3 and the sustained assessment include:

1.2.1. Decision makers
- Congress and the President (as defined by the Global Change Research Act of 1990)
- Federal, state, local, and tribal governments and agencies
- A variety of users in for-profit and not-for-profit sectors

1.2.2. Process participants
- NCA authors
- Federal Advisory Committee (NCADAC)
- Staff (NCO, TSU)

1.2.3. Research community
- Scientists
- Evaluators
- National Research Council

1.24 American public

1.3 What to evaluate

Participants identified key themes related to process, outputs, outcomes, and sustained assessment that could be addressed in an evaluation:

1.3.1. Inputs and Process: the inputs to and the work of implementing the assessment
- Communication and power balance among participants in the NCA process
- Usefulness of workshops, climate scenarios, and other methodology and science inputs
- Writing and review process (e.g., author team guidance, staff support)
- How inclusive the process was of participants and stakeholders
- Adequacy of resources and sustainability of process
- Effects of NCA process on capacity of participants and users to conduct and use assessments
- Motivation for engagement and effects of participation for agencies, authors, and others
- How appropriate the selection process was of NCADAC members, authors, review editors

1.3.2. Outputs: the NCA products delivered
- Perceptions, popularity, and criticisms of products (e.g., report, website, data)
- Ways in which products were used and why

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[3] http://www.globalchange.gov/about/legal-mandate

- How participants and stakeholders benefited or did not benefit from opportunities for input and interaction
- Product outreach: who was reached, who was not, and why
- How understandable and navigable the products are
- Derivative products others have produced using the NCA

1.3.3. Outcomes: changes in learning, actions, and conditions for participants and society

- Use of NCA by agencies and stakeholders in plans, programs, and decisions
- Scientific advancement: effect of NCA on science and data priorities
- Surprise outcomes of the NCA
- NCA engagement with or facilitation of other assessments
- Effect of the NCA on perceptions, understanding, and behavior related to climate change
- Interactions and collaborations among participants and with user groups
- Educational uses of the NCA
- Access to data used in the NCA

1.3.4. Sustained assessment: how evaluation could be implemented in and used to inform the ongoing process

- Creation of an evaluation plan and complementary logic model
- Needs assessment for science and decision-making
- Partnerships for research, communication, and use of assessments
- Central coordination of assessment efforts
- Identification of resources for assessment
- Comparisons to previous assessments

For a full list of the questions included in each theme, please see Appendix G.

1.4. How to evaluate

Participants provided input on how to conduct robust and credible evaluations, considering methods, evaluators, and resources.

1.4.1. What methods could be used?

Participants suggested a number of quantitative and qualitative methods, including ways to combine methods. Common suggestions included surveys, interviews and focus groups, network analysis, citation tracking in specialty and popular media, and web-use analytics.

1.4.2. Who would be the evaluators?

Participants noted the great value in having independent evaluators, but also noted several evaluation steps that could be conducted by USGCRP and its federal agencies. There are a number of factors to consider

in choosing evaluators, including access to information, costs, time, and expertise. Combining the results from internal and external (or independent) evaluators could provide a better overall understanding of the assessment process and help overcome weaknesses inherent from reliance on only one type of evaluator.

1.5. Who participates in the evaluation

Evaluation should include input from people who participated in one or several parts of the assessment process, as well as actual or intended audiences of the report. It is important to have input from a variety of people in order to develop a comprehensive understanding of the assessment's effects for society.

2. INTRODUCTION
2.1. Workshop goal and objectives

The goal of the workshop was to identify potential approaches for evaluating the Third National Climate Assessment (NCA3) processes and products. The U.S. Global Change Research Program (USGCRP) may consider using these approaches to document, analyze and understand NCA3 successes and identify areas needing improvement. Specific objectives for the workshop were to identify:

1. Key audiences for evaluation of the NCA and the types of evaluation that would be most appropriate for those groups
2. Potential topic or thematic focus areas that could be used in evaluating the NCA
3. Potential metrics that could be used to evaluate the NCA within these topic or thematic focus areas
4. Potential methods for undertaking evaluation of the NCA, including identifying potential evaluators,

The National Climate Assessment draws upon the work of NOAA and other federal agencies. *(Photo courtesy of NOAA).*

methods for data collection and analysis, and mechanisms for delivering evaluation results

5. Potential ways to promote adaptive learning within the sustained assessment process and incorporating the lessons learned into ongoing assessment activities

To meet these objectives, the workshop used participatory voting processes, plenary panels and discussions, and topical breakout groups. The appendices provide more information on the workshop agenda and participants:

- Appendix A: workshop Agenda
- Appendix B: workshop Planning Committee
- Appendix C: workshop report Author Team
- Appendix D: workshop breakout session Facilitators and Note-takers
- Appendix E: workshop report Graphic Design
- Appendix F: workshop Participants
- Appendix G: Evaluation questions identified by participants

The workshop website[4] contains the panelists' presentations available for download.

It is important to note that this report does not constitute a comprehensive plan for evaluation, but instead is intended as a reference for individuals or a team of evaluators who will craft more specific questions and methods.

2.2. Definitions

We asked workshop participants to think about evaluation of three different aspects of the NCA, defined in the 2005 report of the National Research Council (NRC), *Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science Program*[5]:

- Process: Course of action taken to achieve a goal. How the assessment is being implemented, including selecting authors, federal advisory committee structure and operations, report writing and review. Process includes inputs: tangible quantities put into a process to achieve a goal.
- Outputs: The products and services delivered. Products resulting from activities or needed to support achievement of the desired outcomes. Outputs include technical input reports, workshops and workshop reports, the NCA3 Report and Highlights, NCA3 website, and outreach and communication.
- Outcomes: Results that stem from use of the outputs and the longer-term societal, economic, or environmental impacts. Outcomes include changes in learning, actions, and conditions. Examples of outcomes include use of the assessment to support discussions and decisions about climate change, partnerships that developed as a result of the NCA process, and changes in attitudes and understanding about climate change.

2.3. Context for evaluation

There have been many evaluations of scientific assessments, including two previous NCAs and other assessment efforts by USGCRP. These evaluations informed conversations about the design of NCA3 and provide a foundation for considering how to evaluate the NCA3 and how to embed evaluation into the sustained assessment process. These past evaluations identify elements of effective assessment and suggest possible metrics to use in evaluating the process, outputs, and outcomes. Table 1 summarizes key points from these past evaluations.

2.4 Audiences

The audiences for evaluation of the NCA are quite diverse. For the purposes of evaluations done by the U.S. Global Change Research Program, the primary audiences include audiences of the NCA as defined by the Global Change Research Act of 1990 (GCRA). Those audiences include Congress, the President, and federal agencies. Other audiences discussed during the workshop include participants in the NCA process – NCADAC, report authors, review editors – followed by NCAnet participants and report users including state, local, tribal decision-makers; educators; resource managers; and, most broadly, the general public. The summaries for the breakout group sessions address audiences in greater depth.

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[4]https://sites.google.com/a/usgcrp.gov/nca2014-evaluation/
[5]National Research Council. 2005. Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science Program. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=11292

Stakeholders of the National Climate Assessment include tribal leaders (*photo courtesy of CEQ*).

Table 1. Summary of previous evaluations of the U.S. Global Change Research Program and the National Climate Assessment.

FOCUS	KEY POINTS
USGCRP	*Thinking Strategically*[a] laid out a framework for evaluating the Climate Change Science Program (CCSP). (The USGCRP was known as the CCSP during the period 2002 to 2009.) The report identified principles for developing metrics, including leadership to guide the CCSP program and apply metrics, an action plan against which to apply metrics, and the strategic use of metrics to enable CCSP to evolve. The report identified a set of 24 general metrics for the CCSP, addressing process, inputs, outputs, outcomes, and impacts. *Evaluating Progress*[b], a 2007 NRC report, provided a high-level evaluation of the strengths and weaknesses of the program. The assessment focused on: • Leadership and budget authority; • Use of science to support decision-making; • Predicting climate from local to global scales; • Understanding climate change impacts; • Status of observing systems; and • Communication and stakeholder engagement. The report suggested ways to apply the framework in *Thinking Strategically* in a staged, practical way. The 2009 NRC report *Restructuring Federal Climate Research*[c] identified priorities for the Climate Change Science Program. Priorities particularly relevant for the NCA include: • Reorganize the program around scientific-societal issues. • Strengthen research on adaptation, mitigation, and vulnerability. • Initiate a national assessment process with broad stakeholder participation. • Coordinate federal efforts to provide climate services to decision makers. Meyer (2011)[d] identified the following public values underlying the CCSP: • Useful information; • High quality science; • Coordination and collaboration; • Transparency and communication; and • Stakeholder participation and support. The paper mapped how decision-making and management within the CCSP is failing to deliver on public values, and provided recommendations for the program's evolution.
NCA1	Based on the experience of the First National Assessment (NCA1[e]), Parson et al. (2003)[f], all members of the federal advisory committee for NCA1, suggested improvements for assessments. These suggestions included scientific research and further development of assessment methods, as well as a new model for implementing assessments. This new model was based on regional efforts and required collaboration between scientists, resource managers, and other stakeholders. Morgan et al. (2005)[g] was written by a team of scientists, half of whom were not involved in NCA1. The authors completed an evaluation of NCA1, using surveys, working papers, and a workshop. Their analysis concluded that the assessment was largely successful in achieving its basic objectives. The paper suggested improvements for future assessments related to developing shared objectives, guidance and training for participants, budgeting, and creating an ongoing process. Moser (2005)[h] completed a paper that contributed to the 2008 NRC report, *Public Participation in Environmental Assessment and Decision Making*[i]. Moser (2005) built on the work reported on in Morgan et al. (2005) and added data from interviews with assessment leaders and document analysis. The report told the story of stakeholder engagement, focusing on: • Quality of outputs; • Quality of broader environmental and social outcomes (decisions and policies); • Legitimacy of outputs and process; and • Building capacity for future assessments. Participants reported successful elements, including: • Extensive stakeholder engagement; • Comprehensive structure of regional, sectoral, and national perspectives; and • Design of the assessment as public-private partnership. Participants' critiques included: • Funding; • Need for better planning; • Finding better ways to shield the assessment from political influence; and • Need for clear commitment to communication and outreach.

CONT. Table 1.	
FOCUS	**KEY POINTS**
Sustained Assessment	*Preparing the Nation for Change*[j], a 2013 NCADAC report, recommended fostering adaptive learning through an evaluation process. To achieve this, the report recommended: • Establishing an evaluation subcommittee as part of a federal advisory committee; • Defining metrics in a number of themes; and • Conducting an evaluation of the NCA3 and early components of the sustained assessment process.
Scientific Assessments	*Analysis of Global Change Assessments*[k], a 2007 NRC report, analyzed eight assessments, included NCA1 and CCSP's Synthesis and Assessment Products[l], which were later synthesized into NCA2[m]. The report reaffirmed three essential properties of successful assessments: saliency, credibility, and legitimacy. • Saliency is the assessment's ability to communicate with users whose decisions it seeks to inform and whether the information is perceived as relevant. • Credibility is the technical quality of information as perceived by the relevant scientific or expert communities. • Legitimacy is the fairness and impartiality of an assessment process, as judged by users and stakeholders. The report identified 11 essential elements of successful assessments, including: • Clear strategic framing; • Adequate funding; • Balance of benefits and opportunity costs; • Reasonable timeline; • Engagement and communication throughout the process; • Strong leadership; • Interdisciplinary efforts; • Realistic and credible treatment of uncertainties; • Independent review process; • Development of decision support tools; and • Nested assessment approach.
	Informing an Effective Response[n] was part of NRC's *America's Climate Choices* series. The report included a short section on assessments as tools for climate-related decision-making. The report built on *Analysis of Global Change Assessments* (NRC 2007) by providing considerations that should be taken into account when assessments are used for decision support. These considerations include: • Creating more focused assessments that are responsive to decisions and stakeholders; • Better inclusion of needs of decision-makers in local government, private sector, and civil society; • A commitment to supporting an ongoing assessment process, including engaging with stakeholders and supporting information systems; and • Careful attention to transparency and communication during the preparation of assessments.

