

Acclimations

Newsletter of the U. S. National Assessment of Climate Variability and Change

Connecting with the Grassroots

By Tom Wilbanks, Oak Ridge National Laboratory

A frequent challenge in our lives is taking something that we must do and turning it into something that we should do. The Global Change Research Act of 1990 says that the federal government "shall prepare and submit to the President and the Congress" an assessment of potential consequences of climate change for the United States, not just as a one-time exercise but as a longer-term continuing commitment. How, then, can we make this process truly useful to our country as we mobilize to deal with one of the most profound environmental issues for the next several generations?

As the current national assessment was being conceived early in 1997, Jerry Melillo laid out a dramatic vision of how it might in fact be useful as well as responsive. His vision was of a strikingly new approach to environmental policy assessment in the United States, grounded in dialogues at the regional/local level between regional experts and regional stakeholders: farmers, ranchers, local business people, local government leaders, local interest groups, and citizens at large. Activated by regional workshops, this consultation would raise the

level of awareness of local citizens of climate change issues, invite them to consider vulnerabilities to possible impacts, and then identify the major issues at the regional scale from the point of view of citizens and voters. Out of this democratic process of information exchange would come a picture of vulnerabilities of our country to impacts of climate change and variability -- not merely as a function of scenarios or local climate change forecasts that could result simply in arguments about assumptions but as a strong, robust set of views from the grassroots across the country. Moreover, this would not be a one-time process.

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NASA's Assessment-related activities; Regional reports from the Southern Great Plains and Metropolitan East Coast; Summary of National Assessment meetings in Atlanta.

Climate Change Fun in the Classroom

By Nancy Colleton,

Institute for Global Environmental Strategies

Icebergs made in paper cups, aquariums, satellite data, bio-engineered grass seeds, and a diagram of the food chain of the white-footed mouse are just a few of the interesting items contained in a series of learning activities promoting the understanding of climate change and its potential regional impacts.

Created by a diverse group of educators, classroom teachers, education technologists, Earth scientists, and teacher trainers, the learning activities focus on sectoral topics consistent with the National Assessment and are targeted to grade levels K-4, 5-8, and 9-12. The activities were developed independently by design team members and presented for review at a January workshop.

The design team members were asked to create an activity to fit a forty-minute or series of forty-minute class periods, ensure

that the activity responds to national education standards, identify existing related materials for more information or research, and develop student assessment indicators.

Eric Barron, director of the EMS Environment Institute at Pennsylvania State University, developed an overview activity reviewing five key elements of an Earth systems approach: 1) a sense of balance; 2) an understanding of feedbacks; 3) the role of life in promoting stability; 4) a sense of change and a sense of time; and 5) the natural-human environment interaction. "The most important thing we can teach our students is that the Earth is a system, and then to consider what happens if we kick that system? That's why we're doing an assessment--to better understand the what if scenarios," states Barron.

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Stakeholder Participation Improves Mid-Atlantic Regional Assessment

By Patti Anderson, Ann Fisher, and Robert O'Connor, The Pennsylvania State University

People usually think of global climate change as something that affects the entire world. While this is true, the impacts of climate change will be different in different regions, and people will experience these impacts where they live. The first Mid-Atlantic Regional Assessment (MARA) of climate change impacts, which is being coordinated by Penn State University, will investigate many types of impacts from global change at a regional level. The assessment will include potential beneficial and detrimental impacts on forests and farms, human health, and the extensive rivers, bays, and coastal waters of the Mid-Atlantic Region which includes all or parts of New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia, North Carolina, and the District of Columbia.

To maximize its usefulness, the assessment needs to integrate stakeholder insights into its design and implementation. In one sense, everyone in the region is a stakeholder in the MARA project because all of the regions citizens could be affected by climate change. In seeking to identify stakeholders to participate in the assessment process, MARA is paying special attention to groups likely to be particularly affected by climate change and to groups that have expressed an interest in the issue. MARA stakeholders represent a myriad of perspectives (Table 1), and are improving the assessment in four ways:

- Early in the project, they explained what kinds of information they need to help them make decisions in the context of regional climate change.

- During implementation of the project, they are reviewing chapter outlines and potential scenarios to be used in writing the report.
- At completion of the draft assessment report, they will review the document and suggest ways to improve it.
- They are advising the MARA team regarding ways to disseminate the results in the region.

The stakeholders have already helped us refine the research questions. For example, participants at the October 19-20, 1998, Advisory Committee meeting made sure that the assessment would be responsive to climate-related issues most important to the people who live and work in the region, such as the need for reliable seasonal climate projections by water system managers and farm operators. They also expressed concerns about the implications of climate change for insurance coverage and the insurance industry. Stakeholders are scheduled to meet again on May 2-3, 1999, to review the draft assessment and offer advice about developing materials and disseminating the assessment results to a wide audience.

