

Engagement in the Third U.S. National Climate Assessment: commitment, capacity, and communication for impact

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Abstract The National Climate Assessment's ability to support decision-making partly relies on engaging stakeholders throughout the assessment process. The guiding vision for the Third National Climate Assessment (NCA3) was for an inclusive, broad-based, and sustained process attentive to both the conduct of assessments and communication of findings. Such a process promotes dialogue between scientific experts, stakeholders, and decision-makers about what is important in a particular region or sector, the potential impacts of climate change, and possible responses. We sought to create actionable research and assessment products widely perceived as credible, salient, and legitimate. The process also sought to build capacity to conduct sustained assessments and use climate change information in decision-making processes. Here we describe how we pursued this stakeholder engagement vision during the planning, development, and release of NCA3. Through repeated opportunities for stakeholder input, we ensured process transparency and inclusiveness in the framing of assessment and built human capital. We also increased connectivity among stakeholder organizations. By

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cultivating a network of collaborators who connected the NCA to other networks, the NCA3 engagement process laid the groundwork for a sustained assessment - which is envisaged to transition the traditional quadrennial assessment approach into a more dynamic and adaptive assessment process.

1 Introduction: engagement and communication as central elements of assessments

Over the past few decades, there has been significant progress in understanding the physical climate system and in documenting impacts of climate change on social-ecological systems (National Research Council [NRC] 2010a; NRC 2007a). Scientific assessments, such as the National Climate Assessments conducted by the U.S. Global Change Research Program (USGCRP) (e.g., Karl et al. 2009; Melillo et al. 2014a) and the Intergovernmental Panel on Climate Change (e.g., IPCC 2014), seek to integrate such scientific information to better inform decision-making (Keller 2010; NRC 2007a; Farrell et al. 2006, Jäger and Farrell 2006). Yet assessments by themselves have not necessarily resulted in greater awareness of climate change risks among citizens and policy-makers or in decisions that explicitly incorporate climate change; to be useful in decision-making, assessments must be accessible and responsive to the needs of users (Moss 2015; Moss et al. 2014; Dilling and Lemos 2011; NRC 2010b, 2008, 2007a and the vast body of literature cited therein).

The Global Change Research Act of 1990 (PL 101-606, Section 106) requires that national climate assessments be produced, but does not specify any requirements for stakeholder engagement. It does charge the USGCRP to “consult with actual and potential users of the results of the Program to ensure that such results are useful in developing national and international policy responses to global change” (Section 102(e)). In addition, the Data Quality Act of 2001 and subsequent Office of Management and Budget guidance about the review process for “highly influential scientific assessments” includes public participation as a component of “process integrity” (70 FR 2664).

The Third National Climate Assessment (NCA3) made stakeholder engagement a principal pillar of the assessment process and sought innovative ways to make the assessment more accessible. This decision resulted from the lessons of previous assessments. The First National Climate Assessment (NCA1, conducted from 1997 to 2000) included strong regional and sectoral stakeholder engagement from the start. This mostly took the form of a series of regional workshops in which stakeholders identified priority concerns, contributed specialized expertise, and identified potential response options (USGCRP 2015). The resulting regional chapters and full report reflected stakeholder concerns to some extent. Members of the Federal Advisory Committee convened to produce NCA1 and outside evaluators of the process recognized the essential role engagement played in creating an effective assessment and noted that continued engagement of a wide variety of scientists, managers, decision-makers, and other stakeholders would be vital to continued success (Parson et al. 2003; Morgan et al. 2005; Moser 2005; NRC 2008). However, there was no Federal support for such ongoing stakeholder involvement, or for outreach and engagement following the release of NCA1. For a limited period of time, outreach was undertaken by a coalition of non-governmental organizations (Moser 2005).

The second assessment did not sustain the level of engagement seen in NCA1; instead, it was primarily a synthesis of 21 scientific reports (called Synthesis and Assessment Products)

published by the Climate Change Science Program (CCSP) from 2006 to 2009. There were some opportunities for participation in the development of these documents: the selection of topics was motivated in part by public input (CCSP 2003), and all reports, including the 2009 synthesis that became the Second National Climate Assessment (NCA2), went through a public comment process. However, the level of stakeholder engagement was left to the discretion of individual agencies that led each report (NRC 2007b). At the end of NCA2, the authors advanced a vision for “sustained, extensive stakeholder involvement” in future assessments, noting that the “value of stakeholder involvement includes helping scientists understand what information society wants and needs...the problem solving abilities of stakeholders will be essential to designing, initiating, and evaluating mitigation and adaptation strategies” (Karl et al. 2009, p. 158).