[a] http://www.nap.edu/catalog.php?record_id=11292

[b] National Research Council. 2007. Evaluating Progress of the U.S. Climate Change Science Program: Methods and Preliminary Results. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=11934

[c] National Research Council. 2009. Restructuring Federal Climate Research to Meet the Challenges of Climate Change. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=12595

[d] Meyer, R. 2011. The public values failures of climate science in the US. Minerva, 49(1), 47-70. http://link.springer.com/article/10.1007/s11024-011-9164-4

[e] National Assessment Synthesis Team (Ed.). 2001. Climate change impacts on the United States-Foundation Report: the potential consequences of climate variability and change. Cambridge University Press. http://www.globalchange.gov/what-we-do/assessment/previous-assessments

[f] Parson, Edward A., Robert W. Corell, Eric J. Barron, Virginia Burkett, Anthony Janetos, Linda Joyce, Thomas R. Karl et al. 2003. Understanding Climatic Impacts, Vulnerabilities, and Adaptation in the United States: Building a Capacity for Assessment. Climatic Change 57: 9-42. http://link.springer.com/article/10.1023/A:1022188519982

[g] Morgan, M. Granger, Robin Cantor, William C. Clark, Ann Fisher, Henry D. Jacoby, Anthony C. Janetos, Ann P. Kinzig, Jerry Melillo, Roger B. Street, and Thomas J. Wilbanks. 2005. Learning from the US national assessment of climate change impacts. Environmental science & technology 39, no. 23: 9023-9032. http://pubs.acs.org/doi/abs/10.1021/es050865i

[h] Moser, S. C. 2005. Stakeholder Involvement in the First U.S. National Assessment of the Potential Consequences of Climate Variability and Change: An Evaluation, Finally. Report prepared for National Research Council, Committee on Human Dimensions of Global Change, Public Participation in Environmental Assessment and Decision Making, NAS/NRC: Washington, DC. http://www.susannemoser.com/documents/Moser_Draft_2-6-05.pdf

[i] National Research Council. 2008. Public Participation in Environmental Assessment and Decision Making. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=12434

[j] National Climate Assessment and Development Advisory Committee. 2013. Report on Preparing the Nation for Change: Building a Sustained National Climate Assessment Process. http://downloads.globalchange.gov/nca/NCADAC/NCADAC_Sustained_Assessment_Special_Report_Sept2013.pdf

[k] National Research Council. 2007. Analysis of Global Change Assessments: Lessons Learned. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=11868

[l] http://www.globalchange.gov/engage/process-products/sap-summary

[m] Karl, T. R., J. T. Melillo, and T. C. Peterson, 2009: Global Climate Change Impacts in the United States. T.R. Karl, J.T. Melillo, and T.C. Peterson, Eds. Cambridge University Press, 189 pp. http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf

[n] National Research Council. 2010. Informing an Effective Response to Climate Change. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=12784

3. PANEL: NATIONAL CLIMATE ASSESSMENT 101

Moderator: Kathy Jacobs (Center for Climate Adaptation Science and Solutions, University of Arizona)
Panelists:

- Tom Armstrong (U.S. Global Change Research Program, White House Office of Science & Technology Policy)
- Glynis Lough (U.S. Global Change Research Program) PDF
- Susi Moser (Susanne Moser Research & Consulting) PDF
- Jim Buizer (University of Arizona) PDF
- Julie Morris (U.S. Global Change Research Program)

The opening session framed the context for NCA3[6] within the wider USGCRP, provided basic understanding of the NCA, looked ahead to the future of assessments within USGCRP, and showcased the role of evaluation in linking these all together.

The NCA is integral to the USGCRP. Quadrennial assessments are called for in the Global Change Research Act (GCRA) of 1990 to: integrate, evaluate and interpret science findings in climate-related global change; analyze the effects of global change; and project major trends for the subsequent 25 to 100 years. The GCRA places such activities into an integrated U.S. research program to understand, predict, assess, and respond to global change. This mandate is reflected in the USGCRP Strategic Plan[7] of 2012, for which the goals are to Advance Science, Inform Decisions, Conduct Sustained Assessments and Communicate and Educate. The NCA is a primary tool in connecting across the different goals of the Strategic Plan and making USGCRP scientific research accessible to those needing to make decisions and take actions in response to climate change.

To ensure broad scientific input from the beginning, NCA3 development was overseen by a Federal Advisory Committee, the National Climate Assessment and Development Advisory Committee (NCADAC) (Figure 1). The NCADAC defined the following objectives for the NCA3, to "provide information and reports in the context of a continuing, inclusive National process that will:

- synthesize relevant science and information;
- increase understanding of what is known and not known;
- identify needs for information related to preparing for climate variability and change and reducing climate impacts and vulnerability;
- evaluate progress of adaptation and mitigation activities;
- inform science priorities;
- build assessment capacity in regions and sectors; and
- build societal understanding and skilled use of Assessment findings.
- recognize the global and international context of climate trends and connections between climate risk and impacts in the United States and elsewhere."[8]

Broad and sustained stakeholder engagement was built into NCA3 from the start, with the objective of serving the needs of decision makers across the regions of the U.S. and in a wide variety of sectors. The NCA3 was issued as a Federal report under the USGCRP on May 6, 2014 (Figure 2). The report has received wide media coverage and there has been extensive use of the NCA website.[9]

Lessons learned from previous national and international assessments contributed to a framework for evaluation that was developed early in the NCA3 process[10]. The framework is represented by a logic model that links inputs to the NCA to outputs and outcomes on different time scales. This logic model forms one basis for evaluation (Figure 3). The NCA Engagement Strategy[11] outlined how the NCA process would engage stakeholders in the private and public sectors throughout the development of the NCA3, providing a basis for evaluating the NCA process as well as its products. The NCADAC and NCA staff tracked aspects of engagement and output from the beginning, providing data that can be used in developing initial metrics. The evaluation planning recognized the importance of both qualitative and quantitative metrics for evaluating the impact of the NCA, and the importance of using performance measures as learning tools to improve future activities as well as to document past performance.

[6]Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2. http://nca2014.globalchange.gov/

[7] U.S. Global Change Research Program. 2012. The National Global Change Research Plan 2012-2021: A Strategic Plan for the U.S. Global Change Research Program. http://www.globalchange.gov/browse/reports/national-global-change-research-plan-2012–2021-strategic-plan-us-global-change

[8]NCADAC. 2011. NCA Interim Strategy – Summary. http://www.globalchange.gov/sites/globalchange/files/NCADAC-May2011-Interim-Strategy.pdf

[9]http://nca2014.globalchange.gov

[10]For example, this presentation at the November, 2011 NCADAC meeting: http://www.nesdis.noaa.gov/NCADAC/pdf/nov_16/NCADAC_Mtg_Pres_Nov11_MoserMaibachCloyd_Final_111711_17-1.pdf

[11]NCADAC. 2011. National Climate Assessment Engagement Strategy. http://downloads.globalchange.gov/nca/nca-engagement-strategy_5-20-11.pdf
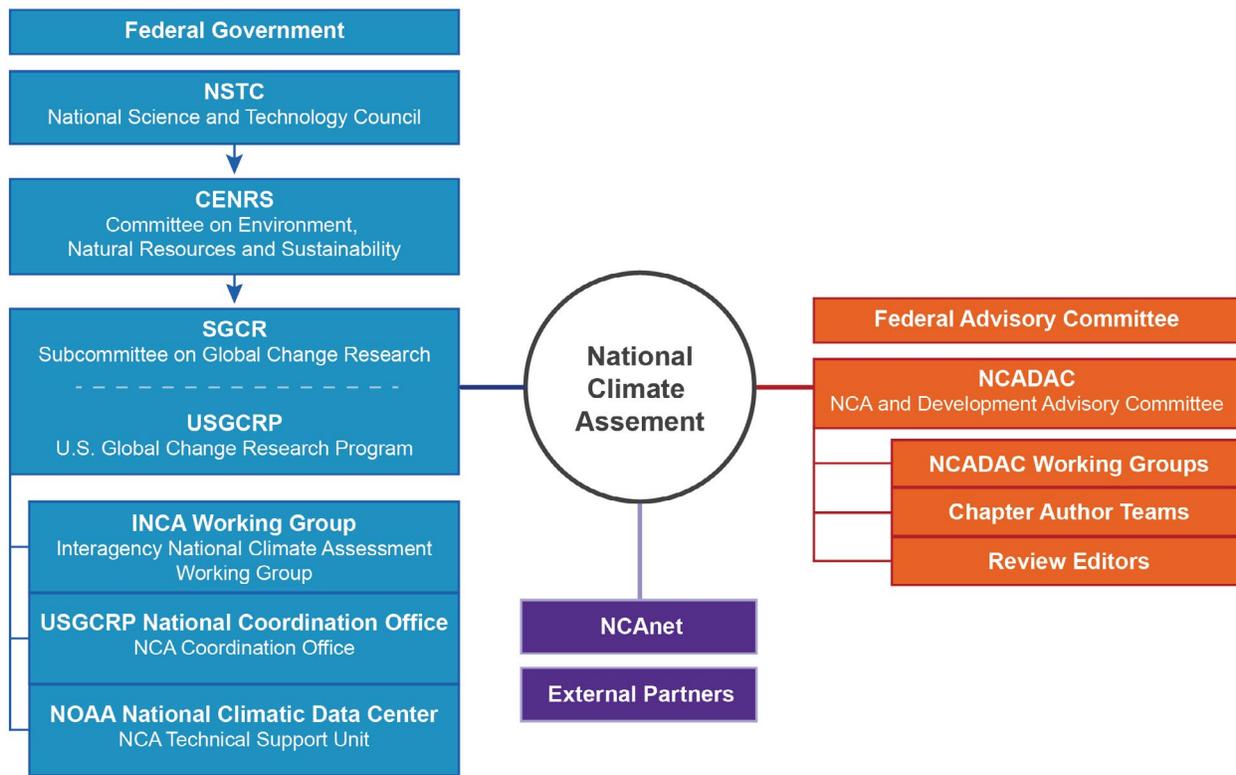
Figure 1. Organization of NCA components. This figure lays out the different institutions and groups of people that contributed to the NCA3. Source: NCA3 Appendix 1: Report Development Process. [http://nca2014.globalchange.gov/system/files_force/downloads/low/NCA3_Full_Report_Appendix_1_Process_LowRes.pdf?download=1]
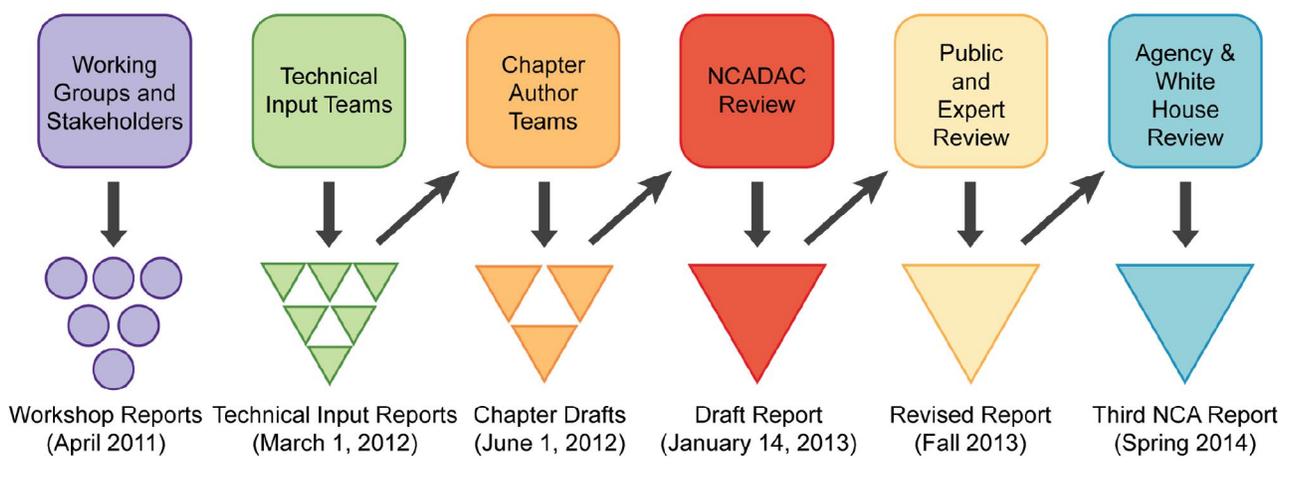
Figure 2. Third National Climate Assessment Report Process. This graphic illustrates the activities and products that were developed during the NCA3 report development process. The circles and triangles are products. The squares represent activities by institutions or groups of people. The process proceeded in time from left to right. Source: NCA3 Appendix 1: Report Development Process. [http://nca2014.globalchange.gov/system/files_force/downloads/low/NCA3_Full_Report_Appendix_1_Process_LowRes.pdf?download=1]

USGCRP is already at work on a sustained assessment process, including laying the groundwork for NCA4. While the exact form of the sustained process is still being worked out, it will likely involve focused, timely interim assessments of specific topics that will inform NCA4, ongoing data collection and scientific tool development to support the NCA, and mechanisms for ongoing collaborative partnerships. Developing a sustained assessment process will necessarily involve learning and adaptive management, for which evaluation of NCA3 will provide critical input and insight.

