Minding the Gap: Creating Decision-Relevant Assessments

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Assessments have provided useful policy inputs and now need to support distributed adaptive management and planning.

NCA3 and the vision for the sustained assessment process advance the process of enabling support for these types of decisions.

This talk focuses on assessment of decision support processes, systems, and tools: important for evolving an understanding of good practice.

Main Takeaways: Using the sustained NCA to facilitate development and application of decision support systems is more important than recognized for successful climate risk management.
In addition, ...

I introduce three topics that I’ve worked on that contribute to using assessments to feed information into decision support processes:

- **Confidence and uncertainty characterization**: providing information about the uses and limits of available information for different types of decisions.
- **Scenario methods**: moving beyond top-down approaches to help decision makers envision the future and interactions between their own decisions and climate change.
- **Vulnerability assessment methods**: a useful first step in defining adaptation needs.

More detailed discussion of these can take place in the Q&A, or if anyone is interested, in conversations during my visit.
Narrowing the climate information usability gap

Maria Carmen Lemos*, Christine J. Kirchhoff and Vijay Ramprasad

Climate-change-related risks pose serious threats to the management of a wide range of social, economic and ecological systems. Managing these risks requires knowledge-intensive adaptive management and policy-making actively informed by scientific knowledge, especially climate science. However, potentially useful climate information often goes unused. This suggests a gap between what scientists understand as useful information and what users recognize as usable in their decision-making. We propose a dynamic conceptual model to address this gap and highlight strategies to move information from useful to usable to reduce climate-related risks.

“...the evidence suggests that we must rethink the ways in which we design and promote use-inspired basic and applied research programmes if we aim to produce usable climate information to meet societal risk and adaptive management needs.”
What Are Assessments?

- Processes that review scientific information to address policy-relevant questions (in interaction with users)
- When they are successful, assessments will...
  - Evaluate the state of scientific knowledge
  - Communicate level of confidence in the information provided
  - Indicate when information will improve
Three Leaders in Assessment
Traditional Scientific Assessments
The Need for a New Approach

- Climate change impacts are happening and many ‘users’ want information to plan.
- The diversity of information needs cannot be met with a centralized, top-down process.
| Water resources                          | • Planning reservoir capacity  
|                                         | • Managing water levels in the Great Lakes  
|                                         | • Improving drought preparedness  
| Energy                                  | • Planning peak demand loads  
|                                         | • Siting bioenergy plantations  
|                                         | • Expanding conventional energy production  
| Transportation                          | • Engineering fixed-route infrastructure  
|                                         | • Increasing resilience of airports vulnerable to storm surge  
|                                         | • Managing flood risk to subway systems  
| Buildings and related infrastructure    | • Setting standards and design loads for structural safety  
|                                         | (e.g., snow loads for roofs)  
|                                         | • Sizing drainage systems and culverts  
|                                         | • Siting buildings and related infrastructure relative to flooding, wildfire, or other hazards  
| Agriculture                             | • Redesigning food processing and supply chains for improved water and energy use efficiency  
|                                         | • Investing in agricultural technology development and diffusion (crop varieties, post-harvest storage)  
|                                         | • Anticipating needs for food security early warning and disaster management  
| Environmental conservation              | • Using coastal ecosystems sustainably to support tourism, conservation, and fisheries  
|                                         | • Long term planning and budgeting to manage wildfires  
|                                         | • Conservation planning to protect viable refuges with high potential to preserve biodiversity  
| Human health                            | • Establishing monitoring systems to track re-emergence of familiar disease threats or emergence of new ones  
|                                         | • Determining what public health investments are needed to manage heat stress in indigent populations  
|                                         | • Monitoring changes in phenology to reduce exposure of sensitive populations to increased allergens  

Decision Categories, Assessments, and The Need for Additional Support Systems

Support for three broad categories of decisions is needed

- Adaptive management: decisions for administering resources, infrastructure, or response mechanisms (given current infrastructure and policy)
- Planning infrastructure and natural resources (given current policy framework)
- Policy formulation of laws, regulations, taxes, or other public mandates (sets new policy framework)

- Providing this information is beyond the capacity of traditional assessments
- A broader range of scientifically grounded ‘decision support systems’ will be needed and are now rapidly emerging
- Assessments will support the process by (i) facilitating evaluation and (ii) providing a wider range of “inputs”
Decision Support – Connecting Science, Risk Perception, and Decisions

- Decision support: organized efforts to **facilitate the use of knowledge** to improve decision outcomes

- What DS systems do:
  - Structure decision making processes
  - Clarify information needs
  - Access and organize information
  - Integrate values and information to evaluate tradeoffs, and
  - Sustain communication

Decision Support is About Systems, Including People (Not Just Tools)

Decision Context:
- Information about the environment
- Models and projections
- Costs and revenues
- Possible responses
- Personal and community values
- Uncertainty

Decision support PROCESSES include:
- Framework for decision-making
- Co-production of knowledge
- Assessments of impacts and vulnerabilities
- Boundary processes to link scientists and decision makers

Decision support TOOLS include:
- Scenarios and scenario planning
- Data management and visualization
- Comparative tradeoff methods
- Integrated assessment models
- Data management systems

Effective Decision-Making:
- **Process Outcomes:** Strengthen relationships and build trust among participants
- **Decision Outcomes:** Consensus about problems, objectives, and options for action

Short-term outcomes include:
- More relevant information
- Insights
- Assessment of significance of uncertainties
- Clearer tradeoffs
- Stronger accountability

The Remainder of This Talk Will Cover...