In addition to coming together for working meetings and reviewing draft documents, many stakeholders have maintained informal communications with team members working on particular parts of the report. In our view, successful stakeholder involvement must be ongoing, two-way, and substantive. One part of the two-way communication is making sure stakeholders under-

stand how their participation makes a difference in the assessment process. Ongoing contact between researchers and stakeholders facilitates this understanding.

For more information, contact: Patti J. Anderson, Earth Resources Research Institute, Armsby Building, The Pennsylvania State University, University Park, PA16802; phone: (814) 865-9903; email: pja5@psu.edu

NCEDR Publication Available

In November 1998, the National Center for Environmental Decision-Making Research (NCEDR) published a Technical Report on "Stakeholder Participation in the U.S. National Assessment of Possible Consequences of Climate Variability and Change: Suggested Guidelines for Doing It Right".

In the context of an assessment grounded in regional dialogues, these suggested guidelines were offered as one basis for meeting the challenge of "doing participation right". They summarize the knowledge base about stakeholder participation, considering the "why," the "who," and the "how" based on the science associated with the subject of public participation. They also propose a set of principles to be followed in stakeholder participation in all parts of the national assessment, and proposes templates for keeping track of stakeholder participation, to enable assessment teams to eventually answer questions concretely about what process they followed.

Copies of the document are available from the National Assessment Coordination Office: 400 Virginia Avenue, SW, Suite 750, Washington, DC 20024; phone: (202) 314-2230; mtaylor@usgcrp.gov.

Table 1: Backgrounds of MARA Advisory Committee Members

Citizen Groups	25
Business and Industry	19
State and Local Governments and Commissions	22
Federal Government Researchers	13
Academic Researchers	13
Total	92



Outreach in the Pacific Islands Regional Assessment: Establishing an Effective Information Partnership

By Eileen Shea, East-West Center, Honolulu, Hawaii

Plans for the Pacific Islands Regional Assessment assume that we are addressing both of the dual objectives of the U.S. National Assessment Program along the lines discussed at the 1997 Aspen Summer Institute on the National Assessment:

- **developing a more complete understanding of the local/regional implications of climate variability and change in the context of other economic, social, and environmental stresses** -- i.e., a scientific effort whose initial goal is to explore in some detail the regional character, impacts and socio-economic challenges and opportunities associated with climate variability and change and produces periodic reports summarizing the results of that work; and
- **establishing and maintaining a continuing, interactive dialogue among scientists and affected businesses, communities, and government agencies** -- a dialogue which supports continuous, two-way information flow between the providers of information about climate variability and change (primarily, but not exclusively within the scientific community) and the users of that information in the public and private sectors.

An interactive dialogue among the providers and users of climate information (Figure 1) is

essential to promoting long-term planning and encouraging pro-active rather than reactive decision making related to mitigation of negative impacts. It also enhances opportunities to capitalize on potential opportunities associated with climate variability and change and guides future research priorities by identifying critical information needs.

Strategy for Success

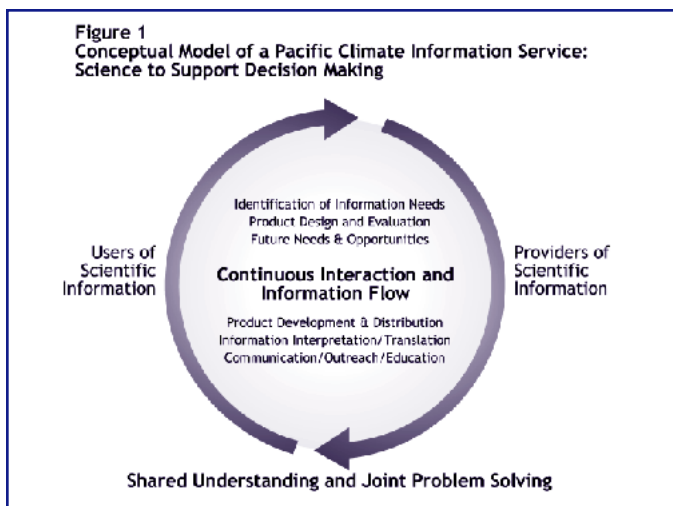
For the Pacific Islands Regional Assessment, "outreach" is defined broadly as this process of establishing and sustaining the partnerships necessary to produce, communicate and use new information and shared insights to address the challenges and opportunities presented by climate variability and change. Thus, for the Pacific Islands Region, "outreach" is the programmatic backbone of the assessment process and the central support structure around which a new regional climate information service is taking shape. To be most successful, assessment activities should be set in the context of a long-term program of capacity building. With adequate resources, this program not only supports the production of a scientifically rigorous Pacific Islands regional contribution to National Assessment reports, but also takes steps to establish and sustain a new level of interaction and dialogue between scientists and the potential beneficiaries of their work outside the scientific community. In addition to the development of new scientific insights about the regional consequences of climate variability and change, Pacific Islands stakeholders are also excited about exploring the challenges of implementing a new paradigm of collaboration to facilitate the integration of information about climate variability and change into practical decision making. This collaboration will also help guide future research by providing valuable insights into critical information needs. The successful and sustained engagement of stakeholders, particularly those outside the