For NCA3, USGCRP convened a National Climate Assessment and Development Advisory Committee (NCADAC), under the sponsorship and auspices of the National Oceanic and Atmospheric Administration (NOAA), to produce the report and to provide advice on the sustained assessment process (Jacobs and Buizer 2015).¹ In spring 2011, the NCADAC approved an interim strategy for the assessment process that included an overarching goal “to enhance the ability of the United States to anticipate, mitigate and adapt to changes in the global environment” (NCADAC 2011a, p. 1) and a vision for “an inclusive, broad-based, and sustained process for assessing and communicating scientific knowledge of the impacts, risks and vulnerabilities associated with a changing global climate in support of decision-making across the United States” (NCADAC 2011a, p. 2). The strategy stated that “an engagement strategy that leverages science and assessment capacity across the United States, while ensuring that the NCA process and products are accessible and useful to stakeholders and the general public, is critical to this vision” (NCADAC 2011a, p. 2); the engagement strategy detailing the approach was also approved (NCADAC 2011b).

One important way that this commitment to engagement and communication became manifest is the inclusion of two communication experts on the NCADAC who co-lead a working group on engagement and communication.² Engagement efforts were discussed at almost every NCADAC meeting and carried into the ongoing proceedings of the Executive Secretariat of the NCADAC. In addition, USGCRP had one full-time staff member dedicated to engagement, communication, and partnership building who was responsible for ensuring implementation of the strategic advice from the NCADAC.

Below we describe guiding principles of stakeholder engagement for the NCA3, and the communication, engagement, and network-building that occurred during its development, at the report release, and afterward. We discuss which communities were engaged and the collaborations that were formed to help with communication and engagement and conclude with a brief assessment of impact and larger lessons for the sustained assessment.

¹ The NCADAC charter is available at http://downloads.globalchange.gov/nca/NCADAC/NCADAC_Charter_6-24-13.pdf.

² This working group was also charged to focus on how to design and embed ongoing evaluation of the entire NCA process into the assessment process, until the topic was deemed to deserve its own working group. Evaluation was eventually included as a recommendation in the sustained assessment special report (Buizer et al. 2013).

2 Principles guiding effective engagement

For NCA3, engagement was defined as an organized process that provides individuals and organizations with access to the design, assembly, content, and products of the NCA by means of two primary and related vehicles (NCADAC 2011b):

- *Communication*: Methods of alerting and informing individuals and organizations about the NCA process and products with the aims of increasing people's interest in and understanding of the NCA, climate change, and the implications of a changing climate for the US, increasing participation, and encouraging use of assessment findings;
- *Participation*: Methods of providing individuals and organizations with opportunities to actively contribute to the assessment – through written inputs and participation in assessment activities – with the aims of increasing the assessment's quality, responsiveness, and utility.

The development of the NCA3 engagement strategy was guided by four overarching principles derived from extant literature (e.g., Dilling and Lemos 2011; NRC 2008, 2007a; McNie 2007; Jäger and Farrell 2006) and experience of the NCA3 leadership:

- *Early and often*: Multiple and varied opportunities were offered for participation during all stages of the assessment process;
- *Inclusive*: Contributions were sought from a diverse set of stakeholders; groups beyond those who contributed to assessments in the past (i.e., scientists, Federal agency experts, and non-governmental groups interested in climate change) were proactively engaged;
- *Sustained*: Relationships with stakeholders – and networks of stakeholders – were developed and maintained indefinitely beyond the NCA3 release; and
- *Enabling*: Capacity was built in myriad organizations beyond the Federal government for individuals to contribute to, use, and communicate assessment findings.

The breadth and number of potential stakeholders for a national climate assessment is considerable. To organize the approach to stakeholder engagement, collaborators were prioritized by type (e.g., government, private sector) and scale of action (e.g., local, regional) (Supplementary Material 1).

3 Planning for engagement: process, strategy and internal organization

The NCA3 engagement effort required considerable internal resources and planning. This planning was undertaken by NCA staff and the NCADAC Engagement Working Group and encompassed both Federal and non-Federal components (Figs. 1, 2). Key elements are described below.

Dedicated staff From the beginning of her tenure in January 2010, the NCA Director made stakeholder engagement a priority. Early workshops on regional impacts of climate change and strategic planning (held in February 2010) included participants representing both contributors to previous NCAs and people and organizations who were new to national assessments. By

