

REPORT

Climate Information Users Roundtable

**Wednesday, October 10, 2007
10:00 a.m. – 2:00 p.m.**

U.S. Climate Change Science Program Office
1717 Pennsylvania Ave. NW, Suite 250
Washington, DC 20006

Introduction

On October 10, 2007, the US Climate Change Science Program (CCSP) convened a roundtable of climate information users. The purpose of the roundtable was for CCSP to gain insights from a range of stakeholders with whom the core program does not often interact in order to help inform future program directions. Roundtable participants were asked to reflect on their expectations for and ideas about CCSP's role in providing climate information. Participants represented a broad range of perspectives, including state government, non-governmental organizations, industry, and academia (a full list is available in Appendix A).

Prior to the discussion, we asked participants to respond to the following questions in the form of a brief written statement (responses are available in Appendix B):

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?
2. What types of climate information, tools, and services do you currently use to support these activities?
3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?
4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?
5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?
6. What should the role of the federal government be in providing climate information, tools, and services?

During the roundtable, we returned to these questions to explore them in greater detail with the participants. The points raised during the discussion were recorded on large wall charts so that participants could review, revise, and expand upon their answers. As the dialogue progressed, it became evident that many of the issues related to the provision of climate information cut across the questions and are relevant for a variety of user communities. In the broadest sense, the discussion might be summarized as follows:

*In the past, CCSP research has focused primarily on the science of climate change. What is needed now is an additional emphasis on the science of **responding** to climate change within specific regions: identifying the impacts of climate change, studying the options for reducing vulnerability to these impacts, and adapting to those impacts that cannot be avoided. Such attention to adaptation and resilience building requires integrating and working with a greatly expanded set of issues and disciplines, such as human health, economics, and other sectors, and recognizing that the set of priority issues and needs in each region will be unique.*

The following summary attempts to expand on this idea and to draw out the themes that arose throughout the discussion, using the following categories:

- Potential roles for CCSP or other central coordinating body
- National, regional, and sectoral research foci and information needs
- Stakeholder engagement
- Communication and social marketing efforts
- Continuity of observations and data
- Products, services, and tools
- Potential additional partners

Prior to releasing this report, CCSP provided roundtable participants with the opportunity to review this summary and provide additional comments and revisions, which have been incorporated into the final report.

Potential roles for CCSP or other central coordinating body

General Comments

There is some confusion about the role that CCSP should and is able to play currently, as well as how this role might change with the passage of bills currently before Congress. In addition, CCSP is a relatively “big ship” and attempting to change its priorities too drastically – e.g., from research-driven to application-driven – may prove to be very difficult. Nonetheless, some of the participants viewed the need to apply the research to the social and commercial sectors as a key duty of the CCSP, and thought this workshop as an initial effort to move in that direction.

Central Coordination

Knowing that federal climate change research is being coordinated is important, so CCSP must have some visibility. In addition, it is important that the various agencies be perceived as equal partners in CCSP activities, as each agency has a distinct and interested stakeholder community. However, there are a number of potential federal and non-federal partners that are not currently involved in CCSP whose participation should be invited, considered, and included to adjust the research focus to the expanding interest in topics such as application-driven information.

Clearinghouse Function

CCSP could provide a “value-added” service by developing, maintaining, and promoting catalogues or master directories of data sources, information, products, tools, and other assets that may be of use to multiple sets of users. This would assist in reducing redundancy and increasing collaboration between groups. Because it is often difficult for one group of users to imagine how their tool might link with another tool, CCSP could assist in fostering these linkages. CCSP could also work with user communities to identify common search terms that these users employ when using Google or other search engines to construct queries. CCSP could then pass this list of terms back to the agencies that provide data so that they could include appropriate terms in the metatags of their webpages.

Climate Services

Currently, there is a lack of clarity about why and how each of the many federal agencies that are engaged in climate research might extend their efforts to include climate services. Furthermore, there is a lack of clarity about how these many service functions might be coordinated into an overall “climate service” of the federal government. CCSP could help to rectify this problem by leading an assessment of the current climate services provided by agencies and conducting an analysis of how the current services compare to the expected services. Some of the specific areas that CCSP might consider in this analysis include the frameworks, metrics, portals, evaluation and refinement processes, and communication practices between agencies.

Program Planning

Regardless of the level of political support for CCSP and the uncertainty about the next administration, the program should continue to engage in planning and evaluation activities, including public comment periods on program documents or other activities, that will allow them to gather input which can be incorporated into future climate science plans.

Federal / Non-Federal Dialogue

CCSP could promote dialogue between federal and non-federal parties interested in working on specific issues related to climate change by convening sessions at professional meetings or hosting focused workshops. Such discussions are important to foster the development of connections between parties that will eventually lead to knowledge sharing. The next step would be for the CCSP to lean integration of federal data sets, programs, funds, and goals to the larger society, where they will have direct impacts on the national response to climate change initiatives.

CCSP may consider identifying a specific case where federal climate research is or could be translated into information used to support local, state, regional, or sectoral decisions. CCSP would convene an initial meeting of federal agencies, state and local governments, NGOs, industry representatives, and other interested parties and continue to follow up on the progress being made within this case. The lessons drawn from this case study could then be used to inform future work in connecting federal and non-federal users. There was support during the roundtable for the CCSP to identify a specific project that would pursue the above mentioned goals, and for the CCSP to provide the resources to engage various organizations to work together in this prototype project.