scientific community, is dependent on their belief that the regional and national assessment process represents more than, to paraphrase a member of the Pacific Workshop Steering Committee, "the production of a one-time inside-the-beltway report."

Getting Started

A program of structured interactions will allow participating individuals and institutions to combine their experience and expertise to collectively assess the consequences of climate variability and change, identify critical information needs, and develop strategies to enhance the production and use of climate information to support practical decision making. Assessment workshops and small-group roundtable discussions will provide opportunities for in-depth exploration of individual issues/sectors and joint problem solving--thus broadening as well as deepening the involvement of interested and affected individuals and institutions focused on a particular topic. The participants will both: (1) contribute their own expertise and the interests of their home community in assessment activities; and (2) serve as a conduit for conveying assessment results/information back to interested individuals and organizations. In this context, the Pacific Islands regional assessment process will provide a critical scientific and decision support bridge. This bridge will help develop and convey new scientific insights that link global-scale processes to local impacts, and provide an opportunity to integrate the individual skills and combined assets of experts, decision makers, and information brokers along a continuum of time and space scales.



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Geospatial Technologies for Grades 5-12

By George A. Seielstad, Upper Midwest Aerospace Consortium and Odegard School of Aerospace Sciences, University of North Dakota

Students and teachers in the northern Great Plains and Rocky Mountain states of North Dakota, South Dakota, Montana, Wyoming, and Idaho have a new tool for learning about the Earth. Under the leadership of Prof. Patricia McClurg, Director of the Natural Science Program at the University of Wyoming, pilot teachers in each of the 5 states have compiled a Geographical Information System (GIS), called Prairie-to-Mountain Explorer. The GIS contains baseline data sets on regional and county scales (ranging in scale from 1:2,000,000 to 1:100,000). The 31 pilot teachers worked with scientists and teacher educators from the Upper Midwest Aerospace Consortium on the educational projects related to many of the National Assessment topics. The result is a set of 4 CD-ROMs containing layers with demographic and economic information, climate histories, highways, rivers, land ownership, political boundaries, and vegetation indices. Accompanying the CDs are a User's Guide and sample lesson plans for grades 5-12. The lessons were built around the organizing principles of Earth system science. Connections were woven among geography, science, mathematics, and art.

The pilot teachers received training in GIS programming and data acquisition and manipulation. ESRI Corporation provided instruction in ArcView software and consulted as the teachers prepared lesson plans. By now, 100 copies of Prairie-to-Mountain Explorer have been distributed and are being used by over 1,000 students. In the next phase of the project, the pilot teachers have conducted, or will conduct, statewide workshops for a second group of teachers. As time passes, this expanding pyramid of trainers training trainers will ripple through many schools.

Each statewide workshop provides lessons in ArcView, in use of a Global Positioning System (GPS) unit, and in teaching GIS lessons and devising ones own. The attending teachers also become part of an electronic network of peers who continue to support and learn from each other. Two case studies were initiated in 1997-98. One focuses on precision farming. Students and teachers work with scientists in the Upper Midwest Aerospace Consortium and with farmers in their community to compile site-specific data about soil types, nutrients, topography, weeds and pests, crop yield, and satellite imagery. The other project engages students with university and

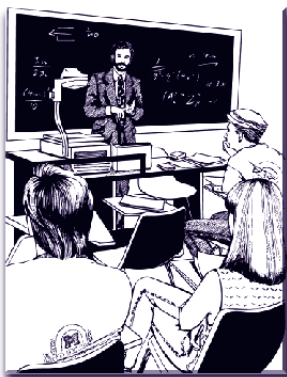


Forest Service scientists in a study of controlled burns. The students are measuring equivalent water content of snow on an identified burn site.

Student skills emerging from these new educational tools include an introduction to interdisciplinary science, an ability to work in teams, appreciation for science as beneficial to their communities, direct connections between science and its use in the real world, and environmental sensitivity.