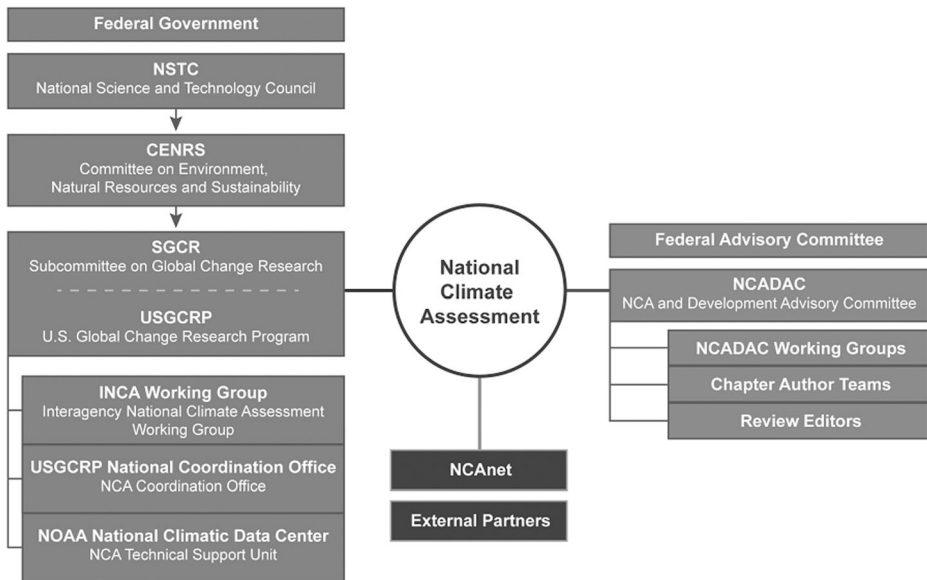


Fig. 1 Organization of NCA components. From Melillo et al. 2014b

summer 2010, the NCA staff included a full-time public participation and engagement coordinator to lead development and implement the NCA3 engagement plan.

Building diverse teams within government In March 2010, USGCRP formed a new interagency working group, the Interagency National Climate Assessment (INCA) Working Group. INCA coordinated, supported, and implemented the Federal components of the NCA, including an interagency operational plan for the NCA, development of technical products, and leadership of expert and stakeholder workshops.³ Building on the call for broad engagement, INCA members made specific efforts to recruit additional participants from agencies outside of the core USGCRP participants. In some cases, that meant program managers whose cabinet-level departments participated in USGCRP but whose agencies were less engaged (e.g., within the Department of the Interior, the National Park Service, Bureau of Indian Affairs, Bureau of Reclamation, and the U.S. Fish and Wildlife Service) and in other cases, agencies with clear interests in climate change that had not previously been part of USGCRP (e.g., the Department of Homeland Security’s Federal Emergency Management Agency).

Explicit focus on engagement within the NCADAC In late 2010, the Department of Commerce announced the formation of the NCADAC. The solicitation of nominations for this advisory committee noted the need for “a very wide range of expertise” and called for individuals “with experience in private industry, state, local, and regional government, academia, and non-governmental organizations, [...] drawn from a broad geographic distribution” (76 FR 11427). To accommodate this diversity, the NCADAC consisted of 44 non-Federal members and 16 Federal ex officio members. Among the various working groups formed under the NCADAC, one focused on engagement and included both NCADAC members and

³ More information about INCA is available from <http://www.globalchange.gov/about/iwgs#INCA>.

Third National Climate Assessment Report Process

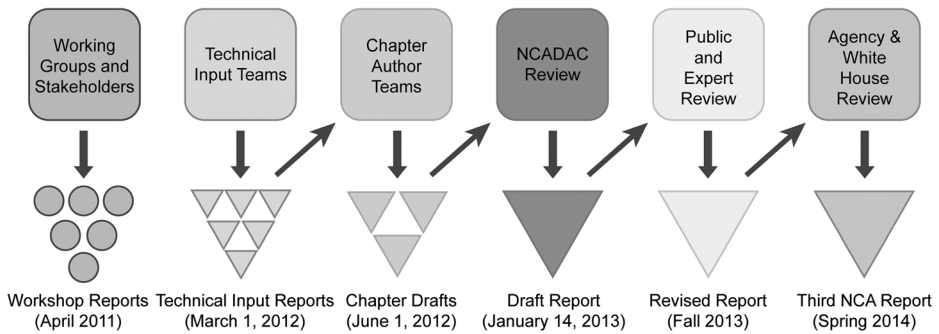


Fig. 2 Third National Climate Assessment Report Process. From Melillo et al. 2014b

additional disciplinary experts and assessment users from within and outside of the Federal government. This helped ensure that communication and participation were carefully considered and informed by multiple perspectives.

Early lessons in engagement When the USGCRP initiated the NCA3 process, a primary guiding principle for the assessment was to “maximize engagement of stakeholders” (USGCRP 2010a). This was reflected in process and methodology workshops in 2010 and 2011, which included topical experts and stakeholders representing non-governmental organizations, other levels of government, tribes, and the private sector.⁴ Often, these individuals were highly experienced in facilitating processes or conducting different kinds of analyses. However, merely inviting a broad range of people to workshops was insufficient to guarantee a diverse set of participants at a given workshop. Instead, stakeholders needed to understand the value of their participation – both for themselves and for the assessment process – before they would participate (NRC 2007a). The experience of recruiting attendees for these workshops and the comments of attendees during the workshops resulted in improved communication about the benefits of participation and the value of meaningful stakeholder engagement to participants and NCADAC (e.g., USGCRP 2010b).