National, regional, and sectoral research foci and information needs

National Assessment

A unified national assessment would provide a common reference point for groups working across the country, reduce the likelihood of overlapping and redundant activities, and allow organizers to take advantage of an economy of scale for collecting and collating inputs.

Regional and Sectoral Foci

Targeted engagement of users and analysis of needs will increase the likelihood of a particular geographic or disciplinary community using any resulting products. The regional and sectoral collaborations and interactions fostered during the first national assessment process were very important, and some of these connections are maintained in various forms to the present. Engaging participants and providing targeted analysis at regional and sectoral levels is essential to increase the likelihood that the resulting assessment will be used by specific communities. On the information side, satellites and other data provide information that is useful to every state and region, but the current set of downscaling tools has not regularly been used to translate national data products to regional or local levels. The CCSP is in a key position to build regional and sectoral communities of practice that can help to share knowledge and tools. (*n.b. There were many other comments related to including and supporting regional, local, and sectoral perspectives – these are included as a part of the specific discussions below.*)

Agriculture

Additional research and information will benefit agricultural risk management, including work in estimating the benefits and costs of climate change effects (e.g., shifts in the occurrence of extreme events) and the ways in which insurance, agriculture, and government might respond to these challenges. Since agriculture is a commercial sector that crosses over various systems and scales, it could be a good place for CCSP to build a prototype integration study.

Ecosystems

Additional information, including spatial representation, is needed so practitioners are able to prioritize on-the-ground activities and dedicate resources to protecting areas that are highly vulnerable or are especially valuable as refugia. Developing adaptation strategies to assist ecosystems to cope with climate change could be helped by improving understanding and models of wetland and beach migration, changes in nearshore habitat, connectivity between natural systems, and responses of plant and animal communities to climate change. Such models should also take into account the possibility of non-linear or abrupt ecosystem state changes.

Energy

More information is needed about the environmental impacts, economic impacts, and social equity of various alternative energy products.

Insurance

The insurance industry attempts to maintain a delicate balance of providing coverage, supporting losses, and maintaining solvency in the context of shifting probability distributions and rate structures. With more information about climate change, the industry may be able to assess rate discounts for actions to adapt to climate change and reduce vulnerabilities. Findings from

federally-funded climate change programs should be shared with the insurance industry, so that they can quickly adapt to potentially changing probability of risk. These adaptations will allow them to develop better techniques to mitigate societal damages under various climate change scenarios.

Land Use and Planning

For planners, climate is just one of many issues – but an important message to carry forward is that multiple hazard mitigation can also be climate vulnerability reduction. Models may be important tools to engage this group of users, but the scale of global climate model outputs is still too large to be useful for local land use planners. In addition, the current generation of models may not yet include the multiple stressors that land use planners must consider. Because of the long time horizon around major land use and infrastructure planning and implementation decisions, tools for planning and zoning officials are needed now to assist them as they plan several decades into the future. Another related need is to identify “second tier” areas where populations may move to as coastal areas are increasingly threatened by sea level rise or other areas are subject to increasingly severe climate-related threats or disasters.

Policy

While CCSP concentrates on the science of climate change and CCTP concentrates on the technology to address climate change, these programs are charged to provide information that is policy-relevant but policy-neutral. A parallel effort is needed that evaluates the potential implications of following particular policy pathways.

Public Health

Information is needed to help identify health disparities and public health infrastructure needs, including the tools, capacity, and resources to address the public health challenges of climate changes.

Stakeholder engagement

General Comments

The strength of the global change research community is generally not in creating and maintaining dialogues with stakeholders – this is an area where CCSP could help, perhaps by facilitating specific discussions about the questions or topics of interest to specific groups. CCSP needs to break the model of “listen, go, do” (communication) and instead must be much more interactive (two-way iterative dialog and engagement).

Regional and Sectoral Foci

Both regionally and sectorally-focused discussions are necessary to move beyond the “DC insiders” and to better understand what are the research and information needs around the nation (regionally and locally) and within each sector. Regional dialogues that are open to a variety of stakeholders are useful for generating discussion about regionally specific as well as cross-cutting issues and needs and for identifying potential partners in the climate information user community. To develop and maintain regional dialogues takes a focused effort that has not yet been included in the science plan. It is also important to have sectoral discussions. Discussion within specific sectors often delves more deeply into an issue because participants already speak the same technical language; such discussion will also assist in developing targeted messages for each sector. Potential venues for sectoral engagement include hosting workshops or sessions at annual meetings of professional societies. Both regional and sectoral engagement requires mechanisms that promote and support iterative dialogue.

Synthesis and Assessment Products (SAPs)

CCSP has been somewhat effective in reaching out to stakeholders as a part of the SAP writing and review process, but stakeholder engagement must be better integrated throughout the SAP process, from start to finish.

Workshops

The large 2002 workshop to gain inputs for the Strategic Plan developed a level of scientific community stakeholder buy-in and engagement in the climate science planning process. To increase stakeholder input, smaller group interactions of non-scientists are also needed on a regular basis.

Selecting Participants

Many NGOs are currently unaware of CCSP and its role in the federal government, thus it is necessary for CCSP to proactively engage these groups. Although its current role is coordinating federal climate science, CCSP might expand its mandate to include purposeful engagement of non-Federal stakeholders to assess whether the information being provided by agencies is the “right” information and that it addresses the “right” problems for their locales and constituents. Many commercial organizations could benefit from knowledge and interactions with federal agencies and could effectively pass this knowledge through the services and products they provide.