4. PANEL: PARTICIPANT PERSPECTIVES ON GOALS FOR AN EVALUATION

Moderator: Allison Leidner (NASA / Universities Space Research Association)
Speakers:
- Richard Moss (Joint Global Change Research Institute) PDF
- Jerry Melillo (Marine Biological Laboratory) PDF

- Jack Kaye (NASA)
- Amanda Staudt (National Research Council) PDF
- Kathy Jacobs (Center for Climate Adaptation Science and Solutions, University of Arizona)
- Nicky Sundt (World Wildlife Fund)

Six speakers provided individual perspectives on what they hoped to see in an evaluation of the NCA, and also commented on various aspects of the NCA3 Report, future NCA reports, and the sustained assessment process.

Richard Moss provided his perspective as both a NCADAC member and a report author. He placed the NCA3 evaluation in the context of the results of evaluations of earlier NCAs, to determine which lessons had been learned and implemented for NCA3. One of the lessons learned from previous assessments was the need for stakeholders to be more engaged in setting the objectives of the assessment. He noted that a sustained assessment would allow for better engagement into the future. One lesson Moss believed was not learned from previous assessments was how to fully integrate sce-

Figure 3. Example assessment logic model. In 2011, the NCADAC Engagement and Communication Wroking Group developed this suggested logic model for the NCA3. The purpose of the model was to help NCADAC think about how to include evaluation in the assessment process *(Source: Susi Moser).*

narios and decision support into each of the chapters. He felt that authors needed better training on the use of scenarios and decision analysis. Moss commented that planning for NCA4 was already behind schedule. He urged that the topic of economic valuation of climate change impacts be addressed.
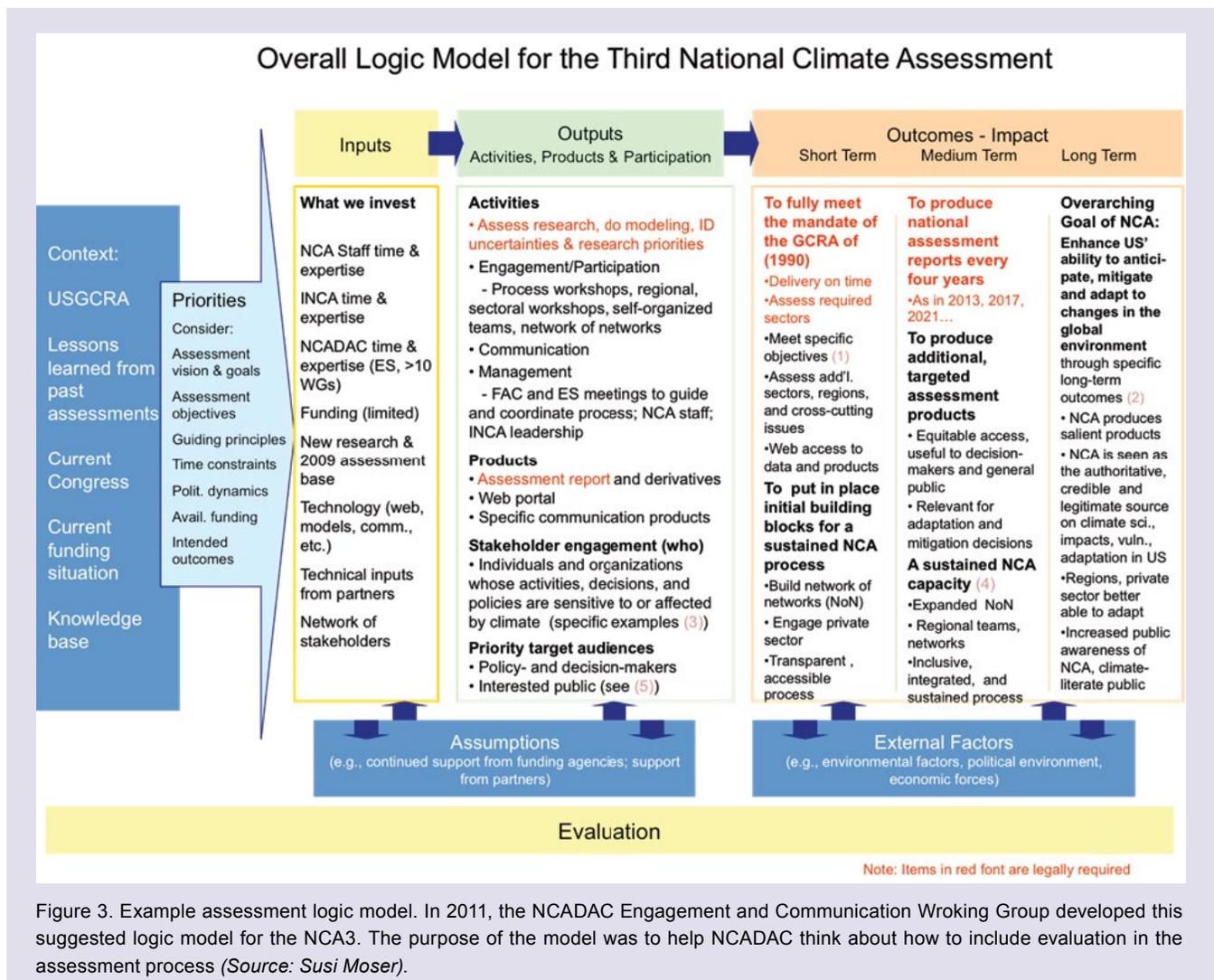
Emily Cloyd presented slides on behalf of Jerry Melillo, Chair of the NCADAC. He suggested that USGCRP could conduct develop an interagency request for proposals to conduct an evaluation of NCA3. The grant could be implemented via a cooperative agreement so that USGCRP could also be involved in the evaluation and modify the terms as needed. He also posed several example questions about the process, products, and outcomes that could be considered for evaluation.

Jack Kaye from the NASA Earth Science Division provided a perspective from a USGCRP Principal and as representative from a science agency. He started by noting that the many audiences interested in assessments – sponsors, assessors, readers, decision-makers – might require different types of evaluations. What would be evaluated – the goals, processes, products, and usefulness – would depend on the audience for the evaluation. However, evaluating the usefulness, and whether or not the report was "noticed", may not be possible immediately because it will take time for the NCA to be incorporated into publications or decisions. One key issue for evaluation, according to Kaye, is whether the level of effort required to conduct NCA3 was worth the time and financial resources of federal agencies, assessors, and the stakeholder community. He also felt that there needed to be a discussion about

the scope of the goals in the USGCRP and the scope of the goals in the NCA. Other issues Kaye suggested evaluating include which research results and observations were used, how research investigators were engaged in the assessment, and better defining the expectations of various audiences for the report.

Amanda Staudt provided a perspective from her current role at the National Research Council (NRC), as well as her previous position at the National Wildlife Foundation. She reviewed the way in which the NRC was involved in previous NCA evaluations and review of the NCA3 report. She also identified potential metrics for evaluating NCA3, including whether the NCA responded to the nation's needs, whether it was communicated appropriately, and whether critical content was missing. From her former perspective as a non-governmental organization stakeholder, she noted that the way in which stakeholders were engaged in and benefitted from NCA3 should be evaluated, as well as how the NCA processes shifted public understanding and opinion.

Kathy Jacobs, former director of the NCA, urged that the evaluation be done efficiently and quickly, so that it can inform future assessment and adaptation activities. In particular, she emphasized that it is critical to document the learning process of how a broad-based engagement effort occurred, and to understand the way in which it built upon previous NCAs. She encouraged that the evaluation be a learning process, particularly regarding how to integrate social science into evaluation. At the end, she noted that the evaluation could be used to promote partnerships.

Ongoing monitoring and observations can help guide decision-making (*photo courtesy of NOAA/NCDC*).

Nicky Sundt spoke from the perspective of an NCAnet participant. Sundt encouraged the NCA to develop a process that would survive changes in administration; one way this could be done is by having the NCA promoted and advocated for by outside groups. Specific questions of interest included:

- What are the specific needs of decision-makers and were they met by the assessment?
- Does the NCA3 help adequately support funding decisions, e.g. for national preparedness?
- Was there adequate funding?
- Can the NCA report be done more quickly?
- Was the information delivered at times useful for decision-makers?
- How effective was communication around the entire NCA3 process?
- What was the independence and integrity of the whole process?

5. PANEL: HOW EVALUATIONS ARE USEFUL

Moderator: Emily Cloyd (U.S. Global Change Research Program)
Panelists:
- Adam Parris (National Oceanic and Atmospheric Administration)
- Anne Grambsch (U.S. Environmental Protection Agency)
- Tom Fish (U.S. National Park Service) PDF
- Kai Lee (David and Lucile Packard Foundation) PDF

The third morning panel focused on illuminating ideas about how evaluations are useful to and used by groups that are being evaluating and whether or not evaluations are sometimes not useful or misused. The panelists, experts from federal agencies and outside the government, expressed the following three key ideas about making evaluations useful:

5.1.1. Making evaluation outputs actionable and acting on them

Whether it is to assess the effectiveness of individual grants or projects or to assess (or re-assess) long-term strategies or programmatic goals, evaluations should be structured in a way to provide direct and actionable feedback by the group being evaluated or by the program performing the evaluation (or for whom the evaluation is being conducted). For example, at NOAA, evaluation of past grantee recipients informed revisions to subsequent requests for proposals.

5.1.2. Employing rigorous evaluation methods both quantitative and qualitative

Enhancing evaluation usefulness requires employing appropriate evaluation methodologies and asking the right (and sometimes hard) questions. However, the panelists cautioned that over-reliance on quantitative

Scientists and educators can collaborate on climate change topics (photo courtesy of NASA).

methods can be counter-productive; sometimes it is the qualitative approaches and information that really motivates behavior change.

5.1.3. Recognizing evaluations as a form of communication and reflection

Evaluations are useful not just because they inform specific actions or provide feedback on progress to date but also because they can be useful tools for communication and reflection within the organization. An ongoing challenge to useful evaluation is the inevitable passage of time and the change that comes with it. For evaluations to remain relevant and useful, they should be timely or ongoing.