- Recap NCA3 and ‘sustained assessment’ vision
- Make a case for assessment of decision support systems and describe the potential role of the sustained NCA process
The Third National Climate Assessment

Goal

• Enhance the ability of the United States to anticipate, mitigate, and adapt to changes in the global environment.

Vision

• Advance 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.
NCA3 Included Many Innovations to Narrow the Usability Gap

- Deliberate community building
- NCANet
- Focus on risk management and decision relevance/support
- Data management and web-based deployment: GCIS, other products on-line
- Spanish language version
- Transparency & Traceable Accounts
- Indicators
- Regional and SLR Scenarios
- Focusing on decision support resources assessment
“Sustained Assessment”

“A sustained assessment is an evolving framework for connecting scientists and practitioners from government, civil society, the private sector, tribal communities, …”

It decentralizes assessment by developing, distributing, and supporting use of a broader range of scientifically grounded and vetted products in decision making.

Facilitates adaptive management, stimulates civic engagement, and enhances the nation’s capacity to respond effectively.

Roles

- Federal agencies provide basic and decision support science
- Citizens, planners, managers, decision makers, …, engage and are actively involved in evaluating the suitability of information for application
- Intermediaries (including the private sector) serve as ‘science translators’

Sustained assessment is **NOT** continuous production of big IPCC-like reports (although these will be produced periodically).
Why a **Sustained** Assessment?

- Social science research has established that effectiveness depends on
  - *Ongoing communication* among users and experts to enhance relevance, understanding, and trust

- Key synthesis reports:
  - *Analysis of Global Change Assessments: Lessons Learned* (Board on Atmospheric Sciences and Climate)
  - *Informing Decisions in a Changing Climate* (Committee on the Human Dimensions of GEC)
  - *Advancing the Science of Climate Change* (America’s Climate Choices Science Panel)
  - *Adapting to the Impacts of Climate Change* (America’s Climate Choices Adaptation Panel)
  - *Informing an Effective Response to Climate Change* (America’s Climate Choices, Informing Effective Responses Panel)
Preparing the Nation for Change: Building a Sustained National Climate Assessment Process

NCADAC Special report that outlines the critical elements of sustained assessment:

1. Establish mechanisms to support enduring collaborative partnerships that sustain assessment activities
2. Enhance and organize the scientific foundations for managing the risks and opportunities of climate change
3. Provide infrastructure to support a sustained assessment process
4. Diversify the resource base and set priorities

Scientific Advances Needed to Support Sustained Assessment

- *Vulnerability assessments
- Indicators
- *Scenario methods and products
- Valuation methods
- International influences
- *Confidence and uncertainty
- Adaptive learning

I turn now to something **NOT** highlighted in the report:

- Evaluation of research on DS systems as a component of sustained assessment
The need for transparent evaluation of uncertainty in information for regional decision support is crucial to effective climate change adaptation and mitigation efforts. This is particularly true for regional decision makers who require accurate and reliable information to make informed decisions about the impacts of climate change and potential adaptation strategies. Transparency and quality control are essential in the highly uncertain business of assessing the impact of climate change on a regional scale.

Climate change projections, including those from the Intergovernmental Panel on Climate Change (IPCC), are invaluable tools for understanding future climate scenarios. However, these projections are subject to significant uncertainty due to the complex interactions of various factors, such as greenhouse gas emissions, natural climate variability, and technological advancements. The IPCC's Fifth Assessment Report highlighted the need for improving the representation of uncertainty in climate change projections to better inform policymakers and decision makers.

The importance of transparent evaluation of uncertainty in regional decision support was underscored in the context of the UK's Climate Change Act, which requires the UK government to publish a comprehensive assessment of climate change impacts and adaptation options. This assessment must be transparent and publicly accessible, allowing stakeholders to understand the limitations and uncertainties inherent in the projections.

To address these challenges, it is crucial to develop and implement methodologies that not only increase the transparency of climate change projections but also enhance the quality and reliability of the information provided to decision makers. This includes the development of more robust and transparent methods for quantifying and communicating uncertainty, as well as the integration of diverse datasets and expert judgment to improve the accuracy of climate change projections.

