U. S. Climate Change Science Program
Climate Change Science Research Listening Session
Association of Metropolitan Water Agencies
2009 Water Policy Conference
April 22, 2009
Washington, DC

Background

In an effort to gain valuable input from water utility managers regarding the information, tools, and resources they need to successfully address the effects of climate change on water resources, the U.S. Climate Change Science Program convened a listening session on April 22, 2009 at the Association of Metropolitan Water Agencies' 2009 Water Policy Conference, held in Washington, DC.

The session was designed to include background information on climate change and CCSP's interagency efforts, including specific details on adaptation efforts and future hydrologic cycle research goals. The following individuals served as CCSP representatives:

- Peter Schultz, U.S. Climate Change Science Program
- Jared Entin, NASA (CCSP Global Water Cycle Interagency Working Group Co-Chair)
- Pat Jellison, USGS

The session brought together approximately thirty water utility managers (see Appendix A for participant list) and a two-way discussion ensued, focusing on the following questions:

1. What major climate-related challenges or questions are you facing in the provision and regulation of water resources?
2. How can climate change science and information needed to support your decisions and discussions be better provided?
3. Do you find scientific assessments related to climate change (e.g., IPCC reports, CCSP synthesis and assessment products) useful in helping you make informed decisions?
4. What do you feel are the roles and responsibilities of the federal government in addressing climate change?

The following report summarizes some key comments the panel received.

CCSP resources highlighted during this session include the following:

- SAP 3.3: Weather and Climate Extremes in a Changing Climate
  http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm
- SAP 4.3: The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the U.S.
  http://www.climatescience.gov/Library/sap/sap4-3/final-report/default.htm
- SAP 5.3: Decision Support Experiments and Evaluations Using Seasonal to Interannual Forecasts and Observational Data
  http://www.climatescience.gov/Library/sap/sap5-3/final-report/

Copies of this summary report and presentation slides from the session, as well as other CCSP listening sessions may be accessed at:
http://www.climatescience.gov/Library/stratoptions/all-sessions.php

Summary of Comments from CCSP Listening Session

General Comments

Several key themes, whether challenges or research needs, were repeatedly highlighted during the session. The following list highlights these important themes, which are discussed in further detail and context in the sections that follow.

- Decision support is critically needed to help in justifying the need for business-related decision making, such as allocating billions in limited resources to design and maintain water systems and related infrastructure that will withstand future consequences of a changing climate.
- Data should be downscaled, preferably to watershed levels. Data quality is important and should focus on extreme outliers, rather than the mean. In certain cases, ranges are more useful for planning purposes rather than precision points.
- There is a need for better interpretation of data (e.g., precipitation and temperature) and what changes may mean for water resources, water utility systems, and related infrastructure.
- Scenarios, preferably regional-based, may be useful in prioritizing issues that need to be addressed.
- A holistic approach is needed to account for multiple stressors threatening future water resources and there is a broader audience of stakeholders who may be impacted.
- The need for coordination of climate change science across the government is important.

The listening session was organized around the four major questions below. The comments below are organized best address each of the questions, although overlap may be inevitable.

1. ***What major climate-related challenges or questions are you facing in the provision and regulation of water resources?***

Temperature and Precipitation Data, Including Extreme or Episodic Events:

Changing precipitation patterns, (either for drier or wetter) as well as changes in temperature are already impacting the nation's water resources. Some impacts are becoming too large to deal with for local water systems (i.e., droughts followed by extreme precipitation events). The future effects on water utility systems and related infrastructure from such changes to temperature and precipitation are not well understood.

Infrastructure Investment Decisions:

Business decisions must be made regarding the investment of billions of dollars into designing new or maintaining existing water utility systems and related infrastructure. Such infrastructure planning requires an outlook for 20 -30 years in advance or more, which requires understanding of the future potential direct and indirect threats and negative consequences to such systems related to climate change. Currently, systems are designed to withstand events typical of the 20th century drought and flood, but we're beginning to experience events outside of the 20th century levels.

We've reached a tipping point, with the current political and economic climates increases challenges with getting funding to support current infrastructure maintenance, let alone investments for building new systems for the future.

Additional Research and Data Needs:

More data of higher quality is needed if decisions are to be made based on science and data. The quality of the data may also be questionable due to how end users manipulate original data and

information, for example, in terms of models we are given and we're told not to downscale, but people will because they need information at that level.

In addition, rather than focusing on the mean or certain data points, extreme outliers and ranges are more useful for overall planning and decision making for water resources.