Selecting Leaders

It is important to foster connections between different groups of stakeholders (regionally and sectorally) while also being sensitive to the types of interactions and messengers that each of these groups is likely to accept. Working with communities through several streams of messengers (e.g., agricultural extension agents, health care professionals, etc.) is likely to result in a broader overall acceptance of any agreed upon climate change message. It is also necessary to identify and reach especially vulnerable populations, perhaps by partnering with churches or other organizations that can assist in these tasks. Finally, it is important to understand who the leaders within the community are and to recognize that these leaders may have widely varied levels of sophistication as consumers and users of climate information, so an appropriate approach is needed to engage these leaders.

Constraints on Stakeholders

Resource constraints along with lack of expertise (knowledge and understanding) may cause local or state organizations to ignore new climate change information products and be fairly reticent about participating in dialogues around climate change information needs. Therefore, it is important that any outreach activities undertaken by CCSP consider the ability and willingness of stakeholders to participate. Any products developed by the program should fulfill a need of the intended recipients and be easy to understand, adapt, and use.

Communication and social marketing efforts

Common Language

The words chosen to represent many climate change concepts are not inherently intuitive, clear or effective; this can cause confusion and needless lack of engagement. For example, the word “mitigation” means one thing to those who deal primarily with atmospheric composition and emissions, another to those who deal with terrestrial and aquatic ecosystems, and an entirely different thing – if anything at all – to lay audiences. Therefore, there is a need to promote the development of a shared lexicon, decrease use of jargon, find “words that work,” or at the very least to provide definition in term use.

Messages

CCSP need not necessarily mount public information campaigns, but they should invest in developing and testing simple clear messages that convey critical information to various priority audiences, e.g., “climate change is real and is happening.” These tested messages will become an asset for the communication efforts of other agencies and organizations (e.g., tailoring and delivering the message to a more specialized audience or constituency). This two-tiered approach to campaign development has many advantages including making the best use of the communication resources of a variety of concerned organizations, ensuring message consistency among diverse organizations, the ability to target and tailor messages to a large number of priority audiences, and the ability to add additional important frames (e.g., climate change is not just an environmental problem, but also has the potential to impact health, economics, etc.) as appropriate.

Metaphors are central to helping people understand and place new information in proper context. For example, ideas such as “planning for climate change is like planning for your retirement” may help people understand that a mix of high- and low-risk and high- and low-yield actions are needed to prepare for the potential uncertainties about the future associated with climate change. Conducting communication research to identify useful metaphors should also be a priority for CCSP.

Partnering

CCSP could partner with Rotary and other groups to develop speakers’ bureaus and to develop a group of common themes or messages, based on sound science that can be delivered to various audiences. CCSP should also work to identify champions in specific communities (e.g., environmental justice) that can help to effectively deliver the climate change message.

Tool Development and Use

The communication tools mentioned above will enhance the climate change communication capacity of a wide variety of concerned organizations. However, information alone is not sufficient to motivate and enable most members of most audiences to make the best-possible decisions and to follow-up on those decisions with appropriate actions – a caveat that the climate change science community seems to be disregarding. Social marketing methods can be used to analyze what additional resources or experiences are needed to help people and organizations change their behavior in ways consistent with the science-based recommendations. CCSP should

consider developing social marketing products or services that help individuals or organizations to more easily and effectively implement recommended actions.

Successful Outreach Examples

The NOAA RISA programs in the Pacific Northwest and Pacific Islands have made a good deal of progress because they begin with the end users at the table during the proposal planning stages, and keep them involved as the work/research progresses.

The National High Blood Pressure Education Program, aggressively led by NIH's National Heart, Lung, and Blood Institute with a modest but sustained funding stream, has attracted co-investment and broad participation by a large constellation of organizations in the public, NGO and private sectors. The impact of this program – successfully sustained over several decades – has been a dramatic (60%) nationwide decrease in the rate of death from stroke and certain forms of heart disease.

Continuity of observations and data

Continuity

Discovery science relies on a continuing stream of observation. Ensuring the continuity of existing observations and data sets is important. There has been a recent focus on using and reworking existing data sets. This is a concern because it seems like there is less focus on continuing to collect certain new data. Without continuing to collect new data, it is not possible to track recent changes in the environment. Any portions of a data set that are not collected are lost forever as there is no way to go back in time and collect those missing data.

Observation Networks and Planning

It is important to have some idea of what the final indicators are expected to look like in order to identify priorities for research, observations, and products. Furthermore, integrating in situ sensors and networks, including identifying those monitoring sites that are in danger of being lost, should be a part of the planning process for prioritizing repair and replacement of existing sensors and placement of new sensors.

Importance at CCSP

Although observations is one of the cross-cutting elements identified in the CCSP Strategic Plan, ensuring the continuity of observations and bringing new observing systems online has not received as much attention as some of the primary research elements.

Proxy Data Sets

Land use and land cover change is often the best possible proxy data set for a number of questions – thus it is important to preserve and build on such data sets.

International Importance

People around the world rely on US-generated data and information.