As the climate changes, the need for improved and more transparent evaluation of uncertainty in regional decision support will become even more critical. This will require ongoing scientific research and collaborative efforts among researchers, policymakers, and stakeholders to refine our understanding of climate change and enhance the effectiveness of our adaptation strategies.
Wide Range of DS Systems and Resources Available Through Multiple Platforms

- Loading dock ("Field of Dreams") approach
- Some systems adopt sounds principles for engagement, transparency, scientific analysis methods
- In others, basic principles for decision support or appropriate use of scientific information are ignored
NCA3 Decision Support Chapter

Facilitated by NRC *Informing an Effective Response to Climate Change* (Liverman, et al., 2010)

What the chapter did:
- Began a process to explore the need and an approach for NCA dialogue on DS systems and frameworks
- Described types of available tools around common quasi-cyclical adaptive management framework

The chapter did not: evaluate specific tools (or classes of tools)

Note: evolution in my thinking about importance of DS dialogue and evaluation in NCA process


Follow-up is Now Required…

- Establish a strategy for a collective effort to promote DS tool development, assessment, and use
- Collect standardized information
- Assess example tools and frameworks in context of sectors or regions
- Establish dialogue across scientists, agencies, standards organizations, professional societies, and the private sector
- Support for fellowships, research grant competitions, etc. to develop human resources for intermediaries/interactors
Four Potential Outcomes of Increased NCA Assessment of Decision Support Systems

1. Change mindset of developers and users to include people as part of decision support systems
   - ‘Facilitating use of knowledge’ requires evaluating the perceptual and social dynamics through which people acquire information and evaluate it

2. Clarify information needs and sources
   - Help developers and researchers understand needs, and users to understand types of information for different problem sets

3. Improve understanding of relationship of uncertainty, risk, confidence, and values
   - Clarify difference between predictive uncertainty and values uncertainty related to aggregation of preferences and attitudes towards risk

4. Establish dialogue about monitoring, measuring, and evaluating decision support effectiveness
   - Advance practice of understanding ‘what works’ in context of sectors or regions where a decision support system is used
Research Roundtable Topics

TODAY OR DURING THE REST OF MY VISIT...
**NCA3 Guidance**

<table>
<thead>
<tr>
<th>Brief statement of conclusion, referenced to report or chapter:</th>
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<tbody>
<tr>
<td>1. Framing and stakeholder information needs</td>
</tr>
<tr>
<td>One or more types of stakeholder decisions (or uses of the information) have been considered in formulating the conclusion.</td>
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<tr>
<td>Yes</td>
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<td>---------------------------------------------------------------</td>
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<td>2. Initial evaluation of evidence</td>
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<tr>
<td>An evidence rating has been assigned, considering the type, amount, quality, and consistency of evidence. In light of the use of the information, the evidence is:</td>
</tr>
<tr>
<td>Strong</td>
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<td>3. Preparation of conclusion</td>
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<tr>
<td>The conclusion reflects the diversity of evidence. For quantitative estimates of relevant parameters or metrics, a range is provided (in which there is a 90% chance the true value falls), and a “best estimate” is given, if warranted. High consequence outliers have been considered,</td>
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<tr>
<td>Fully</td>
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<td>4. Identification of key uncertainties</td>
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<tr>
<td>Sources of uncertainty and steps for improving the information base have been identified.</td>
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<td>Fully</td>
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<tr>
<td>5. Assessment of confidence based on evidence and agreement</td>
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<tr>
<td>In light of the potential uses of the information, a confidence level has been assigned.</td>
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<td>V. High</td>
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<td>6. Indication of how likely it is that an outcome or event will occur</td>
</tr>
<tr>
<td>If you indicate how likely an event is to occur, the standardized numerical ranges and likelihood words have been used.</td>
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<tr>
<td>&gt;9 in 10</td>
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<td>7. Traceable account:</td>
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Parallel Scenario Process

- Socio-economic variables
- Emissions
- Concentrations
- Surface temperature

Shared Socio-economic Pathways (SSPs), Shared Policy Assumptions (SPAs) (in process)

Vulnerability Assessments and Climate Change: Some examples and thoughts

- Vulnerability: the degree to which infrastructure, a system, a place, or a population group is unable to cope with the effects of climate variability, extremes, or change. A function of:
  - Exposure
  - Sensitivity
  - Adaptive capacity

- Vulnerability assessment prioritizes the need for more detailed engineering analysis of adaptation

- Collecting data on these characteristics and making it relevant for decision making can be a challenge
In Closing

- There is a clear vision for evolving the National Climate Assessment beyond production of reports to more varied ‘modes of co-production’ to support use of knowledge in climate risk management.
- NCA3 initiated many important innovations.
- Using the sustained NCA to facilitate development and application of decision support systems is more important than recognized for successful climate risk management.
Thank you!

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