For more information, contact: Patricia McClurg, Director, Natural Science Program; University of Wyoming, Laramie, WY 82071-3992; phone: (307) 766-3617; email: patmc@uwoyo.edu; or George Seielstad, Odegard School of Aerospace Sciences; University of North Dakota, Grand Forks, ND 58202-9007; phone: (701) 777-4755; email: gseielst@aero.und.edu.

Classroom, continued from page 1



Julia Berry, an elementary school science teacher from St. Patrick Episcopal Day School in Washington, DC, created three activities that enable K-4 teachers to introduce their students to the use of simple

scientific tools such as thermometers and rulers in order to: 1) observe and describe changes within ecosystem models; 2) explain the relationship between the model and the real world; 3) measure and record changes; and 4) make predictions about future changes and their potential impacts on Earth.

Carl Bollwinkel, an expert in environmental issues instruction and professor at the

University of Northern Iowa, developed a learning activity to better understand the relationship of erratic weather and new disease. Using the example of hantavirus pulmonary syndrome, Bollwinkel created a game board, to be used by teams of students to examine and discuss how the food chain can change at times of heavy rains and drought and how those changes can influence a disease outbreak. Bollwinkel states, "One of the potential early effects of climate change is erratic weather, something that all students can understand or have even experienced one way or another. What we want to have students think about are the many ways that erratic weather can affect their lives. Disease is of great interest to students and can be a real hook for getting their attention focused on climate change."

These learning activities are the third part of an overall effort being supported by the National Aeronautics and Space Administration (NASA) and the Environmental Protection Agency (EPA) to provide teacher-friendly materials that focus

on the potential consequences of climate variability and change. The Institute for Global Environmental Strategies of Arlington, Virginia is implementing the effort on behalf of NASA and EPA. A list of existing climate change-related education materials was developed as the first part of the effort. As the second part, ten papers discussing the potential regional impacts of climate change have been written and are currently being reviewed by a team of science and education experts. The content of the 10 regional papers will be introduced to students through the classroom-ready learning activities. Distribution of the regional papers and the learning activities is planned for fall of 1999 following a NASA-initiated Earth science education product review.

For more information, contact: Nancy Colleton, Institute for Global Environmental Strategies, 2111 Wilson Blvd., Suite 700, Arlington, VA 22201; phone: (703)875-8634; fax: (703)875-8635; email: ncolleton@aol.com



Native Peoples Participation in the Assessment

By Verna Teller, Pueblo of Isleta, New Mexico

The Native Peoples Native Homelands Climate Change Workshop held in October 1998 in Albuquerque, New Mexico has motivated a chain of positive events among Native Americans that will facilitate continuing dialogue and communication with the science community regarding the impacts of climate change on Native Homelands. These are some of the activities related to the Native Peoples climate change concerns:

- Efforts are being made to identify key Native people from different regions to participate in the assessment with the National Assessment Synthesis Team and with Regional Coordinators.
- Participants of the Native Peoples' workshop continue to distribute the Albuquerque Declaration, a position paper drafted at the workshop, thereby helping to facilitate public awareness and participation in global warming and other environmental issues.

- Native Peoples in the Northern Great Plains and the Great Lakes regions are discussing plans for a gathering of Native spiritual elders and participants of the Workshop to share oral history and traditional knowledge regarding environmental and other pertinent issues related to climate changes.
- Tribal colleges have recognized the interest in climate change and global warming among their students. One of the tribal colleges has developed a course on climate change and has integrated it into its curriculum. Materials from the Native Peoples' workshop (including posters, NASA and other climate-related publications, videos, and other information) have been distributed to middle schools, high schools, and libraries located on Native lands.

Thus, the information and dialogue on global warming and climate change issues is continuing in Indian country. Recent conditions

such as severe drought in the Southwest, heaps of snow in the Northwest, and a severe winter in the North and Northeast have heightened interest in these topics within the Native American community.

As a closing note: Native People have been deeply saddened by the sudden death of Mr. Walt Bresette, an Anishinabe peace and justice advocate of the Red Cliff Chippewa Band of Wisconsin. A member of the Loon Clan, Mr. Bresette defended treaty rights and fought to prevent metallic sulfide mining, and to prevent acid from a mining operation from being shipped across northern Wisconsin. He was a US Army veteran, co-founder of the Witness for Non-violence, was a member of the Midwest Treaty Network, Anishinabe Nijji, Lake Superior Greens, Wisconsin Greens, and was an inspiration to many. Mr. Bresette was a facilitator at the Native Peoples Workshop in Albuquerque and contributed greatly to its success. He will leave a void in Native America. We wish him well on his journey.