Another early attempt to provide an opportunity for stakeholders to engage in the assessment process was a September 2010 call for public comments on the objectives, proposed topics, and next steps for the assessment (75 FR 54403). The call resulted in input from 25 commenters, including individuals, organizations, and other groups (e.g., a college seminar class) (USGCRP 2011a). The comments were used by the USGCRP and the NCADAC in further developing the assessment process, topics, and structure.

A formal engagement strategy The NCA engagement strategy, approved by the NCADAC in May 2011, built on these early public engagement efforts and laid out a coordinated approach to public participation and communication (NCADAC 2011b). As this guiding document explained,

“[t]he goal of engaging a broad range of stakeholders in the NCA (as with similar environmental assessment and decision-making processes at all levels of government) is

⁴ All workshops described and outputs archived at <http://www.globalchange.gov/engage/process-products/NCA3/workshops>.

to create a more effective and successful NCA – *improving the processes and products of this effort so that they are credible, salient, and legitimate and build the capacity of participants to engage in the creation and use of these processes and products for decision-making.*” (p.3, emphasis added).

The strategy encouraged conversations and learning throughout the assessment process, laid out numerous engagement opportunities for stakeholders throughout the creation of the assessment report, and ensured transparency, with the aim of increasing use of assessment findings in decision-making.

The strategy also called for leveraging existing capabilities inside and outside the Federal government to communicate about NCA3 and create a variety of opportunities for public participation in the assessment process. Recognizing that the success of engagement efforts would rely on building collaborative relationships with individuals and organizations with existing connections to the broader stakeholder communities which NCA3 was targeting, the strategy proposed the development of a cross-sectoral “network of networks” that would serve as a place to share information and co-produce knowledge and engagement efforts. Implementation of these efforts through NCAnet is described below.

Specific plans were also developed and implemented for the release of the public review draft (January 2013) and the final report (May 2014). Importantly, the public review draft was released under the purview of the NCADAC, whereas the final NCA3 was released as a major report of the US government. This required full approval and acceptance from all levels of the Federal government following a legally defined review process and close collaboration and coordination with the White House on the actual release of the NCA3. While acceptance of the report by the Administration was never in doubt, the full nature and format of the release was not assured until days before the intended release date, requiring substantial contingency planning independent of the White House.

4 Implementing engagement in the Third National Climate Assessment

Stakeholder engagement throughout the NCA3, as mentioned, involved opportunities for communication and participation, i.e., : enabling NCADAC and authors to communicate with and engage stakeholders effectively, while creating repeated opportunities for diverse sets of stakeholders to learn about, participate in, provide input into, and communicate about the assessment. This duality is apparent throughout the three engagement phases described below; a list of specific engagement activities in each of the phases is provided in Supplementary Material 2.

4.1 Engagement during the development of NCA3

Request for information and participation One of the innovative mechanisms used in the NCA3 was a request for information that invited contributions of technical inputs or other capacity related to regional, sectoral, and cross-cutting topics proposed for the NCA report and the ongoing NCA process (76 FR 41217). The NCADAC Engagement Working Group and the NCA Office provided descriptions of the potential technical inputs (e.g., literature reviews, case studies, topical reports) and capacities (e.g., hosting events, trainings, activating their networks to participate in various activities) and suggested best practices for developing inputs using open, transparent, and participatory processes (USGCRP 2011b).

In response, approximately 500 technical inputs were received from approximately 200 sources, representing more than 1000 individuals. Inputs ranged from photographs and short descriptions of local impacts of climate change, to previously published papers, to novel scientific work by teams of experts. NCA staff reviewed and catalogued all inputs and offered them for review to NCA3 author teams regarding relevance, topical and technical appropriateness, and adherence to information quality standards.⁵

Suggestions and guidance on engagement Although best practices for engagement were provided along with the initial request for information, some technical input providers were able to implement these suggestions better than others. Often the ability to implement stakeholder engagement was contingent on external monetary resources to support activities and staff time. For example, the technical input to the NCA3 for the US Southwest region used resources available through NOAA's Regional Integrated Sciences and Assessments program to conduct a large workshop and three teleconferences to gather information from stakeholders about the issues they wanted addressed in the report (Garfin and Jardine 2013). Similarly, the US Department of Agriculture sponsored a workshop that focused on the impacts of climate change on rural communities (Hauser and Jadin 2012). Other teams drew on the results of recent stakeholder engagement efforts that, while not focused specifically on the NCA process, revealed key concerns over climate change impacts on particular regions or sectors.