6. BREAKOUT SESSIONS: TOPICS FOR EVALUATION

On the first day participants were asked to provide input on what should be considered in an evaluation of the National Climate Assessment. We identified five topics: inputs and process, outputs, outcomes, education and science literacy, and participation. Within these groups, participants were asked to consider evaluation from both the science community and user community perspectives. Groups were provided the following three prompts:

1. What are Key Questions that an evaluation of the NCA might ask?
2. Who would find answers to these Key Questions useful?
3. What are the indicators and metrics you would use to answer these Key Questions?

The following sections summarize the inputs provided under each topic. During the breakout sessions, groups did not necessarily answer all three of these questions. In particular, participants took up the indicators and metrics question in breakout groups on the second day of the workshop.

6.1 Inputs and Process

6.1.1. Science community

From the science community perspective, partici-

pants identified the following themes and key questions about how the assessment was implemented:

PARTICIPATION IN THE NCA PROCESS

- Who is able to contribute time and expertise, what are their motives, and is their participation sustainable?
- What is the impact of relying on volunteers?
- How are contributors selected, does this create bias, and can transparency of the process be improved?
- Which voices are left out, who drops out, and why?
- Are there ways to encourage greater diversity and participation from industry, private firms, and nonprofits?
- Did contributors have a positive experience, learn and grow, benefit professionally, and how can this be improved?

STRUCTURE OF THE NCA PROCESS

- Were the schedule, rules, and engagement structure well designed and successful?
- Were assignments and group activities clear?
- Was communication with organizing staff adequate?
- How were conflicts handled, and were they successfully resolved?
- Was the NCADAC advisory process successful?

SCIENCE

- Were the technical reviews (TIR) adequately used, and the right papers drawn on?
- Were climate scenarios selected successfully, and should they be standardized?
- How much original science and how much synthesis should be created?
- Was scientific controversy addressed and consensus reached?
- Was the work interdisciplinary?

AUTHORS

- Did authors receive adequate training, mentoring, feedback, and support, and was the process empowering?
- Was the review and comment process successful? Was the process well-balanced considering the disciplines of the commenters and reviewers?
- Were expectations clear and attained?
- Was author feedback sought and incorporated?
- Did authors understand and interact with their audience?

GOVERNMENT ADOPTION

- Did authors feel this last step affected the content, legitimacy, and quality of the product, and created unintended consequences?
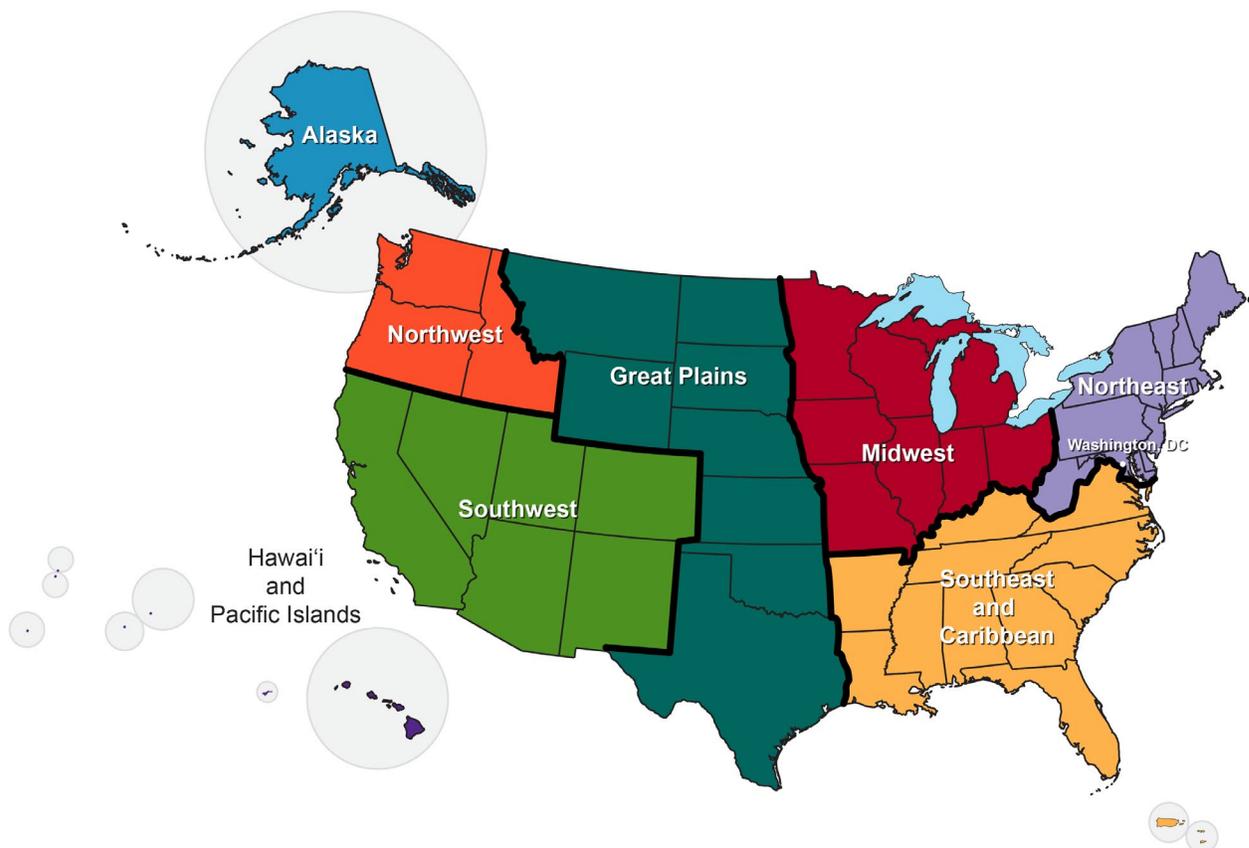
Regions used in the Third National Climate Assessment

FUNDING
- Was the process of getting initial funding commitments and enforcement successful?
- How to ensure future funding and interagency cooperation?
- How to leverage ongoing activities?
- How does level of funding impact the process at different phases?

SOURCES OF FEEDBACK
- Authors and workshop participants not on author teams
- Perceptions of NCA from outside groups like American Geophysical Union and Ecological Society of America
- Community awareness

6.1.2. User community

From the user community perspective, participants identified the following themes and key questions:

STAKEHOLDER ENGAGEMENT
- Do users perceive that the NCA process is inclusive?
- For stakeholders who were engaged in the NCA3 process, did this participation lead to the perception of NCA3 information being more authoritative, relevant, and usable?
- Did NCA3 change due to stakeholder engagement, and, if so, how?
- Did stakeholders learn, change attitudes, and act on learned information because of their engagement in the NCA3 process?

USABILITY
- Is the NCA process sufficient to produce information and tools for agencies or other users with climate related mandates?
- Does the NCA process provide decision support and guidance for applying climate information?
- Is the NCA establishing mechanisms to improve the learning and capacity of decision makers?

CREDIBILITY/AUTHORITATIVENESS
- Do users perceive that the NCA process is transparent?
- Do users perceive that NCA information is credible/authoritative, timely, and actionable?
- Do users find the processes for ensuring credibility of NCA information (e.g. underlying data) sufficient?

FRAMING
- What aspects of framing were new for NCA3 and did they attract new audiences?
- Was the new framing effective for meeting user needs?

DEPLOYMENT
- How did the website and social media affect users?
- Did the deployment reach a broad audience?

- How did engagement with the media affect uptake of NCA information, and other climate sources, by different target audiences?

OVERALL
- What elements of the NCA process, if any, fostered a shift in the debate from climate science to climate action?

6.2. Outputs

The groups first identified the specific outputs from NCA3 that could be evaluated. These outputs fell into three categories:
- Tangible products such as the report itself, the website, as well as technical input and workshop reports developed earlier in the process
- Individual and group interactions, including workshops and NCADAC and author team meetings
- Products that build capacity to conduct and use assessment information, for example guides for educators, guidance for authors, and media training for authors

Breakout groups identified a set of key questions to be addressed in evaluating NCA3 outputs from the perspective of both the science and user communities:
- Is the output discoverable: Can and do the intended audiences find the output?
- Does the output contribute to understanding climate change science, impacts, and responses?
- Does the output adequately characterize uncertainty and gaps in knowledge?
- Does the output contribute to the capacity to conduct and use assessments?
- Can and do intended audiences use the output? Which users are using which outputs?
- How does the output contribute to subsequent steps in the assessment process? For example, how did the guidance for authors (on risk-based framing, traceable accounts, etc.) shape the chapter writing process? How were technical inputs considered in drafting the chapters?
- Is the output credible, salient, and legitimate?
- Can users access the content of the output? For example, is the output behind a paywall? Is it accessible to users with visual impairment?
- How accessible is the output to users with varying levels of literacy, considering overall writing style as well as scientific terms?
- Is it "connectable"? How easy is it to connect specific content within the output to related content or discussions outside of the NCA process? For example, is it possible to link to the URL for a specific key message in the report, or can users only link to a main webpage that contains the key messages?

- Does the output maintain the above attributes over time? Are there sufficient resources to maintain these attributes? For example, do weblinks to the report remain active? Is there a webmaster who can update links?
- What financial and human resources were required to produce the output? Do the ends justify the means?

Participants noted that there are both quantitative and qualitative metrics that could be used to answer these questions. For example, quantitative metrics include the number of downloads, time users spend on a website, and number of participants at a workshop. Quantitative metrics could also include number of citations of a particular output in the scientific or popular press. Qualitative metrics include usability of a website, users interpretation of a key message or graphic, or an author's report on their experience with the assessment.

6.3. Outcomes

Breakout sessions focused on evaluating outcomes from the perspectives of NCA users and from the perspectives of the science community that informed or participated in the development of NCA products. Each of these perspectives is treated separately below.

6.3.1. Science Community

In thinking through the things that scientists would want to learn from an evaluation of the NCA, participants came up with a list of questions that can be grouped into two broad questions: how has the NCA changed science; and how has NCA science changed the world?

HOW HAS THE NCA CHANGED SCIENCE?

This first broad question relates to the bureaucratic and scientific system that underlies the NCA. Implicit in these questions is a recognition of interplay between the NCA and this system: each one supports, and is supported by, the other. Each one is changed by the other. Participants felt that it is important to document these dynamics in a self-reflective way, and think carefully about how the system could improve in service of a better NCA over time. The specific questions were:

- How is the NCA changing research trajectories?
- Is the NCA changing perceptions of data and information needs?
- Has the NCA process enabled more effective interactions between scientists and user groups? Has it improved awareness--among scientists and federal agencies--of user needs?
- Has the NCA improved upon the science of assessments?

HOW HAS THE SCIENCE IN THE NCA CHANGED THE WORLD?

Participants recognized that the science community would have an interest in the broader value of their participation in the NCA. Documenting answers to these questions could be useful in drawing scientists and other professionals into the sustained assessment process. Specific questions include:

- Did we save the world? This broad question indicates a general interest on the part of scientists in the impact they are having by participating in the NCA.
- Has the science in the NCA informed decisions? Are NCA data being used?
- What is the demand for NCA products and how is that changing?
- Have awareness and perceptions of science changed due to the NCA?

6.3.2. User Groups

This breakout group focused on identifying the outcomes of interest from the perspective of user communities, the parties interested in evaluating these outcomes, and the methods that might be used to conduct an evaluation.

WHAT ARE THE OUTCOMES OF THE NCA?

Based largely on anecdotal evidence from participants, outcomes of the NCA could range broadly from changes in behaviors of people and institutions to increased or improved knowledge to changes in management actions. Questions that could be part of an evaluation include:

- How are mission-focused federal agencies using NCA science and information both to shape their science priorities and to make their operations more resilient and adaptive?
- What impact has participation in the NCA had on participants' careers?
- Are there political or programmatic risks associated with participating in the NCA for individuals, agencies, or other organizations?
- Have new communities of practice emerged?
- Does the expanded level of engagement in regions and sectors signal a change in attitudes on and perceptions of the importance of global change?
- How has knowledge and information gained from the NCA influenced state policies and city management actions? Influenced educational resources?