Products, services, and tools

Capacity Building

The core requirement for developing products, services, and tools is to identify the primary users or client base up front and to make sure that any research and development will ultimately address the societal benefit or social application issues of importance to those users. Stakeholders must be engaged in both the process of identifying requirements for these tools – both requirements for the types of questions such tools address and the requirements for interfaces and outputs – and in developing appropriate training programs for the use of existing tools. Agencies often go about this process backwards, identifying a specific hypothesis and then building tools to test that hypothesis. Instead, approaches are needed that begin with the audience in mind and then build a framework for answering the audience’s questions and accessibility requests. Right now, most of the methods for stakeholder engagement that federal agencies rely on are not well suited for shifting from hypothesis-driven to audience-driven tool development, although some may be available (e.g., Climate-Ready Cities). Developing a catalogue of successful methods would be useful.

Level of Detail

The questions of concern and the tools needed to address those concerns range widely both between communities and within communities. While some users may be interested in basic questions such as “is climate change happening in my community?” others may need specific tools to assess, e.g., the effects of climate change on soil moisture and resulting contributions to stream flow. So CCSP outputs need to take into account the variety of needs of the user communities, including helping to engage various organizations pursuing these goals.

Uncertainty

Not all groups of users require the same level of certainty before they take action. For example, insurance companies may be able to adjust rate structures with 40% certainty about an event, managers may wish to undertake certain precautionary measures with 60% certainty, while scientists are likely to hold off on noting the potential for an event until there is 90-95% certainty. There is additional uncertainty introduced by trying to scale model results up or down to satisfy the needs of decision makers. CCSP could assist with this identification of uncertainty by providing guidance about what is realistic to expect models to deliver at various scales and what the associated uncertainties might be.

Resource Management

There need to be systems or tools that promote the use of adaptive management practices by allowing users to incorporate monitoring data and plot avenues for action.

Crossing Disciplinary Boundaries

The federal agencies often work very piecemeal – each engaging stakeholders and developing tools within specific “pigeonholes.” What is needed is a way for users to work across these boundaries and to integrate multiple streams of information to examine how natural and social systems interact.

Existing Tools

A number of tools already exist that may meet some users' needs. However, it is often difficult for users to find and then learn how to use such tools, so additional effort is needed to catalogue such tools and to help users identify existing tools that they may use to answer their questions. Mechanisms are needed to engage in a two-way dialogue with users about what their needs are and how existing tools can meet those needs.

Payoffs

In some cases, there may be users who can benefit from information or tool "microlending" – with just a small bit of information or training in the use of a tool, they may be able to bring back large returns on this investment through appropriate and useful applications of information.

Visualization and Scenario Evaluation

Tools that allow the user to evaluate the potential impacts of one or more scenarios (e.g., conservative vs. extreme estimates of change, alternative management plans) by presenting virtual representations that users can explore and compare would be extremely helpful in information dissemination.

Web-Based Activities

Creating a web-accessible database of tools would allow CCSP to be a "spreader of great ideas" (theoretical bases on which to draw include diffusion of innovation and social marketing). Such a database would help a user identify what is working elsewhere and increase access to those proven tools. Alongside this database, there could be ongoing accumulation of information about users' needs via a web-based survey or other assessment (what tools are they using, how might the database be organized to meet their needs, what is still lacking, etc.). The design and interpretation of such tools is both a science and an art and would require specific focus and resources for successful development and implementation.

Potential additional partners

Participants identified a number of additional partners that CCSP may consider engaging as a part of its strategic planning process and/or outreach activities.

- Heinz Center brings academics, feds, local/state government, and others together (focus on ecosystems, resilience, etc. - Council of Indicators: Heinz, US Chamber of Commerce, Homeland Security, International Business Council, National Biological Information Infrastructure, etc.)
- EBMTTools network focuses on decision support systems and the flows between terrestrial and aquatic systems – CCSP could join this network
- National Phenology Network – focus on monitoring
- Governors and Mayors Associations, ICLEI, and Cool Cities, etc. – cities and states are ahead of the federal government in some respects, but still need information from the federal level
- Professional societies (e.g., The Wildlife Society, Society of American Foresters, The Coastal Society, etc.)
- NOAA Coastal Services Center, Sea Grant, and National Estuarine Research Reserves and EPA National Estuary Program may be able to help with training on how to access and incorporate coastally related climate data into planning and education efforts
- Health: World Health Federation, American Medical Association, CDC Coalition, local boards of health – general newspaper (Nation’s Health), special issue of J. of American Public Health, speakers bureau, Trust for America’s Health
- Insurance: Institute for Business and Home Safety, Reinsurance companies (e.g., SwissRe)
- Private sector: through Small Business Innovation Research (SBIR) program (offer a grant focused on climate innovation across agencies), model similar to National Weather Service (NWS provides information, which other private groups then transform and disperse using their own sets of tools), need to show that the economy can benefit from taking climate action (e.g., as with the Clean Water Act, where resistance was based on the perceived harm to the national economy – but CWA actually spurred innovation and economic growth)
- American Planning Association
- Various associations of state officials
- Climate Savers (corporate)
- Organizations that cater to a more general audience (e.g., National Wildlife Federation and its publications)
- Agricultural extension agents, especially disaster preparedness specialists, and crop insurance programs