Grassroots, continued from page 1

The regional workshops and subsequent regional assessments would catalyze the development of stakeholder networks that would support a continuing process of information exchange, education, and outreach related to climate change issues. In fact, this approach might well serve as a model for addressing other thorny environmental policy issues in the United States in the future. As you know, this vision has since been expanded to address key sectors as well as regions.

While the production of the first report to the U.S. Congress speeds along this year, all of us with a commitment to the national assessment vision want to do our best to assure a strong parallel effort directed at outreach, education, and stakeholder interactions. This effort is not unrelated to the first national report, of course; we believe that by drawing on the knowledge bases of stakeholders and local/regional experts the assessment will be stronger than if it were based only on the knowledge base of national experts and modelers. But for the longer term, in many ways the outreach component of a comprehensive national climate change impact assessment program is an issue in its own right, essential for fulfilling the Congressional mandate,

which is why it is getting special attention in this issue of Acclimations.

What we know is that a comprehensive national program in the years to come is going to be based solidly in research and development to improve our knowledge of impacts and vulnerabilities and the analytical tools available to answer such questions. To be effective, it will also include continuing structures for interaction with regional, sectoral, and national stakeholders, and it will use them to involve a range of U.S. citizens that mirrors the complexity of our democratic approaches to national decision-making. As this issue indicates, it needs one further component as well. Broad public participation only works well when it is well-informed, which means that R&D on the one hand and participation on the other need to be linked by effective information dissemination and education. And this linkage needs to consist not just of top-down teaching and mentoring but also of responsiveness to bottom-up questions and concerns -- what the current national assessment is calling an "inverse" approach to vulnerability assessment.

A big question for the future, however, is

which of these functions should be performed by the federal government. Clearly, the government has traditionally taken the lead in supporting the R&D component, and there are many reasons why it should continue to play a major role. On the other hand, stakeholder participation and much of the information dissemination are likely to be more credible and sustainable if they are separated from government funding and management. Who will play these roles and how will they be supported? Unless we come up with some effective strategies, and soon, the future of the outreach, educational, and stakeholder participation aspect of the national program is going to be in jeopardy. Why soon? First, because we need to capitalize on the momentum from the regional workshops and deliver on our promises to regional and sectoral stakeholders and, second, because important decisions about the long-term national program are likely to be made during this year, since some of the current mechanisms will go out of business when the first assessment report is completed. As you read this issue, we invite you to think not only about the potentials of outreach strategies but also about possible mechanisms for implementing them, and we hope to hear from you about your ideas.



Responding to Climate Change: The Groundwater Foundation Accepts the Public Education Challenge

By Rick Leonard, University of Nebraska Water Center, Lincoln, NE; Susan S. Seacrest, The Groundwater Foundation, Lincoln, NE; and Bob Kuzelka, Asst. Dir., UNL Water Center, Lincoln, NE

The Groundwater Foundation is a non-profit organization that educates the public about the nature and value of groundwater. In this capacity, the Groundwater Foundation has worked with a wide variety of institutions and organizations in enhancing the public's understanding of groundwater science and technology associated with groundwater use. As an organization with a deep commitment to the protection and stewardship of this critical resource, we are naturally interested in the ongoing investigation of the water resource implications of global climate change.

Since 1985, one of the Foundation's major partners has been the University of Nebraska Water Center. Assistant Water Center Director, Bob Kuzelka, has served as consultant to several Groundwater Foundation programs including its fall symposium series and community education and recognition program, Groundwater Guardian. Most recently the Groundwater Foundation and University of Nebraska Water Center have formed a partnership as co-leads for the education and outreach components of the Water Resources Sector Assessment Team (SAT) of the National Assessment.

One of the goals of the water resources assessment is to involve and inform stakeholders and others interested in water resource issues with the process and findings of the National Assessment as it addresses climate change realities and opportunities. The Groundwater Foundation has faced a large communication challenge in helping people understand and appreciate groundwater, which, much like climate, is largely taken for granted. The Foundation has addressed this issue by developing a community-based program, Groundwater Guardian, which provides a consistent framework and process for community teams to use in educating citizens about the importance of the issue. The Foundation's network of Groundwater

Guardian communities and contacts with public and private water management agencies across the nation will help the Foundation disseminate the products and information developed through the national assessment process.

The Foundation's contributions to the Water Resources SAT include:

- compilation of a bibliography of research literature pertaining to the relationships between climate change and groundwater resources;
- a survey of water resource organizations across the nation to learn the extent to which climate change has been a focus of their educational, research, and outreach activities; and
- a survey of attendees at the National Groundwater Guardian Conference in Anaheim, California last November to elicit their perceptions of the public's awareness and concern for potential climate change impacts to water resources in their communities.



The results of both surveys suggest climate change has not yet achieved a level of credibility and urgency to be an issue of immediate concern.