A network of networks (NCAnet) Prior assessments provided important lessons about the crucial role of communication and engagement in making assessments impactful (NRC 2007a). First, direct involvement in an assessment builds familiarity, trust, and greater legitimacy. Second, salience is enhanced by integrating, early and often, the viewpoints and needs of potential end users. Third, communication and engagement are more effective when done by groups and individuals outside the Federal government with whom stakeholders are more familiar. Thus, a strategic decision was made to develop a network of organizations whose participation and interaction with the NCA process would be enabled and facilitated through the NCA Engagement Coordinator and occur through an accessible interface. This network, called NCAnet, extended the already substantial capacity of experts directly involved in the NCADAC and on author teams and served as an essential mechanism for dialogue between NCA3 and outside stakeholders. This network grew steadily from its founding in 2012, largely through word-of-mouth and direct appeal, and now includes more than 170 organizations linked to hundreds of thousands of stakeholders (Fig. 3). Participants represent a wide range of organizations, including professional societies; local, state, and tribal governments; NGOs; business and industry; and academic institutions. Organizations participate in NCAnet voluntarily and generally without financial support for any of their services to the NCA. They have self-organized into topical affinity groups (e.g., education and communication) and have expressed great appreciation for the opportunity to collaborate and exchange ideas.⁶

NCAnet was essential in the development and rollout of NCA3's draft and final report. During the development of NCA3, NCAnet participants contributed technical inputs, organized and joined regional town hall meetings, informed their members about NCA3, hosted

⁵ Author teams were responsible for deciding whether cited source material met information quality standards. NCADAC-developed guidance for assuring information quality is available from <http://www.globalchange.gov/sites/globalchange/files/NCADAC-Nov2011-Information-Quality-Principles.pdf>.

⁶ More information about the composition and operation of NCAnet at <http://ncanet.usgcrp.gov>.

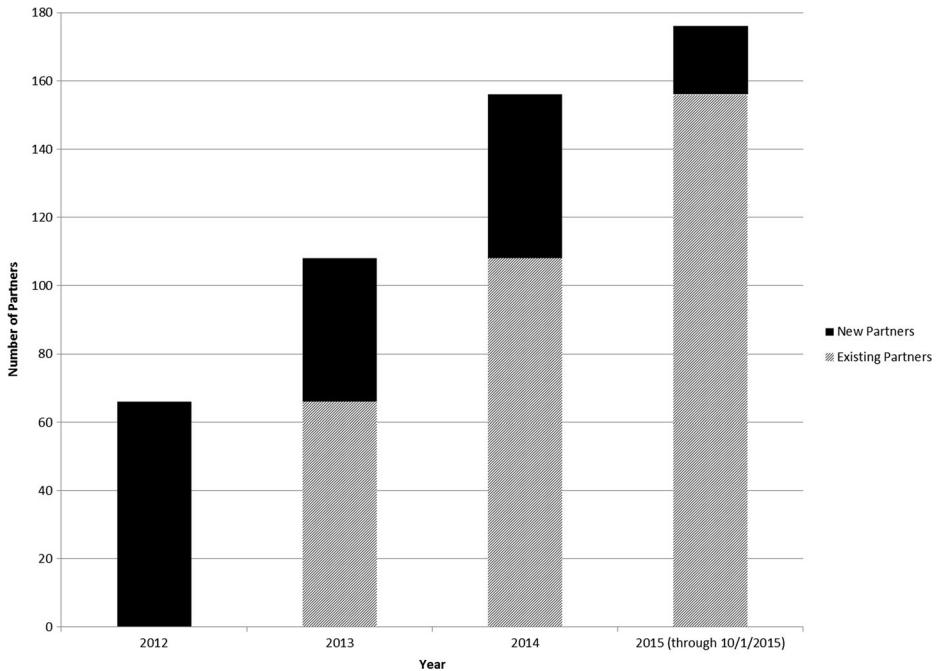


Fig. 3 Growth of NCAnet, January 2012 – October 2015

webinars that sought input on specific topics, and assisted in communication and media outreach during the release of the draft report (an occasion for which the NCADAC and author teams were prepared to respond to inquiries, but did not proactively try to get press coverage, as the product was not yet final). NCAnet was influential in getting significant press coverage for the draft report (approximately 140 media mentions within the first week after the release on January 11, 2013 and approximately 310 mentions by the time comments closed on April 12, 2013; prior to the release of the final NCA3 in May 2014, the draft had been cited or referred to in over 800 media stories).