WHO CARES ABOUT OUTCOMES FROM THE NCA?

The NCA has a broad and visible audience. The release of the NCA and the findings associated with it have received considerable attention in national and international media outlets. While there are a number of audiences for the NCA, participants remained largely focused on people and institutions that directly participated in the NCA3:

- Officials within the Executive Office of the President, interested in what the NCA outcomes

The National Climate Assessment incorporates the results from monitoring programs (*photo courtesy of NOAA*).

mean for program design and the use of science for public value

- USGCRP Principals and leaders of agencies, interested in building on communities of practice and collaborations inspired by the NCA, particularly within interagency working groups
- More generally, many of the people who contributed to the NCA throughout the process wish to build on the momentum in sustaining the assessment process.

WHAT ARE THE POTENTIAL WAYS OF MEASURING THESE OUTCOMES?

Participants noted that richer perspectives on the outcomes of the NCA, such as changes in risk perception and use in planning and policy, create a need for greater social science capacity to conduct both qualitative and quantitative evaluation. Specific examples include:

- Interviews, which can be critical for identifying the aspects of the NCA (e.g., engagement or science or both) that enabled new management actions, can help establish causality. The time and labor-intensive nature of interviews, however, also represent difficulty in terms of systemizing the evaluation and avoiding selective bias.
- Longitudinal studies, such as the Six Americas[12] study, may complement more in-depth evalu-

ations drawing on mixed methods including interviews.

- Other mechanisms include collections of case studies that can be compiled on the web and used both as evidence of outcomes and as a means of deciding where further evaluation would be beneficial.

6.4. Participation

This breakout group focused on questions that could be asked in an evaluation of participation in the NCA process. Key questions identified include:

- Who were the actual participants? Were there groups that were invited to participate that did not? Were there groups that were overrepresented? Were there groups that were missed?
- How did participants learn about opportunities to participate? How effective were mechanisms for announcing participation opportunities (e.g., USGCRP newsletter, Federal Register Notice, NCAnet)?
- How did participation in NCA3 compare to that in previous assessments?
- How were the inputs provided by participants (e.g., technical inputs, comments made during town hall meetings) used in the NCA process and outputs?
- Did participants find value in participating?
- What were the incentives offered to participants? Were these incentives effective?
- How did participation help the NCA meet its goals?

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[12] Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2009). Global Warming's Six Americas 2009: An Audience Segmentation Analysis, Yale Project on Climate Change and the George Mason University Center for Climate Change Communication. http://trid.trb.org/view.aspx?id=889822

- Did participants' experience meet their expectations?
- How much effort (and by whom) was required to achieve the participation levels seen in the assessment? Was it worth it?
- Were opportunities to participate at appropriate times in the NCA process, and was the scale of participation for each opportunity appropriate? For example, was it appropriate to have a 90-day comment period on the public review draft, or a 5-minute public comment period at NCADAC meetings?
- How did the network of participants change over time?

There are a few quantitative metrics that could be used, such as number and diversity of participants, attendance records of participants, and costs. However, many of the above questions will require qualitative methods and analysis.

6.5. Science Education and Literacy

This breakout group focused on evaluating the NCA contributions to improving science education and literacy. Participants in the session started the discussion by defining the scope of the evaluation and then the discussion moved to key questions and methods of assessment. Lastly, the group reviewed key challenges for the NCA related to achieving science education and literacy goals.

The early discussion focused on articulating potential science education and literacy goals for the NCA and identifying target audiences. Goals discussed included:

- Contribute to public lifelong learning and deeper engagement with and about climate, not just front page headlines and short-term awareness building
- Build capacity among the future scientific workforce for understanding and responding to global change
- Foster greater public understanding of global change and greater education of the public about global change and related societal issues
- Endeavor to produce usable information easily integrated into science education curricula and media reports, and easily digestible by the public

Potential targets for science education and literacy included:

- Citizenry
- Educators (both formal and informal; K-12, higher education, and professional)
- Curricula and state science standards
- Media
- Future scientific workforce

Information from the National Climate Assessment can be incorporated into education (*photo courtesy of NOAA*).

Once the potential science education and literacy goals and target audiences were defined, these became the basis for identifying key questions and methods of assessment aligned with the science education and literacy goals.

As the conversation shifted to questions and methods of assessment, the group coalesced on the following key questions and methods for the evaluation:

6.5.1. Understanding the level of awareness and use of the NCA by educators, the media, the public and others

- One way to assess the level of awareness and use of the NCA is through the administration of surveys or interviews of educators and the public. Surveys or interviews could be used to track not only awareness but also to go deeper to ask questions about the level of knowledge about global change.
- Web tracking (or other means of tracking) could be used to count web (or other) requests for NCA materials and requests for NCA or global change presentations and slides.

6.5.2. Understanding how use and awareness of the NCA influences change (e.g., in the level of knowledge about global change, in science curricula, in discussions about global change)

- Surveys and interviews could gather data about what information is most useful and give some idea of how that information is used and what changes, if any, have resulted.
- Case studies could be employed to gain a deeper knowledge about how the NCA is used by highlighting particular applications.
- Content analysis could aid in measuring and tracking change across different areas of interest over time. For example, content analysis could be used to assess changes in state science standards, language used by educators to talk about or frame global change, and wording in media articles about the NCA or the national dialogue about global change.

During the later discussion on goals, key questions and assessment, three potential impediments or

challenges to achieving NCA education and science literacy goals were raised:

- Keeping pace with changing educational standards and requirements
- Effectively meeting the diverse and sometimes divergent information needs of the different science education and literacy audiences
- Creating a sustained assessment with sufficient embedded evaluative activity to assess progress in achieving science education and literacy goals and to make informed course corrections and adjustments as needed

WORKSHOP DAY TWO

7. PANEL: WHAT CAN WE LEARN FROM OTHER EVALUATION PROCESSES?

Moderator: Caitlin Simpson (NOAA)

7.1. Part 1: What do we evaluate?

Panelists:
- Ryan Meyer (California Ocean Science Trust)
- Alfredo Gomez (U.S. Government Accountability Office) PDF
- Baruch Fischhoff (Carnegie Mellon University) PDF
- Maria Carmen Lemos (University of Michigan)

This first series of talks led to a wide range of insights about the potential focus of an NCA evaluation. Ryan Meyer discussed the need to examine the science system and how it is informing and responding to the NCA. Alfredo Gomez similarly suggested looking across government efforts, to examine how the NCA is making climate information more useful and accessible. Maria Carmen Lemos also emphasized evaluations of usability, but across all the potential users of the NCA, and offered a framework for thinking about the basic components of usability: perception of fit with user needs and intersection with users' beliefs and activities.

Speakers in this first panel also suggested a focus on evaluating the entire NCA process, as opposed to its impact. Baruch Fischhoff pointed out that, while it is possible to learn about what has changed, attribution of impact to the assessment is extremely difficult. Evaluations of impact are often simplistic and uninformative; however, evaluations of process provide opportunities for learning and are valuable if rooted in a strong theory of change. Ryan Meyer proposed a focus on institutional barriers to the changes that the NCA is trying to bring about. An evaluation should yield insights about realistic changes and incremental improvements, and document them as they occur.

Agencies like the National Park Service can use information from the National Climate Assessment in their programs (*Photo by Joseph Bruce, National Park Service*).

7.2. Part 2: How do we evaluate?

Panelists:
- Susi Moser (Susanne Moser Research & Consulting) PDF
- Stuart Levenbach (White House Office of Management and Budget) PDF
- Elizabeth McNie (University of Colorado)
- Malgosia Madjawecz (Columbia University) PDF

Several speakers talked about setting up a process to collect baseline data as soon as possible; this is important for assessing outcomes in the future. A focus on evaluating outcomes (e.g., resilience) or at least milestones that lead to outcomes (e.g., percent of states planning or implementing adaptation actions) will be important for communicating results to audiences inside and outside the government. Routine tracking of activities, outputs, and outcomes from the outset is essential. One component to begin immediately is an evaluation of the NCA governance process (e.g., NCA-DAC, resources, USGCRP oversight). Some felt that it was important to have an interagency, synthesized evaluation and not have each agency doing its own evaluation. The evaluation process should be a collaboration between the evaluators and those involved in designing and implementing the NCA. In addition, the evaluators should, according to Susi Moser, "practice humility; [they should] be humble … because evaluation is sensitive business." In addition, one idea was to include a chapter on evaluation in the NCA4 report.

Panelists and the audience raised a number of issues that could be considered in NCA evaluations, including:
- Identify the major strengths and weaknesses of various stages of the assessment process

- Focus on identifying what feedback would be helpful to the NCA
- Uncover emerging opportunities for improving science and communicating results
- Measure how much it cost to undertake and produce the NCA, including in-kind support of people's time from outside and inside the government
- Include analysis of the benefits and costs of NCA collaborations (e.g., with universities and NGOs)
- Look for opportunities to demonstrate improved understanding of impacts in particular locations
- Ask users what they perceived as the outcomes of NCA3 that were relevant to them
- Include long-term measures such as whether users have undertaken resilience-building actions
- Report failures as well as successes

8. BREAKOUT SESSIONS: METHODS FOR EVALUATION

8.1. Themes for breakout sessions

When participants first arrived for the second day of the workshop, they were given the opportunity to vote on which questions from the day one breakout groups they saw as high priority for an evaluation. Following this vote, questions were grouped into a number of themes. Within each area of evaluation (process, outputs, outcomes) the themes are roughly ordered according to the number of votes received from participants. For a full list of the questions included in each theme, please see Appendix G.

8.1.1. Input and Process Themes
- Communication and power within or between groups
- Methodology and science inputs
- Writing and review process
- Inclusivity and engagement
- Resources
- Capacity and tools
- Selection of teams
- Innovation

8.1.2. Outputs Themes
- Product perceptions and popularity
- Product use
- Benefits of input/interaction
- Product outreach and discoverability
- Understandability and navigability
- Derivatives

8.1.3. Outcome Themes
- Informing planning, programs, and decisions
- Scientific advancement
- Surprises

- Other assessments
- Perceptions and understanding
- Interactions and collaborations
- Education
- Data access

Groups were asked to provide input on how to conduct a robust and credible evaluation in addressing each theme. More specifically:
- What methods could be used?
- Who would collect the data?
- How can different approaches be combined?
- What would it take (resources of all kinds, skills, capacities) to do a good job?

Following the first half of discussion, participants were free to rotate or could join a new group. The new groups focused on how to embed evaluation into the sustained assessment process. More specifically:
- What mechanisms would facilitate and enable ongoing monitoring, and thus evaluation and learning?
- How do we use the results of evaluations to inform and adapt the sustained assessment process?
- What would it take (resources of all kinds, skills, capacities) to do a good job?

8.2. Inputs and Process

For all the process-related themes considered by breakout groups, an initial survey would allow data collection from a large number of process participants. However, surveys need to be carefully constructed and should not be conducted in haste. Considerations include the number of questions, and the amount of time needed to complete the survey. A series of brief surveys of a large number and variety of people can help provide a baseline and be followed by other methods that allow more in-depth data collection from a smaller number of people. However, while such a baseline survey can provide a lot of important informa-

A sustained assessment process can provide decision-makers with more timely and useful information (*photo courtesy NOAA/NCDC*).

tion, survey creators will need to make modifications to the set of questions used, the number of questions, and the wording of specific questions to accommodate the different types of participants included in a survey. Additional and often complementary methods are suggested below.

8.2.1. Communication and power within or between groups

To understand if and how power and communication influences the assessment process, it is important to understand how the process and inputs shaped the products:

- Was there a technical input and, if so, did the chapter authors use it?
- How did the author team balance input across the team?
- How did the amount of NCA staff support and knowledge of staff shape the way chapters developed?