As part of our outreach efforts, National Assessment information is being incorporated into Groundwater Foundation publications and programs. Our quarterly publication, "The Aquifer" will include a regular column on the progress of the National Assessment and highlight specific climate-related research findings. Three papers have also been submitted to the American Water Resources Association's Specialty Conference on Potential Consequences of Climate Variability and Change to Water Resources of the United States (Atlanta, May 10 - 12) which will feature the works of contributing researchers of the Water Resources SAT. Two of the papers will focus on public perception and outreach, incorporating both our own survey results and previous research findings of how the public understands climate change. The third paper synthesizes research conclusions about the implications of climate change for groundwater resources.

The prospect of global climate change presents significant new planning and management challenges for communities, resource managers, and water-resources organizations. The Groundwater Foundation is fortunate to have this key vantage point in the study of climate change, and we look forward to working with SAT partners to help shape an environmentally and economically viable response.

For more information, contact: Robert D. Kuzelka, Associate Professor; 103 Natural Resources Hall, University of Nebraska-Lincoln, Lincoln, NE 68583-0844; Phone: 402-472-7527; FAX: 402-472-3574; email: rkuzelka1.unl.edu.



Workshops on Climate and Water Resources in the Pacific Northwest

By Philip Mote, Climate Impacts Group, University of Washington

The Climate Impacts Group (CIG) at the University of Washington held two workshops on climate and water resources in the Pacific Northwest during October 1998. The purposes of the workshops were: (1) to present some research results of the CIG and (2) to obtain feedback from participants on the uses of climate information and seasonal forecasts and on the utility and possible future directions of CIG research.

Participants came from a variety of backgrounds. Representatives from several federal agencies, state agencies from Idaho, Oregon, and Washington, regional and tribal entities, and urban water supply and power interests attended the workshops. Participants also came from other universities and from the private sector, including farmers and a representative of a ski area.

The program covered climate variability and hydroclimatology of the Northwest, the long-range climate forecast for winter 1998-99, long-range streamflow forecasting, and a retrospective of the 1997-98 El Nino. Lunchtime talks described the National Assessment of climate change and the implications of climate change in the Northwest.

Selected participants presented operational perspectives on the use of climate forecasts. Some had used seasonal forecasts, but noted disadvantages and barriers. For example, managers of major reservoirs are constrained by many competing priorities that could, to some extent, be alleviated by better forecasts; yet current operating rules require drawing down the reservoirs at a predetermined rate until December 31, when the first streamflow forecasts are available. A representative of the ski industry likened her business to farming: very weather-dependent and reliant on a 5-month season to make all its income. Seasonal forecasts have a huge impact on public perceptions and, therefore, on the ski resort's budgeting.

Response from participants was enthusiastic. Several had never before heard of the Pacific Decadal Oscillation (PDO), a slow climate variation whose impacts on the Pacific Northwest rival those of El Nino. Some who use climate information in decisions were keen to include the PDO as well as El Nino. Doug Bloem, from the Portland Water Bureau (PWB), said that Portland has an unfiltered water system that is vulnerable to high streamflow events (which increase turbidity). If the PDO shifts to negative and such events become more common, PWB may have to spend \$250

million to meet clean water requirements (which are based on turbidity data that go back only to 1976, and hence are drawn entirely from a positive phase of the PDO). Hossain Parandvash, also from PWB, produces forecasts of water demand on time scales of years to decades, and was very interested in collaborating on climate change impacts.

In panel discussions, a recurring theme was the need for more specific seasonal forecasts. Another important theme that emerged was the potential value of being able to diagnose, in real time, a shift in the PDO. In short, PDO prediction could have benefits that rival (in dollar value) El Nino prediction for the Northwest. In summary, these workshops appear to have been very effective at communicating with stakeholders. This communication was clearly two-way: their comments are likely to influence our research, and our results are likely to influence some of their procedures and decisions.

For more information, contact: Philip Mote, Climate Impacts Group, University of Washington; P.O. Box 354235; Seattle, WA, 98195; phone: (206) 616-5346; email: phlip@atmos.washington.edu; or see the CIG web site at <http://tao.atmos.washington.edu/PNWimpacts>.

Q&A

Q: Why is it important to involve stakeholders in the National Assessment?

A: Stakeholder involvement is a critical part of the assessment process in order to: 1) ensure relevancy of the research effort; 2) promote understanding and willingness to apply new knowledge of climate change consequences; 3) build resiliency and enhance coping capabilities; and 4) support capacity building.

Q: What does it mean to have true stakeholder involvement?