Importantly, while there was ongoing communication among NCAnet, the NCA Engagement Coordinator, and the NCADAC Engagement Working Group, all activities of the NCAnet were voluntary and completely autonomous. While very substantial trust and cooperative spirit was created over time, there was no control or formal accountability mechanism between NCAnet and the NCADAC or the NCA Office.

Public comments on the draft report The public could comment on the draft report during a 90-day period (January to April 2013). In addition to the Federal Register Notice announcing the comment period (78 FR 4132) and NCAnet participants calling on their own networks to comment, USGCRP agencies sponsored eight public town hall meetings (one per region).⁷ NCAnet participants hosted additional meetings and webinars. At these events, report authors provided summaries of draft report findings and attendees could ask questions about the draft report. The meetings often also included sessions focusing on particular sector- or region-

⁷ All town halls and related materials available at <http://www.globalchange.gov/engage/process-products/NCA3/workshops#Town Halls>.

specific topics and on local or regional responses to climate change and provided opportunities for networking. By the end of the public comment period, USGCRP received 4161 comments from 644 government, non-profit, and commercial sector employees, educators, students, and the general public (USGCRP 2014a; Melillo et al. 2014b).

Less successful engagement experiments While many engagement efforts worked exceedingly well, several experiments were limited in scope and impact. One that ultimately proved too labor-intensive for the impact it achieved was the Climate Conversations project, convened by the Keystone Center with a grant from the Energy Foundation. The Center hosted four Climate Conversations across the country, with audiences not already convinced of the importance and seriousness of climate change (for a detailed description of the Climate Conversations, see Moser and Berzonsky, 2015). Of the approximately 2000 people invited, about 200 from different sectors participated. Over half a day, they learned about regional climate changes and NCA3, then participated in World Café-style dialogues about interests and concerns related to those changes. The experiments confirmed the value of dialogue and of educating people about climate change and NCA3, but the effort to recruit participants, the facilitation of dialogue, and the need for meaningful ways to sustain the newly established relationships were not commensurate with the perceived benefits for the NCA (Keystone Center 2012).

Other ideas, such as building a corps of “NCA Ambassadors” – trusted communicators who could convey the findings of the NCA3 once the final report was released – did not come to fruition as they overlapped with existing or new efforts organized outside of the NCA3 process.

Science translation To ensure the report used understandable language and graphics, NCA3 employed an editorial team that assisted the authors with writing in an accessible manner and producing easily comprehensible illustrations. Public comments on the draft report also pointed to areas where readers were confused about concepts and terminology, allowing authors and editors to make further improvements in writing style.

4.2 Engagement during the rollout of NCA3

Engagement workshop In February 2014, in preparation of the release of the final NCA3 report, the NCA Engagement Coordinator organized a workshop for approximately 80 NCAnet participants, NCADAC members, Federal agency representatives, and chapter authors. The workshop sought to generate ideas for engaging assessment users in learning and conversation about climate change impacts and science, using the NCA3 as a springboard. Participants developed ideas and planned implementation of such activities around the release of NCA3, including media outreach, regional events, professional development training, and educational materials (NCAnet 2014, NOAA et al. 2014). Several restrictions affected but did not curtail these activities: resources for NCAnet-led activities had to come from NCAnet organizations; Federal agencies had to work within their own budgets and capacities; and travel funding for outreach was available only for authors and NCADAC members. Planning for these activities continued throughout spring 2014 and following the release of NCA3.

Communication training for authors and NCADAC members: Prior to the release of NCA3, the NCADAC Engagement Working Group and NCA3 editorial team offered several web-

based communication trainings for interested authors and NCADAC members. These web trainings allowed authors to practice delivery of report findings and answering questions. In addition, the strategic communications firm Climate Nexus, an NCAnet participant, led an in-person, two-day media training for approximately 20 NCADAC members and NCA3 authors. Although several of these authors were already media-experienced, the training session was particularly useful for helping individuals sharpen their message and communicate the NCA3 findings more effectively.

Communication products One of the innovations of NCA3 was its electronic delivery. Only short report summaries (a 140-page Highlights document, a 20-page Overview, and 4-page regional summaries) were printed; the vast body of material of the assessment was delivered via an interactive website (<http://nca2014.globalchange.gov>). The website was designed to work on virtually any desktop or mobile platform and to easily connect to social media (Facebook, Twitter, and permalink sharing options for each chapter segment, graphic, and key finding). In addition to the direct derivatives of the NCA3 report, one of the NCA3 editors independently produced short video introductions to selected chapters, featuring the chapters' lead authors, and to selected topics, featuring Americans dealing with particular impacts in their regions or sectors (<https://vimeo.com/channels/nca>). These videos were featured repeatedly in the TV and online media coverage.