Appendix A: Participants

David Allen, US Climate Change Science
Program Office
dallen@usgcrp.gov

Alan Basist, Commodity Hedgers
alan@commodityhedgers.com

Bill Brennan, NOAA & US Climate Change
Science Program
Bill.Brennan@noaa.gov

Lynne Carter, Adaptation Network
LCARTER231@aol.com

Jena Carter, Coastal States Organization
jcarter@coastalstates.org

Keya Chatterjee, WWF-US
keya.chatterjee@wwfus.org

Emily Cloyd, US Climate Change Science
Program Office
ecloyd@usgcrp.gov

Margaret Davidson, NOAA Coastal
Services Center
Margaret.Davidson@noaa.gov

Phil DeCola, OSTP
[Philip L. DeCola@ostp.eop.gov](mailto:Philip_L._DeCola@ostp.eop.gov)

Patrick Gonzalez, The Nature Conservancy
pgonzalez@tnc.org

Zoe Johnson, Maryland DNR
ZJohnson@dnr.state.md.us

Russell Jones, American Petroleum Institute
jonesr@api.org

Jack Kaye, NASA
jack.a.kaye@nasa.gov

Mary Klein, NatureServe
mary_klein@natureserve.org

Tracy Kolian, American Public Health
Association
tracy.kolian@apha.org

Fabien Laurier, US Climate Change Science
Program Office
flaurier@usgcrp.gov

Linda Lawson, DOT
Linda.Lawson@ost.dot.gov

Edward Maibach, George Mason University
emaibach@gmu.edu

Chad McNutt, NOAA
Chad.McNutt@noaa.gov

Ryan Meyer, Arizona State University
Ryan.Meyer@asu.edu

Michael Mortimer, Society of American
Foresters
mortimer@safnet.org

Robin O'Malley, Heinz Center
omalley@heinzctr.org

Peter Schultz, US Climate Change Science
Program Office
pschultz@usgcrp.gov

Amanda Staudt, National Wildlife
Federation
staudta@nwf.org

Nick Sundt, US Climate Change Science
Program Office
nsundt@usgcrp.gov

Appendix B: Participant Statements

The following statements were received in response to the following request from CCSP, included in the invitation to participate in the roundtable:

Prior to the roundtable, we ask that you reflect on the following questions in a short written statement (1-2 pages, maximum) that we can share with other participants in advance of the meeting to help stimulate discussion. Not all of these questions will apply to everyone, and your participation in the roundtable is not contingent upon providing a written statement. Even if you choose not to submit a written statement, please do consider these questions ahead of the roundtable, as they will form an important portion of the discussion.

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?
2. What types of climate information, tools, and services do you currently use to support these activities?
3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?
4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?
5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?
6. What should the role of the federal government be in providing climate information, tools, and services?

The following statements are considered as an informal communication, meant to provide further information about the types of climate information used and/or needed by various groups of stakeholders ahead of the roundtable.

Alan Basist, Commodity Hedgers

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

A shift in the distribution function of extreme events along with their social and economic costs. Most of our work is related to the probability function, and how variations from the normal impacts crop production, as well as infra-structure and resource costs related to extreme events. An example would be a hurricane that passed through the Gulf oil fields impacting supplies, price and distribution, then severely damaging the infrastructure and social fabric in the region near landfall. These costs need to be better understood, mitigated, and protected by risk management. Also how changes in the climate impacts the global food supply.

2. What types of climate information, tools, and services do you currently use to support these activities?

We use a composite of satellite data for monitoring land surface temperature and wetness around the globe. Also run and/or analyze ensembles forecasts for the world, and use these to monitor and predict agricultural yields and extreme events. Our work helps mitigate risk, and plan for the future.

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

I receive data from the satellite archive of NESDIS and National Weather Service. I am happy with the delivery. I would like more readily available information from other countries.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

This is a huge question. Climate impacts so many aspects of our lives, such as agriculture and climate, energy and climate, insurance industry and climate, urban planning and climate, health services/disease control and climate, water resources and climate. Each of these is in partnership and has a relationship with the other (whether they know it or not). I am engaged in many of these, although my primary interests are agriculture and climate, as well as risk management and climate variability (change).

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

You cannot easily go backward and get quantitative climate information in the areas I am working: probability distributions. So I am looking forward to what is possible. Ideally, we would get a global network of climate reporting stations, that are homogenized and deliver the data in a real time basis. This ground truth data would be integrated with satellite observations, for more comprehensive spatial and temporal information. This would be a tall order, but I

believe it would bring great value, since these partnerships could be applied in the risk management, resource allocation, politics and planning activities.

6. What should the role of the federal government be in providing climate information, tools, and services?

The federal government should work more closely with the other countries of the world and the WMO, in order to achieve more comprehensive monitoring, data archiving and distribution systems (NCDC would be a natural conduit for the this activity).

Keya Chatterjee, WWF – US

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

Around the world, climate change is threatening not only individual species such as polar bears, tigers, salmon, penguins and corals, but it is also posing potentially catastrophic and long-term changes to the environment and people's lives around the world.

WWF is actively working in places where we are dealing with the affects of rising temperatures, sea level rise, glacier decline, increased drought, shifts in the timing of seasons, changes in freshwater supply, and an increase in extreme weather events. We are redesigning conservation to include responses to these changes.

2. What types of climate information, tools, and services do you currently use to support these activities?

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

WWF-US uses a variety of tools to support our conservation activities. We have scientists and consultants who collect their own field data and use relatively raw information sources such as GCM outputs, remotely sensed data, DEMs, etc. We also have field programs that rely heavily on published literature and grey literature from World Bank Reports, FAO reports, etc. to help them to create adaptation plans for climate change.