In order to answer these questions, participants identified methods, including:

- Interviews and focus: While these methods require much more time to conduct and analyze, they provide the flexibility to drill down into individual experiences. Interviews and focus groups can help understand how the process and products were shaped by power dynamics and existing and new relationships among participants. Focus groups especially would provide the ability to engage different types of process participants in conversation. However, it is important to be attentive to the ways in which status, previous relationships, and other factors can affect the input gained from a focus group.
- Social network analysis could help understand who had power and knowledge in the process, and how relationships between individuals and groups developed.

8.2.2. Methodology and science inputs

- Interviews and focus groups could explore how inputs (technical inputs, workshop reports, public and agency comments) shaped the final products. Interviews and focus groups could explore how inputs were considered, even if they were not ultimately cited. For example, how did issues explored and reported on in workshops shape the choices that were made later in the process?
- Counting the number of citations to technical inputs, workshop reports, and other process outputs in the NCA3 and in other documents can help identify the utility of these inputs within and beyond the process. Tracking the number of downloads of technical input reports, scenarios,

workshop reports, both from globalchange.gov, and through other hosts (e.g., Island Press) can help us understand what people are interested in.

8.2.3. Writing and review process

- Interviews and focus groups can help understand how teams executed the process in reality, versus the ideal imagined in the guidance materials. They could also explore authors' ideas for alternate mechanisms for developing chapter content and key messages (e.g., Delphi method or other expert judgment elicitation). These methods can also help understand how public, agency, and expert reviews were used, or not used, by author teams in revising their chapters. Interviews with authors could help surface the ways in which the mix of backgrounds of teammates shaped the writing process and final chapter.
- Content analysis can be used to understand how the document changed and identify new areas and content that were added in response to input from the public and agencies. Analyzing drafts in relation to public comments can also identify public input that was not included.

8.2.4. Inclusivity and engagement

- Interviews and focus groups could help understand how and when participants in the NCA process became involved. These participants should include not only report authors and NCADAC members but should also target NCAnet members, participants in workshops, and technical report authors. Interviews and focus groups can also explore whether the experience of participating in the NCA matched participants' expectations.
- Content analysis of notices in the Federal Register, and subsequent NCA materials, can help track the evolution of NCA topics and membership of the NCADAC.
- Citation counts can be used to understand the types and quantity of sources that cited the NCA (disciplines, particular scientific journals, journals versus other types of sources). Counts of participants can help understand the distribution across sectors, regions of the country, or other factors of interest.
- Social network analysis can be used to understand how the network grew over time and the variation among participants in how central they were within the network.

8.2.5. Resources

- Interviews could be used to understand how financial and human resources were deployed,

and how resource constraints affected the process.

- Content analysis can be used to identify investments in the NCA within agency budgets. However, content analysis cannot identify investments made by contributors who may not wish to publish their budget or who do not track investments in the NCA in particular.
- Breakout group participants noted that trying to determine if resources were adequate could be considered rude or unethical given that much of the assessment was conducted by volunteers or free-will contributors.

8.2.6. Capacity and tools

- Interviews and focus groups with users can help frame how people are using or anticipate using the assessment. These methods can also provide important feedback on the utility of NCA3's approaches to framing risk and uncertainty for decision-making. Interviews with authors and other participants can reveal how knowledge about the process of conducting assessment was shared and how new knowledge was built. Interviews could also be used to identify the benefits that accrued to participants that may be incentives for them to participate again, and the costs of participating that may be barriers to future participation.
- Social network analysis can be used to characterize the connections among NCA participants, especially researchers' connections to end-users and to other decision-makers.

8.2.7. Selection of teams

- Interviews and focus groups will be necessary to understand and reconstruct the process and criteria used to nominate, vet, and select NCADAC members, authors, and review editors. It would also be useful to ask these participants why they agreed to participate.
- Content analysis will also help reconstruct the process and criteria. Specifically, content analysis can be applied to Federal Register notices, NCADAC meeting minutes, and other recruitment materials used in selecting teams. Once the process and criteria have been reconstructed, then it will be possible to determine if the people selected match the criteria that were set out. Further, it will be possible to compare the composition of people selected, versus the pool of people considered.

8.3. Outputs

The groups focused on evaluation of outputs, in and of themselves, and as a contributor in developing metrics for NCA outcomes. For the purpose of the discussion below, outputs include:

- NCA3 content in both web and PDF forms
- NCA authors' outreach activities, along with those of the agencies and USGCRP staff
- Portions of the USGCRP website, www .globalchange.gov, including those pertaining to the NCA process and the Global Change Information System (GCIS)[13]

8.3.1. Intended Audiences

Initial discussion focused on intended audiences for the NCA3 and for the results of the NCA evaluation. Identifying desired audiences will help in designing metrics that measure success and explore barriers and opportunities for NCA use.

Audiences for an evaluation of the NCA include:

- USGCRP decision makers[14]: Subcommittee on Global Change Research (SGCR), Interagency Workgroup for the NCA (INCA), White House Office of Science and Technology Policy (OSTP), White House Office of Management and Budget (OMB)
- Funders for NCA process: Congress, Agencies
- Co-producers of NCA input/content: Federal regional organizations; non-federal government, NCAnet members
- USGCRP Advisory Committees: NRC, federal advisory committee

Possible participants in an evaluation include:

- NCA leaders: e.g., NCADAC, authors, federal agency leaders
- Key public sector users: e.g., Congress; defense, infrastructure & security planning; land use planning; resource managers; cities, counties, states, tribes, and regions
- NCA collaborators: NCAnet, NGO participants, regional users
- Research and education: scientists, K-12 and informal educators and students
- Business users: e.g., (re-)insurance, Chambers of Commerce, energy sector, industry, agriculture
- Media

8.3.2. Approaches for NCA Metrics

The groups discussed and developed candidate metrics for areas deemed most important for NCA usability: product outreach, accessibility (understandability and navigability), and products derived from the NCA. The metrics included both quantitative and qualitative measures. Some metrics can be gathered immediately and can help shape subsequent evaluation methods. A combination of approaches would help USGCRP learn how to better reach and serve the NCA's intended audiences.

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[13]http://data.globalchange.gov/
[14]http://www.globalchange.gov/about/organization-leadership

8.3.3. Product Outreach and Discoverability

- Track media coverage, by scale (e.g. international, regional) and primary topic
- Track NCA-related outreach, including activity type and SGCR, author, and staff participation
- Track referral sites by which visitors reach the NCA website and dwell time on site
- Track use of NCA through citations in a variety of publications, including masters and PhD theses, peer-reviewed publications, and other white and grey literature
- Identify most frequently used parts of the NCA and GCIS and most frequent types of users

It is important to understand how the NCA informs planning, programs, and decisions in different sectors (*photo courtesy NOAA/NCDC*).

- Track page views and image and chapter downloads by region and sector and user groups
- Analyze social media (e.g. re-tweets, Facebook likes) and website information on domestic and international user domains (e.g. .gov, .com, .edu, .net) to develop typology of NCA users and interests
- Use above information to develop and deploy interviews/surveys to determine NCA awareness and uptake within various regions and sectors

8.3.4. Understandability and Navigability (Accessibility) of the NCA on the Web

- Activity currently underway: Survey NCADAC regarding NCA outreach and its products and their usability
- Track use of search bar and topics searched for, as indicators that direct links on webpages may not support optimal navigability
- Track visitor pathways on site, and number of clicks associated with average visit
- Consistent with Federal guidance, use simple feedback boxes to allow viewers to identify areas regarded as useful and understandable, or not.
- Conduct focus group discussions with various audiences
- Develop, deploy and analyze surveys aimed at diverse audiences, that include forward looking questions about types of decisions for which information is needed
- Work with experienced designers to evaluate the success of the website and suggest improvements

8.3.5. Derivatives (Products derived from the NCA)

Such products extend the reach of the NCA and demonstrate its usefulness to wider audiences. Some have already been produced, while others are expected to emerge months to years after release of the report.

- At various intervals (e.g., one year, two year, etc.), survey federal and non-federal organizations to identify products being derived, including who developed them and what parts of the NCA were used.
- When possible, track development and deployment of these NCA-derived products.
- Develop, deploy and analyze surveys that aim to identify how products derived from the NCA are being used.

8.3.6. Product use (understanding how outputs are used)

Questions that will help elucidate how particular outputs are used include:

- Which products do users report as useful, which do they criticize, and in what contexts?
- What barriers do users experience to using a particular output (policy, legal, practical)?
- What characteristics of the output make it more or less understandable and useable?
- What are users' future decision areas and information needs?
- How do users perceive the authority and legitimacy of the outputs?
- In what ways do outputs increase the capacity of users (e.g. reduce costs, mitigate risks, improve decision-making)?

Many of these questions will require more detailed interviews or open-ended questions on surveys.

8.4. Outcomes

Two breakout groups looked at some of the questions around evaluating the outcomes of the National Climate Assessment and potential methods for collecting this information. Specific themes are discussed below; an overall strategy suggested for this evaluation was to consider OMB-able (budget-sensitive) metrics across the board.

Methods for evaluating **how the NCA informs planning, programs, and decisions** include investigating how the NCA influenced changes in different sectors. This could be investigated by determining how often and in what context the NCA is cited in a number of document types, including:

- Government (federal, state, local, tribal) documents and announcements (e.g., Federal Register Notices, Executive Orders, regulations, codes, resolutions, adaptation and mitigation plans);
- Business, NGOs (e.g. CERES, Risky Business, manufacturing and building standards); and
- Media (e.g., in relation to climate events)

Surveys followed by in-depth interviews for users could gather information on how the NCA is used by various sectors. The need to combine disparate data sources was discussed, as was the need to use data mining, document analysis, and surveys and interviews to inform this evaluation. The breakouts suggested groups that could help with this part of the evaluation – for example, USGCRP via web feedback, NCAnet participants, and CERES.

To evaluate the NCA's **impact on scientific advancements**, these groups suggested looking at data accessibility, overall trends in research, and the emergence of new programs. Surveying users who download data from GCIS can help USGCRP understand how people plan to use the data. Counting references to the NCA in funding opportunities (federal, state, foundation) and proposals could help answer how the NCA influences trends in the studies of climate impacts and trends in penetration of climate into related fields. Interviews with members of the scientific community could explore how NCA participation and results changed scientists' research focus. Interviews could also explore how the NCA spurred new research programs (internally within USGCRP and externally). Social network analysis could help track peer-to-peer diffusion. Case studies could examine how private sector companies are using the NCA in their own research and development programs. Much of this work could be completed by evaluators outside of the federal government, especially those who are associated with bound-ary organizations (e.g., universities, NGOs, extension, RISAs[15]). Some questions may be better addressed by the USGCRP (e.g., surveys of GCIS users).

Existing mechanisms could be used to gather data on people's **perceptions and understanding of climate science**. Data from existing national-scale surveys (e.g., Yale Project on Climate Change Communication/ George Mason Center for Climate Change Communication, Gallup, Pew Research Center) provide a pre-NCA3 baseline. Future surveys could include NCA-specific questions that will help us understand whether the NCA affected people's perceptions and understanding. Additional surveys at regional or sectoral scales could also provide useful information. This evaluation should focus on understanding and perceptions of climate change causes and impacts, rather than the physical mechanisms by which climate is changing. Although currently employed survey mechanisms may not account for the influence of the NCA3, adding survey questions could help elicit the effect of future NCA activities.

Evaluating the **interactions and collaborations facilitated by the NCA** involves looking at how the network of NCA participants changed over time and how collaboration on the NCA influenced shared projects outside of the assessment. Social network analysis can be used for an initial mapping of participation. Interviews with authors and other long-term participants can illuminate the types and quality of interactions related to the NCA. Tracking bibliometrics can be used to evaluate how the NCA influenced scientific collaborations. Another question to explore is how to better engage social scientists in the NCA.