Release day events The NCA3 was required by Congress and prepared by an advisory committee; when accepted by the Obama Administration, it became a government report released to Congress and the public. Following the commitment of the Administration to advance climate policy during the President's second term, the White House devoted time and personnel to creating a highly visible release event on May 6, 2014. After the NCADAC approved the document and NOAA delivered it to the White House, Administration leaders together with the chair of the NCADAC held a press conference to announce the key findings of the assessment. Later that day, the President hosted several one-on-one interviews with selected TV weathercasters in the White House Rose Garden. Concurrently, the President's science advisor and other Administration officials hosted a live-streamed event for stakeholders, during which a dozen NCA3 authors introduced key findings from their chapters.⁸

Outreach immediate following the report release In the first few days following the release and after White House involvement subsided, NCAnet participants, the NCADAC, and author teams continued a substantial schedule of outreach activities, including a briefing to Congress the day after the release. Over 100 activities (ranging from web-based seminars to community meetings to full-day workshops) have taken place since the release, many of them organized by NCAnet participants.

4.3 Engagement in support of the sustained assessment

Implementation of the core elements of the sustained assessment process as advised by the NCADAC (Buizer et al. 2013; Buizer et al. 2015) has been uneven. However, selected

⁸ The stakeholder event is archived at <http://www.c-span.org/video/?319224-2/white-house-unveils-climate-assessment-report>.

elements continue, including requests for information (80 FR 26105) and Federal Advisory Committee nominations (80 FR 45643), special assessment reports, launch of a pilot indicator system (Kenney and Janetos 2015), and NCAnet. Two of these are described below.

Ongoing NCAnet activities Congruent with the intention to build a sustained assessment process (Buizer et al. 2015), NCAnet has persisted. According to a brief informal survey of NCAnet participants conducted in spring 2015, considerable outreach work around NCA3 continues and many participants have developed regional or topical reports that draw on information from NCA3. Several of the affinity groups continue to meet to create and refine products and activities, including on the anniversary of the report release. In addition, new affinity groups have formed to address emerging topics such as valuation, risk management, and climate projections.

Climate and health assessment One of the special reports currently in development is an assessment on climate change and human health, led by USGCRP's Climate Change and Human Health Working Group. The topic was chosen because of significant external stakeholder and Federal agency interest, and was mentioned in the President's Climate Action Plan. As during NCA3, this special report requested public input to inform the report's scope (79 FR 7417) and during a public comment period for the draft assessment (80 FR 18619).

5 Preliminary evaluation of impact

The overall goal of engagement was to create a more effective and successful NCA3 – i.e., an assessment that is viewed by participants and outsiders as credible, salient, and legitimate, underlain by a transparent and accessible process (NCADAC 2011b, NRC 2007b). The NCA engagement strategy suggested that NCA3 could achieve an even broader impact, namely, “[t]he NCA process and products...can serve as a vehicle for civic engagement, providing space for conversations about the underlying science, expected impacts of, and responses to climate change in the US” (NCADAC 2011b, p. 3).

Soon after the NCA3 release, USGCRP organized a workshop on how to conduct a critical but constructive post-NCA3 evaluation and how to build ongoing evaluation efforts into the sustained assessment process (USGCRP 2014b). The workshop involved evaluation experts from inside and outside government, academia, and NGOs. While the NCADAC had built careful tracking and ongoing learning-oriented evaluation into developing NCA3, including its engagement dimension, a full external evaluation has not yet been undertaken.

Selected elements of the engagement process, however, have been critically and routinely assessed. For example:

- Regional town halls and workshops included participant feedback mechanisms;
- The Climate Conversations were critically debriefed by the dialogue facilitators, funders, NCADAC Engagement Working Group, NCA Engagement Coordinator, and NCA leadership;
- A media analysis was conducted after the release of the draft NCA3 report to track responses to the report and process;
- Ongoing media and outreach activities tracking is being undertaken by USGCRP and NCAnet members;

- Researchers from Michigan State University, together with USGCRP staff, conducted social network analysis (SNA) to evaluate how NCA3 outreach activities have changed the interconnectivity among researchers, government actors, NGOs, and other stakeholders (Supplementary Material 3); and
- NCAnet members provide regular feedback about their use of NCA3 and usefulness of the NCAnet process as a part of NCAnet conversations.

Based solely on this ongoing internal tracking, it is impossible to assess the overall impact of the assessment. Thus, a critical evaluation must be left to external experts not involved in the day-to-day operation of NCA3.