The most helpful information tools, and services are those that are free and available on line through simple search terms.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

WWF partners with universities, businesses and governments to obtain information.

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

We need:

- Forest carbon data (both standing stocks and fluxes)
- Sea level rise data- that we can overlay with topography and land cover type at higher resolutions
- A better understanding of how specific species and ecosystems are impacted by climate change (including agricultural impacts)
- More accurate regional climate models that operate at the scale of our priority places
- Much better communication to the public that climate change is real and is already happening.

6. What should the role of the federal government be in providing climate information, tools, and services?

The Federal Government should play a much stronger role in providing information to the public that helps them to understand the scale and scope of climate change. They should encourage federal government scientists to speak to the public and to policy-makers about their research. The federal government should also provide the public with clear information about the climate change mitigation potential of various energy alternatives.

The federal government should also continue to provide free global datasets and models for analysis by government scientists, academia, and civil society. Pushing forward on the spatial resolution of models and key climate variables will also be very helpful in our planning.

Margaret Davidson, NOAA Coastal Services Center

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

We work closely with regional and local stakeholders to understand and adapt to SLR and other anticipated climate impacts along the coast. Higher spatial resolution (models, decision support tools) is critical at these levels of government

2. What types of climate information, tools, and services do you currently use to support these activities?

Our 'historical' product lines have been GIS based 'community risk and vulnerability assessment' tools, systematic partnerships to acquire high resolution coastal landscape change (5 year refresh rate) and coastal geomorphological change data (LiDAR, IfSAR, etc) and on line analysis tools.....

We closely with regional and local 'stakeholders' to identify, provide access to and help build capacity to use a variety of adaptation tools and strategies. These range from geospatially facilitated decision support tools (GIS, viz, etc) to model ordinances, siting and building practices, and landscape conservation acquisition strategies.

We largely work with intermediary professional and scientific organizations and groups: e.g. a consortium of casualty loss insurers, National Association of Counties, the Extension Disaster Information Network, The Land Trust Alliance (representing community land trusts).

We also help these types of organizations plan and facilitate 'climate impact' meetings and workshops for their organizations. We have helped several to develop their statement of 'needs'.

At CSC, our guiding principle is to 'build the community of practice'. We have also focused on the 'connectivity' between multi hazard mitigation and adaptation to climate change: especially coupling improved coastal inundation tools with the added advantage of adaptation to SLR.

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

We are constantly scanning what is produced by federal entities and those receiving federal funding such as RISAs. We also try to provide access to information, tools and services provided by the NGO and other communities. Through an internal CSC, an internal NOAA and numerous other mail lists, we remain aware of, connected to and refer others to many of these sources.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

Because of our emphasis on building awareness, access and capacity at the regional and local

levels...we are principally focused on working with regional and state coastal resource managers (regardless of whether they derive funding from NOAA, DOI, FEMA or EPA), university programs such as Sea Grant and Cooperative Extension, national and local land conservation and acquisition groups (TNC, LTA) and professional organizations such as NACO, Council of Mayors, Assoc of State Floodplain Managers...

Over the past couple of years, our principal strategic partners have been the Business Leadership Council of the US Chamber of Commerce (about to announce a 'coastal community resilience indicators' pilot in the northern Gulf of Mexico), The Nature Conservancy, the 'coastal' initiative with the Land Trust Alliance and the 'coastal focus' with the ASFPM. and the Sea Grant network.

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

As we all know....the modeling efforts need to be much higher resolution.....even as the 'bottom up' planning and permitting local end users need to be aware and energized to engage at the sub regional and regional levels have been working with the NOAA Climate Data Center to provide funding for the development of coastal climatologies.

6. What should the role of the federal government be in providing climate information, tools, and services?

To provide a framework, facilitate access (through portals and other open sources), provide systematic as well as opportunistic funds to universities and other strategic partners, and provide continuous evaluation and refinement of available tools and services.

Mary Klein, NatureServe

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

- Species response to climate change including modeling predicted species distribution changes, scenario evaluation, and extinction risk
- Ecosystem response to climate change including modeling predicted ecosystem changes and scenario evaluation
- Ecosystem services in societal response to changing climate especially coastal buffer zones, ground and surface water recharge areas, and carbon sequestration potential of ecosystem types
- Cumulative impacts of stresses on ecosystems including cumulative effects of climate change with land use changes and emerging invasive species
- Land use and conservation planning for long-term sustainability using decision support tools with scenario visualization and assessment capability
- Transportation infrastructure impacts especially with respect to increased access to remote forests in Latin America and Canada
- Coordination of the Ecosystem Based Management Tools Network, a voluntary network of tool developers working to integrate ridge to reef data into coastal and marine conservation planning (<http://www.ebmtools.org/>)
- Monitoring and trend detection through field work conducted by our international network of member programs (natural heritage programs and conservation data centers)
- Predicted land use changes related to increased demand for alternative energy sources such as biofuels and wind power, and their impacts on species and ecosystems
- Providing access to scientifically sound information via the Web to help guide conservation actions, including response to climate change (<http://www.landscape.org/preview/Understand>, <http://www.natureserve.org/explorer/>)

2. What types of climate information, tools, and services do you currently use to support these activities?

- Species distribution models supported by occurrence and field observation data
- Satellite images for ecosystem mapping
- Species natural history data to help determine risk (e.g., dispersal ability, ecological sensitivity)
- GIS for scenario assessment and visualization
- NatureServe Vista decision support system for scenario development and evaluation (<http://www.natureserve.org/prodServices/vista/overview.jsp>)

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

Climate information is obtained through publications and through the results of well-established climate The modeling programs in the UK, Australia, US Universities, and NOAA. The most

important data to date have been predicted changes in moisture/rainfall, temperature, and sea levels.