Evaluating the NCA's **interaction with education** could follow two paths: evaluating the uptake of a specific NCA product or advances in climate knowledge more generally. Although it may take a long time to integrate the NCA into published textbooks and education standards, several mechanisms can provide information about early uptake. These include syllabi repositories, teacher conference proceedings, online discussion forums and blogs, interviews with teachers, and development of education-related products by NGOs. Other potential methods for evaluating the NCA and its impact on education include: interviewing boards of education, tracking content sharing through social media, and tracking use of NCA content by museums that have global change information.

8.5. Sustained Assessment

Participants highlighted multiple points in the assessment process where planning for and conducting evaluation may be considered:

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[15] NOAA's Regional Integrated Sciences and Assessments (RISA) program. http://cpo.noaa.gov/ClimatePrograms /ClimateandSocietalInteractions/RISAProgram/RISATeams.aspx

- An evaluation plan that is in place at the beginning of the process will allow more efficient deployment of the financial and social capital resources needed for evaluation. Development and implementation of this plan could be led by a standing committee composed of both federal and non-federal representatives (e.g., federal interagency working group, federal advisory committee).
- A logic model will help identify assessment objectives, resources, activities, outputs, and outcomes. A logic model will further help identify appropriate points in the process for evaluation to occur.
- A needs assessment early on in the process may be done to determine potential contributions, collaborations, allocation of resources, and accountability that the needs of affected members of these partnerships are met. While understanding needs is vital to the evaluation process, it is important to conduct a National Climate Assessment and not get caught up in identifying needs.
- Identifying scientific needs and conducting research can strengthen cooperation between federal agencies and non-federal investigators. It is important to capture lessons during early stages of the scientific assessment process, therefore these stages should be considered when designing evaluation. One way to ensure adequate evaluation occurs is to include evaluation requirements in federal science funding mechanisms.
- Periodic surveys may be used to track progress. Surveys may include gathering input from process leaders (e.g., federal advisory committee, agency leaders, etc.) to evaluate new products and milestones throughout the development of the NCA4.
- Piloting any evaluation tools with a small number of participants can help ensure the resources needed and results achieved will be practical and suitable.

In addition to the methodological considerations described above, participants noted a number of other considerations for implementing a successful evaluation.

- Partnerships (internal, external, regional, public-private) can help define the operational model for the sustained assessment. Partnerships may shape inputs to better fill gaps and assess usability and value of the process.
- There is often a stigma attached to the evaluation process; some federal agencies may fear that evaluation will result in significant changes that negatively impact both the assessment and available resources.

- A federal advisory committee may help ensure an evaluation process is in place, includes voices from outside the federal government, and is based on the best available methods.
- Central coordination of these efforts is crucial in providing a repository for shared information to facilitate the alignment of the short- and long-term pieces of the logic model and management of the NCA. This centralized coordination will also ensure the principles of evaluation are preserved throughout the entirety of the sustained assessment. These principles include traceability, reproducibility, transparency, prioritization of activities, and procedures to capture and provide access to new data.
- The NCA requires significant resources from individual federal agencies and from outside the federal government. We need better ways to account for these diverse resource streams.
- Results from evaluations of past assessments could be used as baselines for evaluating NCA3 and the sustained assessment. Specifically, were problems and gaps identified in previous assessments addressed in NCA3 and in the sustained assessment?
- It is important to recognize that each of the previous NCAs and the sustained assessment are different; however, many elements remain the same. Evaluators will need to adapt methods to fit changes in the assessment, while also designing evaluation so as to allow comparisons across multiple assessments where possible.

APPENDICES

Appendix A: Workshop Agenda

9.1.1. DAY ONE: THEME FOR THE DAY: WHY DO WE EVALUATE? WHAT DO WE EVALUATE?

8:00 am   Registration and provocative questions.
Please come early because there will be a fun and important stage-setting activity! Posters will be set up, and workshop participants are invited to write on the posters, in response to these questions:
- What makes a scientific assessment successful?
- What makes an evaluation successful?
- Who do you think are key audiences for an evaluation of this and future National Climate Assessments?
- What is most important to you that we cover in these next two days?

9:00 am   Welcome, introduction to the workshop organization and objectives, and
            provocative questions
Speaker: Tom Armstrong (U.S. Global Change Research Program, White House Office of Science & Technology Policy)

9:15 am   NCA 101 Panel
- Introducing the NCA3: Where does the NCA fit into USGCRP? What did we set out to do with NCA3?
- Overview of evaluation guidance and activities embedded in NCA
- Sustained Assessment Special Report
Moderator: Kathy Jacobs (Center for Climate Adaptation Science and Solutions, University of Arizona)
Panelists:
- Glynis Lough (U.S. Global Change Research Program) PDF
- Susi Moser (Susanne Moser Research & Consulting) PDF
- Jim Buizer (University of Arizona) PDF
- Julie Morris (USGCRP) will join panel for discussion.

10:15 am   Break

10:30 am   Five-minute talks about what people want to get out of evaluation
Moderator: Allison Leidner (NASA / Universities Space Research Association)
Speakers represent different audiences for evaluation, including NCA3 chapter authors, NCADAC, agencies, NCAnet, NCA staff, and decision-makers.
Speakers:
- Richard Moss (Joint Global Change Research Institute) PDF
- Jerry Melillo (Marine Biological Laboratory) PDF
- Jack Kaye (NASA)
- Amanda Staudt (National Research Council) PDF
- Kathy Jacobs (Center for Climate Adaptation Science and Solutions, University of Arizona)
- Nicky Sundt (World Wildlife Fund)

11:15 am   Panel discussion: How are evaluations useful to and used by the groups being evaluated? Are evaluations ever NOT useful or misused?
Moderator: Emily Cloyd (U.S. Global Change Research Program)
Panelists:
- Adam Parris (NOAA)
- Anne Grambsch (U.S. Environmental Protection Agency)
- Tom Fish (U.S. National Park Service) PDF
- Kai Lee (David and Lucile Packard Foundation) PDF

12:15 pm   Lunch on your own

1:15 pm   Synthesis of responses to questions from breakfast. Framing questions that breakout groups will address. Define focus areas for breakout groups: outputs, outcomes, and process. PDF

1:45 pm   Breakout session: Participants will rotate between discussion tables that will take on key focus areas for evaluation.
Each group will take on a focus area (outcomes, output, process). Groups will build on the information gathered during breakfast. Groups will use the following questions to guide discussion:
- What are key questions to be asked in an evaluation of the breakout group's focus area (outputs, outcomes, or process)?
- Who might be asking these questions?
- What are the indicators and metrics you would use to answer these questions?

2:30 pm   Break

2:45 pm   Breakout groups resume.

3:40 pm   Breakout groups create summary for sharing with plenary.

4:00 pm   Groups report out and discuss in plenary.

4:50 pm   Synthesized recap of the day. Things to ponder overnight, logistics for Day Two.

5:00 pm   Adjourn

11.1.2. DAY 2: THEME FOR THE DAY: HOW, WHO, AND WHEN DO WE EVALUATE?

8:00 am   Voting on areas for further discussion during the day's breakout session.
Posters will be set up with the focus areas and measures of success ("indicators and metrics") identified in Day One's breakout session. Workshop participants will be given colored dots to place by things people are especially interested in working on further in Day Two. People can also write new things on posters (based on their overnight thoughts).

8:45 am   Introduction and framing what we will do today.

9:00 am   Panel discussion: What can we learn from other evaluation processes? What works and what doesn't work? (2-part panel)
Moderator: Caitlin Simpson (NOAA)
 Part 1: What do we evaluate?
Panelists:
- Ryan Meyer (California Ocean Science Trust)
- Alfredo Gomez (U.S. Government Accountability Office) PDF
- Baruch Fischhoff (Carnegie Mellon University) PDF
- Maria Carmen Lemos (University of Michigan)
 Part 2: How do we evaluate?
Panelists:
- Susi Moser (Susanne Moser Research & Consulting) PDF
- Stuart Levenbach (White House Office of Management and Budget) PDF
- Elizabeth McNie (University of Colorado)
- Malgosia Madjawecz (Columbia University) PDF

10:30 am   Break

10:45 am   Introduction to discussion tables.

11:00 am   Discussion tables will get more specific about how to do evaluation of assessment based on measures of success voted on earlier in the morning. During this hour, tables will address the question:

- How can we conduct a robust and credible evaluation of the NCA process, outputs, and outcomes?

12:00 pm   Lunch on your own

1:00 pm   Breakout groups continue pre-lunch discussion and create summary for sharing with plenary.
During this hour, participants will rotate to a new table. Discussion will continue on the question:

- How can we conduct a robust and credible evaluation of the NCA process, outputs, and outcomes?

Additional tables will be formed to address the question:

- How can we embed evaluation into the Sustained Assessment process?

2:00 pm   Groups report out and discuss in plenary.

3:00 pm   Wrap up, thank you, and next steps (outputs from this workshop; ways to get involved in the actual work of evaluating the NCA3).

3:30 pm   Adjourn

3:45 pm   Planning Committee and Report Author Team convene to discuss workshop report.

5:00 pm   Planning Committee and Report Author Team adjourn.

9.2. Appendix B: Workshop Planning Committee	
PERSON	**AFFILIATION**
Virginia Burkett	USGS
Emily Cloyd	U.S. Global Change Research Program
Lisa Dilling	University of Colorado Boulder
David Easterling	NOAA
Ilya Fischhoff	U.S. Global Change Research Program
Bryce Golden-Chen	U.S. Global Change Research Program
Anne Grambsch	EPA
Kathy Jacobs	Center for Climate Adaptation Science and Solutions, University of Arizona
Fabien Laurier	White House Office of Science & Technology Policy
Allison Leidner	NASA Earth Science Division/ Universities Space Research Association
Glynis Lough	U.S. Global Change Research Program
Ryan Meyer	California Ocean Science Trust
Julie Morris	U.S. Global Change Research Program
Susi Moser	Susanne Moser Research & Consulting
Adam Parris	NOAA
Caitlin Simpson	NOAA

9.3. Appendix C: Workshop Report Author Team	
PERSON	**AFFILIATION**
Tess Carter	U.S. Global Change Research Program
Emily Cloyd	U.S. Global Change Research Program
Irina Feygina	AAAS / APA Congressional Science Fellow
Ilya Fischhoff	U.S. Global Change Research Program
Christine Kirchoff	University of Connecticut
Allison Leidner	NASA Earth Science Division/ Universities Space Research Association
Glynis Lough	U.S. Global Change Research Program
Amanda McQueen	U.S. Global Change Research Program
Ryan Meyer	California Ocean Science Trust
Julie Morris	U.S. Global Change Research Program
Adam Parris	NOAA
Mark Shimamoto	U.S. Global Change Research Program
Caitlin Simpson	NOAA

9.4. Appendix D: Workshop Breakout Session Facilitators and Note-takers	
FACILITATOR	**AFFILIATION**
Emily Cloyd	U.S. Global Change Research Program
Irina Feygina	AAAS / APA Congressional Science Fellow
Marcia Brown	Foundations of Success
Jim Buizer	University of Arizona
Dan Ferguson	University of Arizona
Glynis Lough	U.S. Global Change Research Program
Ryan Meyer	California Ocean Science Trust
Julie Morris	U.S. Global Change Research Program
Susi Moser	Susanne Moser Research & Consulting
NOTE-TAKER	**AFFILIATION**
Samantha Brooks	U.S. Global Change Research Program
Tess Carter	U.S. Global Change Research Program
Bryce Golden-Chen	U.S. Global Change Research Program
Amanda Lamoureaux	USGCRP Indicators Team / SESYNC Intern
Ainsley Lloyd	USGCRP Indicators Team
Omar Malik	USGCRP Indicators Team
Amanda McQueen	U.S. Global Change Research Program
Olivia Poon	USGCRP Indicators Team / NOAA EPP Intern
Justin Shaifer	USGCRP Indicators Team / NOAA EPP Intern
Mark Shimamoto	U.S. Global Change Research Program