In the absence of an independently conducted evaluation, however, ongoing tracking of the assessment's uptake via surveys and interviews provides hints of the assessment's perceived credibility, salience, legitimacy, and transparency. For example, the assessment has been cited as the rationale and policy justification for several Executive Orders and Federal agency climate adaptation initiatives (e.g., EO 13514, the President's Climate Action Plan, EO 13653, EO 13693), though some representatives of the US Congress have tried to prevent policy initiatives based on NCA3. On subnational scales, NCA3 and its underlying regional technical input reports have informed regional and state-level efforts (e.g., Bathke et al. 2014; Allegheny Highlands Climate Change Impacts Initiative 2015; Tassel 2015). NGOs and private sector actors have also drawn on the findings of NCA3 (e.g., Adams et al. 2014; Risky Business 2014).

As for reaching the American public, the widespread media coverage gives some hope. In recent years, communication about climate change – relatively muted in traditional media (Boykoff 2015) but ongoing, loud, and often polarizing in new and social media – has struggled to engage the American public in constructive discourse (Moser and Berzonsky 2015). Previous NCA reports and other scientific assessments were not paired with comprehensive communication and outreach plans (Ekwurzel et al. 2011). By contrast, active White House engagement, involving the President and other Administration officials, and interviews with weathercasters who are among America's most trusted climate change messengers (Maibach et al. 2011; Supplementary Material 4), live-streamed release events, and the enormous outreach efforts undertaken by the NCAnet member organizations likely contributed to the “news splash” when NCA3 was released and thereafter. Within one week of the release, more than 2000 news stories citing NCA3 were cataloged; media mentions have continued at a steady rate (over 5000 unique news stories cited NCA3 by October 2015, often 5 to 10 per week). Within the first year of its release, the full report was downloaded over 850,000 times, the report Highlights were downloaded over 189,000 times, and over 433,000 users visited the NCA3 website.

6 Conclusions: lessons for the sustained assessment

The NCA3 engagement efforts can teach several important lessons for future national and other assessments.

Making engagement a priority Despite early agreement by USGCRP's participating Federal agencies and the NCADAC that engagement and communication would be priorities for NCA3, in practice science was often treated preferentially. For example, some technical input teams did not engage potential information users, the Federal assessment plan lacked a dedicated budget for engagement, and there was tension, though diligently handled, between

authors and editors regarding the creation of succinct and accessible key messages and chapters. While the engagement strategy approved by the NCADAC provided a framework to ensure engagement would be a priority, many ideas could not be implemented due to a lack of staff time and resources.

Building extended stakeholder networks One of the core pillars of the sustained assessment process is the importance of building and maintaining collaborations with an extended community of scientists and others reaching into stakeholder communities. NCA3 has had unprecedented success in this effort. As the SNA (Supplemental Material 3) showed, the network of stakeholders and extent of interactions between people and organizations engaged by NCA3 has grown significantly over time. As a tool in support of ongoing engagement efforts, SNA can also point to network gaps and guide outreach efforts to bring additional organizations into NCAnet for the sustained assessment.

Matching assessment and engagement boundaries Boundaries of the regions delineated in the report were adjusted slightly from those used in NCA1 and NCA2, to align with state boundaries, allow stakeholders to more quickly be identified or locate themselves within the assessment, and for information to align with common jurisdictional boundaries. In addition, the “Islands” category used previously was changed, placing Puerto Rico and the U.S. Virgin Islands in the Southeast and Hawai‘i and the Pacific Islands in their own region. However, the placement of some states within particular regions and the size of some of the regions proved to be confusing for some and may require further deliberation in future assessments.

Stakeholder-driven topical coverage Several new topics were added to NCA3 on the basis of public and NCADAC input. Most notable were multiple calls for cross-sectoral chapters (e.g., Energy, Water, Land; Land Use and Land Cover Change; and Rural Communities) and response chapters (Decision Support; Adaptation; and Mitigation). These are of growing importance and continued stakeholder engagement will ensure improved decision-relevance. Undoubtedly, stakeholder input is important to capture emerging information needs.

Clear, accessible language and visuals, electronically delivered The linguistic, electronic, and visual access to the often dense and complex climate change information was crucial, and countless comments from outsiders reinforced the importance of providing information in this way.

Collaboration, not outsourcing Rather than counting on individuals to write a specific section of a chapter or to create and lead one portion of an engagement activity, NCA3 experience indicates that the most useful input is developed collaboratively. The requisite skills for transdisciplinary work should continue to be built and fostered.

Dedicated and sustained resource stream is essential to engagement process Having dedicated staff for the engagement and an expertise-rich NCADAC were essential to the success of NCA3. Building the sustained assessment without at least this level of support is likely to result in inadequate outcomes. Several engagement ideas could only be accomplished with resources, staff time, and financial support from NCAnet members and other external funding sources. While an indication of great generosity and dedication, this is not a sustainable model for engaging the American public over the long haul. Effective engagement – given its central importance in reaching those who could actually use the results of

considerable Federal investment in science – is a necessary, not supplementary, investment in America's future preparedness for climate change.

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