Key improvement that would help NatureServe would be an increase in the spatial resolution of climate models.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

Our most important partnerships for studying climate change are with the US Forest Service, US EPA, US Geological Survey, Heinz Center, and the National Phenology Network (designed to detect changes in species life cycles).

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

- Continued improvements to species and climate models.
- Collaborations with sectors accustomed to forecasting conditions under a very complex set of conditions (e.g., economic forecasting) to improve conceptualization of risks and options.
- Systems for dynamic and real-time access to satellite imagery

6. What should the role of the federal government be in providing climate information, tools, and services?

- Investment in monitoring and trend detection on the ground (especially by state agencies)
- Support in developing improved climate models and species/ecosystem distribution models
- Support in developing indicators of change that can drive targeted monitoring efforts (e.g., the National Phenology Network, EPA, and Heinz Center efforts)
- Better coordination of federal and private efforts to develop decision support systems for societal adaptation
- Incentives to landowners and water owners to work with their communities to increase ecosystem and societal resilience to climate change (e.g., conservation of wildlife corridors, coastal buffer zones, wetlands for water recharge)
- Increased investment in plant conservation efforts (plants are particularly susceptible to climate change because of limited mobility)
- Incentives for forest conservation
- Better agricultural planning related to development of alternative energy sources, and funding to ensure that ecosystem functions are conserved as land use changes
- Support for public education programs

Tracy Kolian, American Public Health Association

Founded in 1872, the American Public Health Association (APHA) is the oldest, largest and most diverse organization of public health professionals in the world. The association works to protect all Americans and their communities from preventable, serious health threats. APHA represents a broad array of health officials, educators, environmentalists, policy-makers, and health providers at all levels working both within and outside governmental organizations and institutions.

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

The key climate-related challenges that APHA is currently addressing and expects to address in the future include:

- Educating targeted and key audiences (in particular policy makers and public health professionals) that climate change is a public health issue.
- Ensuring that health, in particular, health of vulnerable populations is considered and addressed in policies related to climate change.
- Reaching out to local public health professionals and disseminating information about climate change and public health - making the connection between what public health is already doing (e.g., vector control) and climate change.
- Determining what the public health community is or is not doing regarding climate change.
- Ensuring that adequate capacity and funding is available for public health to address/prepare for the potential impacts of climate change.
- Delivering messages about a holistic public health approach to addressing climate change (i.e., sustainable community development: improving community design to benefit health and to help mitigate climate change).

2. What types of climate information, tools, and services do you currently use to support these activities?

The types of climate information, tools, and services we currently use to support these activities include:

- Scientific reports and publications with assumptions/predictions regarding what might happen in the U.S. e.g., sea levels rising and loss of coastal regions, increase in vector borne diseases, extreme weather events and potential health impacts.
- Summary of legislative activities associated with climate change.

To disseminate this information to the public health community, we rely primarily on APHA communication channels such as *The Nation's Health* (APHA's signature newspaper), sessions at APHA annual meeting (which occurs in early November) and our partner organization's (e.g., state, and city and county health officials) outreach channels.

APHA government relation's staff work, with partners, to educate national policy makers and to help ensure public health issues are considered and addressed in climate change legislation.

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

APHA obtains climate change information from:

- Listservs/announcements about climate change,
- Word of mouth and colleagues,
- Expertise of APHA members,
- Known and (what we consider to be) credible resources: WHO, NRDC, PEW, CDC, and
- Internet and researching specific web sites.

Improvements could be made in the delivery and availability of information by providing a one-stop resource for climate change information. There is no, or does not seem to be, one collective source for evidence, policy, etc.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

Current APHA partnerships that might be leveraged in extending climate services and/or building networks between users of climate information include: public health partner organizations, federal agencies in particular CDC, and community development and health groups.

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

Climate information, tools, and services that APHA could use now that are not currently available include: evidence based information about the public health impacts in particular among vulnerable populations in the US, and summary of policy information.

6. What should the role of the federal government be in providing climate information, tools, and services?

Several roles that the federal government could play in providing climate information, tools, and services include:

- Offering one stop resource regarding climate change research, activities and policy.
- Delineating and reporting on where climate change activity is happening within federal agencies? Who is doing what? Where is there collaboration? Where are the gaps? Where is the overlap?

**Edward Maibach, MPH, PhD, Professor and Director
Center of Excellence in Climate Change Communication Research
George Mason University**

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

Our research center is just now getting up and running – we launched in late August. Fundamentally, the challenge we are focused on is: How can concerned organizations more effectively influence population behavior (consumption behaviors and citizenship behaviors) to mitigate and adapt to climate change. This includes the behaviors of individuals, businesses, and other organizations.

2. What types of climate information, tools, and services do you currently use to support these activities?

We hope to soon build a suite of audience research and message research tools that will enable us to offer informed opinions about how to improve a broad range of climate change social mobilization strategies.