A: Stakeholder involvement promotes relevancy and information exchange while building resiliency and capacity. It also encourages that the National Assessment process be grounded in dialogues at the regional/local level between regional experts and regional stakeholders, including: farmers, ranchers, local business people, local government leaders, local interest groups, and citizens at large. Relevancy is achieved because the on-going dialogue allows stakeholders to identify the most significant societal, environmental, and economic challenges facing state and local decision-makers and citizens at the regional scale. This dialogue then becomes "science in the service of society" when it begins to shape the research direction.

continued on next page

Calendar

National Assessment Sponsored Meetings:

Southern Great Plains Workshop on; Climate and Agriculture; Austin, Texas; TBD (Contact: Robert Harriss, harriss@tamu.edu)

Southern Great Plains Workshop on; The Importance of Natural Systems in Cities for Mitigation/Adaptation; Houston, Texas; TBD (Contact: Robert Harriss, harriss@tamu.edu)

Southern Great Plains Workshop on; Impacts of Climate Laredo; Texas; TBD (Contact: Robert Harriss, harriss@tamu.edu)

Alaska: Evening Public Forum with Wildlife Federation of Alaska; Anchorage, Alaska; March 4, 1999 (Contact: Patricia Anderson, patricia@gi.alaska.edu)

Central Great Plains: Meeting of All Stakeholder Groups; Loveland, CO; March 22-24, 1999 (Contact: Becky Techau, (970)491-1988)

Coastal Areas and Marine Resources Sector: Coastal/Marine Workshop; Rockville, Maryland; March 23, 1999 (Contact: John Field, John_Field/NOAA_COP@cop.noaa.gov)

New England: Meeting on Forestry; Durham, New Hampshire; March 30, 1999 (Contact: Clara Kustra, clara.kustra@unh.edu; and Barry Rock, barry.rock@unh.edu)

New England: Meeting on Water; Durham, New Hampshire; March 31, 1999 (Contact: Clara Kustra, clara.kustra@unh.edu; and Barry Rock, barry.rock@unh.edu)

New England: Meeting on Human Health; Durham, New Hampshire; April 8, 1999 (Contact: Clara Kustra, clara.kustra@unh.edu; and Barry Rock, barry.rock@unh.edu)

National Assessment Annual Workshop; Atlanta, Georgia;

April 12-15, 1999 (Contact: Melissa Taylor, mtaylor@usgcrp.gov)

Mid-Atlantic: Meeting of Advisory Committee; University Park, Pennsylvania; May 2-3, 1999 (Contact: Ann Fisher, fisherann@psu.edu)

Meeting of the National Assessment Synthesis Team; Washington, D.C.; June 7-8, 1999 (Contact: Melissa Taylor, mtaylor@usgcrp.gov)

Meeting of the National Assessment Synthesis Team; Washington, D.C.; July 8-11, 1999 (Contact: Melissa Taylor, mtaylor@usgcrp.gov)

Meeting of the National Assessment Synthesis Team; Woods Hole, Massachusetts; August 10-20, 1999 (Contact: Melissa Taylor, mtaylor@usgcrp.gov)

Teleconference on Telecommunications Technologies and Applications for Businesses; Fargo, North Dakota; May 4-6, 1999

AWRA: Potential Consequences of Climate Variability and Change to Water Resources of the United States; Atlanta, Georgia; May 10-12, 1999 (Contact: American Water Resources Association, (703)904-1225, awrahq@aol.com)(Contact: George Seielstad, gseielst@aero.und.edu)

Northern Great Plains: Series of Teacher Workshops; TBD; Spring 1999 (Contact: George Seielstad, gseielst@aero.und.edu)

Related Meetings:

Biodiversity and Climate Change: Conservation in the Face of Uncertainty; New York City, NY; April 30-May 1, 1999 (Contact: rapaport@amnh.org; www.research.amnh.org/biodiversity/)

American Geophysical Union: Special Session on Integrated Assessment of Climate Impacts; Boston, Massachusetts; May 31-June 4, 1999 (Contact: Phil Mote, philip@atmos.washington.edu)

Q&A contiued form previous page

The process of information exchange raises the level of awareness and understanding of climate change issues. However, there are many stages from the first level of awareness to the application of new information through action. By developing trust through an informative two-way exchange between and among stakeholders, scientists, and decision-makers, many of those necessary steps can be taken. Building resiliency includes encouraging stakeholders to consider opportunities around and vulnerabilities to possible impacts of climate change and increased variability. It also means engendering a level of understanding and trust that encourages the use of new and emerging information in the decision-making and management processes. And finally, when one considers the future and that human activities are the chief causes of many of the climate changes we already observe, we must empower individuals and society as a whole to make better, more environmentally friendly decisions. Capacity building is a natural outcome of involving a wide range of participants in an evolving assessment process. Participation of those not traditionally engaged encourages the development of analytical and process-oriented habits in decision-making.