9.5. Appendix E: Graphic Design	
GRAPHICS PRODUCTION	**AFFILIATION**
Deborah Riddle	NOAA's National Climatic Data Center / Lead Designer
Sara Veasey	NOAA's National Climatic Data Center / Graphics Team Lead
Liz Love-Brotak	NOAA's National Climatic Data Center / Graphic Designer
Jessicca Griffin	CICS-NC / Graphic Designer

9.6. Appendix F: Workshop Participants	
PERSON	**AFFILIATION**
Avanthi Ajjarapu	National Science Foundation / Rice University
Tom Armstrong	U.S. Global Change Research Program
Ko Barrett	NOAA
Jonathan Berg	National Science Foundation / Rice University
Samantha Brooks	U.S. Global Change Research Program
Marcia Brown	Foundations of Success
Jim Buizer	University of Arizona
Virginia Burkett	USGS
Maria Carmen Lemos	University of Michigan School of Natural Resources and Environment
Tess Carter	U.S. Global Change Research Program
Ella Clarke	USGCRP Indicators Team
Emily Cloyd	U.S. Global Change Research Program
Daniel Ferguson	University of Arizona
Irina Feygina	AAAS / APA Congressional Science Fellow
Baruch Fischhoff	Carnegie Mellon University
Ilya Fischhoff	U.S. Global Change Research Program
Tom Fish	U.S. National Park Service
Lisa Gaines	Oregon State University, Institute for Natural Resources
Bryce Golden-Chen	U.S. Global Change Research Program
Alfredo Gomez	U.S. Government Accountability Office
Anne Grambsch	EPA
Dave Gustafson	Monsanto
John Hall	Department of Defense
Paula Hennon	NOAA National Climatic Data Center Technical Support Unit
Patricia Jacobberger-Jellison	NASA
Kathy Jacobs	Center for Climate Adaptation Science and Solutions, University of Arizona
Tony Janetos	Boston University
Baek Ho Jang	National Science Foundation / Rice University
Jack A. Kaye	NASA
Melissa Kenney	University of Maryland / USGCRP Indicators
Christine Kirchoff	University of Connecticut
Amanda Lamoureaux	USGCRP Indicators Team / SESYNC Intern
Fabien Laurier	White House Office of Science & Technology Policy
Kai Lee	David and Lucile Packard Foundation
Allison Leidner	NASA Earth Science Division/ Universities Space Research Association
Stuart Levenbach	White House Office of Management and Budget
Fred Lipschultz	U.S. Global Change Research Program
Ainsley Lloyd	USGCRP Indicators Team

9.6. Appendix F: Workshop Participants (continued)

PERSON	AFFILIATION
Glynis Lough	U.S. Global Change Research Program
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Alison Meadow	Southwest Climate Science Center - University of Arizona
Ryan Meyer	California Ocean Science Trust
Julie Morris	U.S. Global Change Research Program
Susi Moser	Susanne Moser Research & Consulting
Richard Moss	Joint Global Change Research Institute
Leah Nichols	National Science Foundation
Frank Niepold	NOAA
Gigi Owen	Climate Assessment for the Southwest
Adam Parris	NOAA
Olivia Poon	USGCRP Indicators Team / NOAA EPP Intern
Roger Pulwarty	NOAA
Julian Reyes	USGCRP Indicators Team / Washington State University
Connie Roser-Renouf	George Mason University
Justin Shaifer	USGCRP Indicators Team / NOAA EPP Intern
Mark Shimamoto	U.S. Global Change Research Program
Caitlin Simpson	NOAA
Amanda Staudt	National Research Council
Brooke Stewart	NOAA National Climatic Data Center Technical Support Unit
Nicky Sundt	World Wildlife Fund
Sacheen Tavares Leighton	NOAA Coastal Services Center
Joe Thompson	U.S. Government Accountability Office
Anne Waple	Second Nature
Chris Weaver	U.S. Global Change Research Program
Robert Wolfe	U.S. Global Change Research Program

APPENDIX G: EVALUATION QUESTIONS IDENTIFIED BY PARTICIPANTS

When participants first arrived for the second day of the workshop, they were given the opportunity to vote on which questions from the day one breakout groups they saw as high priority for an evaluation. Following this vote, questions were grouped into a number of themes. Within each area of evaluation (process, outputs, outcomes) the themes are roughly ordered according to the number of votes received from participants.

9.7.1. Inputs and Process

Breakout Group 1

COMMUNICATION AND POWER WITHIN OR BETWEEN GROUPS

- What was the experience of working in or with the NCADAC, and how did the approach used affect the process/products?
- Was communication and power balance between categories of participants appropriate?
- Did the assessment process adequately deal with conflict and controversy?

METHODOLOGY AND SCIENCE INPUTS

- Were the regional climatologies and scenarios provided in a timely fashion and used/useful?
- Did the assessment adequately leverage federal and non-federal government resources, research and capacity?
- Was the technical input process adequate and useful?
- Were the methodology and process workshops useful?

WRITING AND REVIEW PROCESS

- Was the guidance/training process timely, adequate, well-articulated, useful and followed by authors?
- Was the quality/approach to providing staff and technical support to authors/NCADAC appropriate and useful?
- Did the review, response, revision process improve the product?
- Did the process that the chapter author teams used result in integration of different sources of
- knowledge?

INCLUSIVITY

- Was the process sufficiently inclusive?

Breakout Group 2

RESOURCES

- Is a sustained assessment process sustainable, considering level of effort required and barriers?
- Were there adequate resources for the process?

CAPACITY AND TOOLS

- Is the NCA providing appropriate use of information by decision makers?
- Did the process build capacity? How? With whom?

ENGAGEMENT

- How was engagement in the assessment process useful to federal agencies, authors, NCADAC, other participants?
- What was the motivation for engagement of assessment participants?

SELECTION OF TEAMS

- Was the process for nominating/selecting NCADAC authors, review editors, etc. appropriate?

INNOVATIONS

- What aspects of the NCA process were new -- and what was the benefit of those approaches?

9.7.2. Outputs

Breakout Group 1

PRODUCT PERCEPTIONS AND POPULARITY

- How are the products perceived (salience, credibility, legitimacy)?
- Which products were most popular (to whom and, if possible, how so)?
- Which products were most criticized (by whom, for what)?

PRODUCT USE
- In what way were the products useful? Why/Why not?
- What is the use context of uses?

BENEFITS OF INPUT/INTERACTION
- How did/didn't people benefit from opportunities for inputs and direct interaction?
- (What else would have made them more useful?)

Breakout Group 2
PRODUCT OUTREACH AND DISCOVERABILITY
- How discoverable are the products (and how does this change over time)?
- Did outputs and events reach intended audiences? If not, why not? Who else was reached?

UNDERSTANDABILITY AND NAVIGABILITY
- How understandable are the products (readability, accessibility, graphic appeal, etc.)?
- Once found, how navigable are the products? If not found, what would improve navigation?

DERIVATIVES
- What derivative products have been produced: by whom, for whom, for what purpose, what kind, how accurate?

9.7.3. Outcomes
Breakout Group 1
INFORMING PLANNING, PROGRAMS, AND DECISIONS
- Does the NCA improve the usability of science to inform decisions, plans, programs, and policies?
- Does the NCA help agencies better understand and respond to user needs?

SCIENTIFIC ADVANCEMENT
- Does the NCA inform science and data priorities? Does it change the research trajectory?
- Does the NCA contribute to the science of assessment?

SURPRISES
- What is surprising about NCA outcomes?

OTHER ASSESSMENTS
- Does the NCA engage with or facilitate other assessment activities?

Breakout Group 2
PERCEPTIONS AND UNDERSTANDING
- Does the NCA change perceptions and understanding of climate science? Does it change behaviors?

**INTERACTIONS AND COLLABORATIONS**
- Does the NCA improve interactions between climate researchers and user groups?
- Do contributions to the NCA advance careers and collaborations (for participants, institutions and communities of practice)?

EDUCATION
- How is the NCA used in education (formal K-20 and informal, e.g. museums)?

DATA ACCESS
- Does the NCA improve data accessibility?
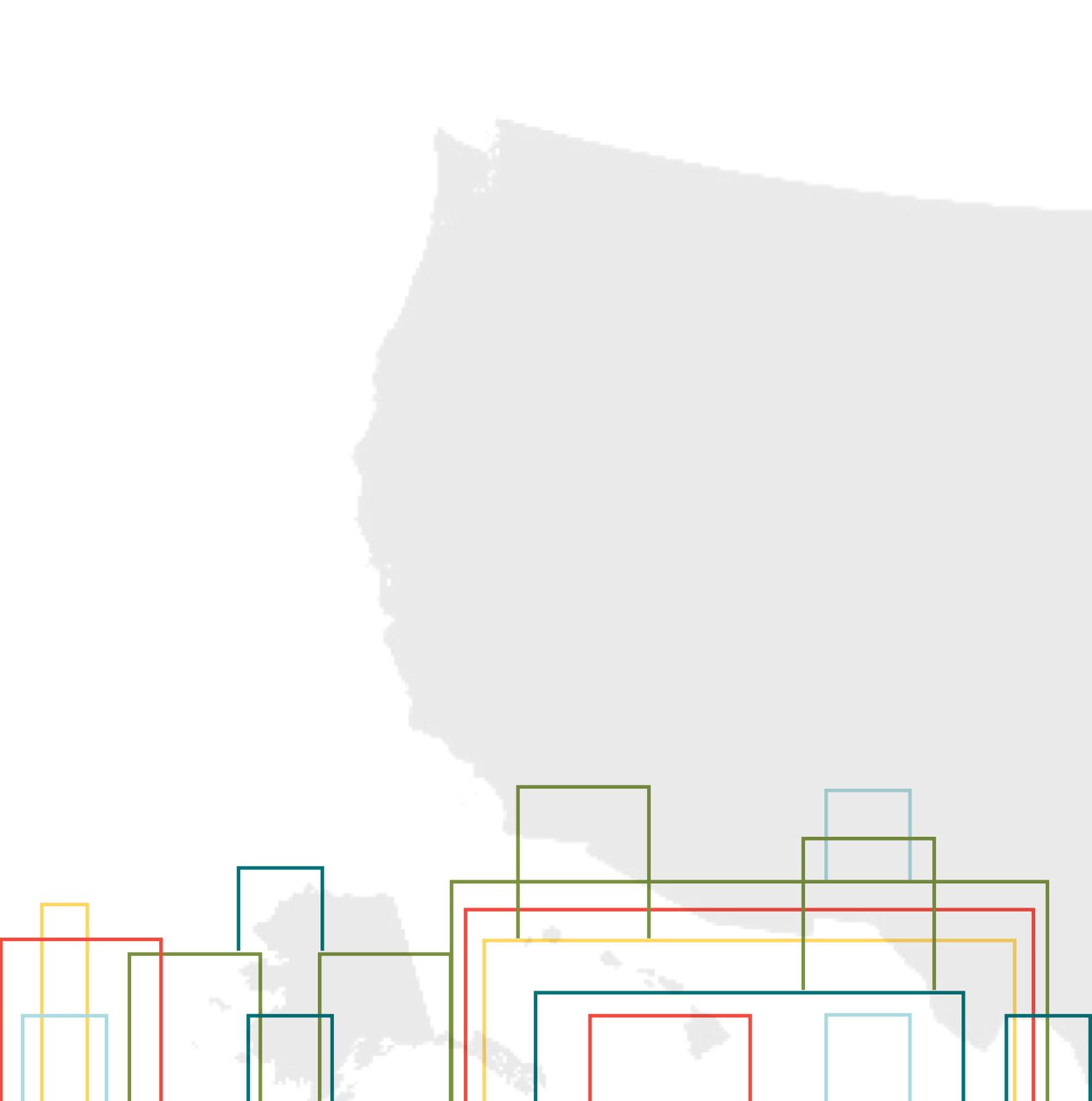
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