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

Prior to establishing our Center, several of our investigators were involved in the creation of “marketing research” tools for public health communication and social marketing initiatives. The methods are well developed and extensively used in the field of public health. To the best of our knowledge, however, no one is yet building or using such planning tools to promote climate change, energy use reduction, or sustainability objectives.

In addition to conducting research and using the research to build program planning tools, an integral aspect of our mission is to provide technical assistance to organizations that are attempting to advance society’s ability to prevent and/or adapt to climate change.

4. What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?

We are currently forging research partnerships with other research institutions (e.g., Yale, Potsdam Institute for Climate Impact Research) as well as with organizations the actively communicate with the public or others about climate change. For example, while I can’t name any names yet, we hope to soon be announcing partnerships with two major media companies.

5. What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?

See my answer to #6 below.

6. What should the role of the federal government be in providing climate information, tools, and services?

Although a self-serving recommendation, I feel there is an urgent need for the federal government to support the development of public access data that can be used to improve climate change (mitigation and adaptation) information, communication and social marketing programs. Many significant investments are currently being made in developing such programs by organizations in the public, private and NGO sectors, but (with the possible exception of proprietary data available only to one corporation or another) there is currently little or no high-quality “open access” audience and message research data available on which to make solid program planning decisions.

Amanda Staudt, National Wildlife Federation

1. What are the key climate-related challenges that you or your organization currently address and/or expect to address in the future?

The National Wildlife Federation's research and information efforts on climate change are focused on three overarching objectives: (1) articulating the need to significantly reduce U.S. greenhouse gas emissions and examining the implications of different policy options; (2) synthesizing information on the observed and projected impacts of global warming on wildlife in target regions or habitats and providing relevant resource managers (e.g., wildlife professionals, forest managers, coastal managers) with concrete, place-based strategies for helping wildlife cope with global warming; and (3) improving communication of climate change science, impacts, and solutions to the general public and to targeted audiences (e.g., hunters and anglers, gardeners, bird lovers).

Much of the NWF's contribution to new research to date has focused on the impact of sea-level rise on coastal habitats, with reports produced over the past 2 years examining the impacts in Florida, the Pacific Northwest, and the Chesapeake Bay. These reports include modeling results illustrating how habitats will migrate in response to different sea-level rise scenarios, literature reviews focusing on the impacts on local fish and wildlife, and recommendations for resource managers.

With the addition of new science staff, NWF will be expanding its research efforts in the coming year. Planned projects include an analysis of how to attain significant greenhouse gas reductions in an ecologically sensitive, economically sustainable, and equitable way; a guide for wildlife resource managers providing regionally specific strategies for managing habitats in the face of global warming; and a study of how changes in a range of extreme weather events will impact wildlife and options for modifying wildlife management in view of these anticipated changes.

2. What types of climate information, tools, and services do you currently use to support these activities?

- Published articles in the scientific literature
- Assessments and synthesis reports produced by CCSP, NRC, NGOs, etc.
- Sea-level rise model, coastal elevation data (LiDAR where available), GIS
- Observations and model results made available on government websites (e.g., GISS Temp, NCDC)

3. How and from what sources do you obtain climate information, tools, and services that you currently use? How might the delivery of these be improved?

We primarily obtain climate information via the web or by working with colleagues in academia and government.

Climate model data could be made more accessible. For example, making use of the AR4 archive requires a significant investment in time and expertise. In contrast, the GISS model archives can be easily explored via a web interface. A web-based interface for accessing the AR4 archives could greatly facilitate wider application of this rich data source.

Regional data has multiple different repositories – a single clearinghouse directing one to these sources would be incredibly helpful. For example, to find NOAA’s regional data, one must search individual sites of the individual labs (e.g., Great Lakes Regional Environmental Laboratory, Pacific Marine Environmental Laboratory). Likewise, an effort to inventory and make available in one location observational data from land, fish, and wildlife agencies would facilitate climate-related studies of this information.

4. *What partnerships are you currently engaged in that might be leveraged in extending climate services and/or building networks between users of climate information?*

- NWF membership, NWF affiliates in most states, grassroots efforts
- State fish and wildlife managers
- The Wildlife Society (professional society that is increasingly taking interest in climate change impacts on wildlife)
- Regional networks of activists
- Hunting and angling organizations
- Partnerships with universities
- Partnerships with other NGOs

5. *What climate information, tools, and services could you use now that are not currently available? What additional climate information, tools, and services do you anticipate needing in the future?*

Regional climate modeling projections. There is a strong demand for regionally specific information about future climate change and associated decision support tools. The resolution of global modeling results is insufficient to provide reasonable input into regional decision making. In addition, it would be valuable in designing regional model efforts to ensure that the parameters/values archived are those of relevance to regional decisions.

6. *What should the role of the federal government be in providing climate information, tools, and services?*

The federal government should play a primary role in deploying environmental monitoring systems, archiving observational data, and making the data easily accessible to users. In addition, the federal government should support the development of a range of climate modeling tools and make the results from standard projections widely available. The development of decision support tools for specific applications (e.g., addressing sea-level rise in a particular region) should generally be pursued in partnership with or solely by other entities that have the resources and keen interest in developing regionally specific knowledge along with networks of experts and interested parties necessary to more effectively meet local needs. There is a role for the federal government in providing seed funding for a limited number of regional decision support projects (e.g., RISA) to help jump start this still young field. In addition, the federal government should create a clearinghouse and sponsor conferences where expertise and tools developed in different regions and for different applications can be shared.