Q: What mechanisms have been employed to encourage stakeholder involvement?

A: Stakeholder involvement in the regional and the sectoral activities is being encouraged in multiple ways (many of which are described in detail in this issue of Acclimations): team membership; interactive workshops to solicit inputs or generate dialog; knowledge transfers/two-way communications; and review of materials; These two-way communications are involving participants from and through: community programs; native organizations; government agencies (local, state, regional, tribal, federal); industry; educational institutions (formal and informal); the media (radio, TV, newspapers); electronic media (websites, email); publications (peer-reviewed, popular, newsletters); and trade organizations.

Outreach, continued from page 3

To support this effort, the Pacific Islands assessment will build on and leverage existing outreach and education efforts of participating institutions and programs. Recognizing the importance of addressing climate in the context of existing challenges

opportunities to participate in scheduled meetings of scientific organizations, sectoral associations, regional economic development and environmental organizations, resource management bodies, and interested public interest groups will be sought. For example, a small stakeholder workshop with coastal

managers was conducted as part of the 16th Annual Pacific Basin Coastal Zone Management Conference, which took place in Guam in late January 1999. Discussions are also underway regarding possible collaboration with the Pacific ENSO Applications Center, the South Pacific Geosciences Commission, and the South Pacific Regional Environment Programme in their efforts to address drought and water resource management issues.

Assessment News Bits

Scenarios:

Two new scenarios have been released by NCAR's Climate System Model of the 21st century: business as usual and stabilization at 550 ppmv CO₂. This GCM includes multiple greenhouse gases and an actual sulfate chemistry model.

Eustatic sea level data has been released for HADCM2 for the periods (2020-2040) - (1980-2000) and (2080-2099) - (1980-2000).

ENSO indices have been developed for CGCM1 and HADCM2.

David Legler and James O'Brien have calculated 4 sea surface temperature (SST)-based ENSO indices (JMA, Nino-1/2, Nino-3, and Nino-4) for our National Assessment.

NCAR released a report done for NIGEC: A Comparison of Simulations of Current Climate from Two Coupled AOGCMs Against Observations and Evaluation of their Future Climates.

NPAData Services has released another socioeconomic CD-ROM: Three Growth Projections (1967-2025) using the Economic Database.

Regions and Sectors:

A draft report on the water sector workshop is currently available; and a report of the agriculture workshop held in January will be available soon.

The Caribbean/S. Atlantic region released their workshop report.

Reports Received at NACO:

Caribbean/S. Atlantic Workshop Report

An Ecological Assessment of the United States Mid-Atlantic Region (EPA)

Condition of the Mid-Atlantic Estuaries (EPA)

Climate Research Special Issue "Regional Assessments of Climate Change and Policy Implications"

Water Resources Update:
"Global Change and Water Resources Management"
Water Sector Workshop Draft Report

Transportation and Global Climate Change (USDOT)

A Strategy for Assessing Potential Future Changes in Climate, Hydrology and Vegetation in the Western U.S. (USGS)

Climate Change Scenarios for the United Kingdom (UK Met Office)

A Comparison of Simulations of Current Climate from Two Coupled AOGCMs Against Observations and Evaluation of their Future Climates (NCAR)

The Pacific Islands assessment will therefore provide an exciting early opportunity to coordinate, focus and leverage the assets and expertise of diverse institutions and individuals throughout the region in the context of a new climate information partnership designed to:

- clarify the information needs of identified stakeholders;
- provide access to critical data sets and information products;
- translate/interpret research results into useful and usable information to address specific needs;
- improve access to information through the use of innovative communication and decision support tools; and
- provide expanded education and training opportunities to enhance the cadre of individuals in the Pacific Islands Region skilled in the development and use of climate information to support decision making; and
- identify critical information needs to guide future research.

Finally, the review process the Pacific Islands assessment report will provide an opportunity for input from interested individuals and institutions who might not have participated directly in the development of the assessment documents, thereby enhancing awareness and ownership of the assessment process. Broad dissemination of assessment reports and information products -- with mechanisms for user feedback and evaluation -- will help identify new issues and future assessment participants.

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Newsletter of the U.S. National Assessment of the Potential Consequences of Climate Variability and Change

The Newsletter of the U.S. National Assessment of the Potential Consequences of Climate Variability and Change is published by the U.S. Global Change Research Program, 400 Virginia Avenue, SW, Suite 750, Washington, DC 20024, and is available on the World Wide Web at <http://www.nacc.usgcrp.gov> or by writing to the above address. Articles, other submissions, and suggestions are welcomed, and should be sent to :

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