Additional data needs identified include:

- Streamflow
  How will water quality change with changes in precipitation and streamflow? Currently, historical data is used for planning purposes. Several water utilities are focused on trying to expand what is already available with other forms of data (e.g., tree ring data, precipitation data) and translate that back to streamflow information. USGS and NOAA streamflow data and networks are useful, but the continuous threat of funding cuts is frustrating for water utilities. The usefulness and accessibility through the web are some of the most positive features.
- Snowpack
  More accurate snowpack data is needed for proper assessment in an annual cycle, which will improve planning for water use throughout the year. Snowpack is important to track, but the measurements from the end of the accumulation season are most important, not the average. NRCS data is used, and simulations from NOAA are not adequate enough to help with business decisions that need to be made for water use throughout the season.
- Ground Water Recharge
  How will changes in temperature and precipitation affect groundwater recharge?
- Saltwater Intrusion
  What will the effects of saltwater intrusion mean for water utility systems and water treatment needs, water availability, ecosystems, human health, etc.?
- Tidal Fluctuations and Sea Level Rise
  How will tidal fluctuations and sea level rise impact water utility systems and related infrastructure in coastal zones?
- Storm Surges
  What effects will storm surges have on water utility systems and related infrastructure?

Future Trends:
As water availability continues to decreases in some regions, water rights will become an increasingly important and controversial issue, especially regarding allocation of water for various uses.

As water availability declines in some regions, it will become necessary to use lower quality water in the future. This will result in the need for more energy intensive treatment options and better understanding of what the water will need to be treated for (e.g., arsenic, brackish water, etc.). How do we address the possible health effects that may be associated with future water quality?

2. How can climate change science and information needed to support your decisions and discussions be better provided?

Holistic Approach:
An interdisciplinary, holistic approach is needed to address this issue. There are many linkages that need to be made, such as those between types of water use and legislation or regulation related to water quality and quantity (e.g., Clean Water Act, Endangered Species Act). A better understanding of the multiple stresses on water resources and water utility systems is needed. A better understanding of what is driving the change in future water availability and quality is also needed, and may include

climate change; others (i.e., population growth, increasing demand, etc.) will also need to be taken into consideration as we strive for more sustainable use of water resources.

Downscaled Data and Information:
Downscaled data to the watershed level would be most useful for decision making that is needed at the local level. Localized sets of scenarios, including monitoring over time would be most useful in helping to prioritize risks. Currently, scientists often look at the means and over worldwide or large regional areas rather than ranges or extremes at the watershed or local level.
When it comes to business related decision making and future investments, downscale information to state levels with language for those that are interested in economic issues, such as elected officials, is extremely valuable.

Communication and Outreach:
Communication with small utility systems (the majority of systems) is just as important as communication with large, metropolitan ones. Most utility systems are regulated by the states. Therefore, federal relations with individual utilities are typically far removed. In order to overcome that, communication must be with state regulators and state officials, which also need to be encouraged to move down to the local level.

Condensed, key information presented in bullet points and simple figures is typically most useful. The ideal way to present information depends on the task at hand. For example, we often have to "sell" the need for infrastructure investments to those funding or designing the systems. In this case, condensing down to key messages is most effective (i.e., 27 words/9 seconds/3 messages – risk communication guidelines).

The effectiveness of outreach efforts made by the Program could be increased by implementing alternative methods, such as presentations at standing meetings or conferences, webinars or other web-based technologies, and materials that summarize the key take home messages from reports or other large documents.

Decision Support:
Increased decision support tools and processes are needed, whether focused on infrastructure planning, investment, and design, or how to manage fluctuating water resources resulting from a changing climate. Due to the current economic and political climates, decision support can also serve to help prioritize what issues need to be dealt with and when.

Models:
Currently, a multiple model approach is used in the scientific community, where the trend is to look at whole spectrum of models rather than create a ranking that prioritizes models by "goodness". This creates problems for utilities and decision makers looking to invest billions of dollars in future infrastructure or working with elected officials – one single model is preferred to help sell the need for funding and make other decisions at the local level.

3. Do you find scientific assessments related to climate change (e.g., IPCC reports, CCSP synthesis and assessment products) useful in helping you make informed decisions?

The IPCC assessment reports, CCSP reports, and other assessments may have succeeded in helping to settle the question of climate change importance and pushing to make climate change a factor to

consider in the decision making process, but the degree of uncertainty with climate change related risks and timing still makes decision making regarding investments difficult.

The Synthesis and Assessment Products and other reports coming out of CCSP may be more useful to those stakeholders within the beltway, rather than outside. Stakeholders outside the beltway need key points extracted and presented in more user friendly manners, i.e., brochures, etc.

While assessments giving way to regional information are certainly needed, we also must recognize that climate change impacts on water resources is a national problem, and we will lose ground if we focus only on certain areas (e.g., Colorado River Basin).

In regards to outputs from IPCC assessment reports, during the last report, information on sea level rise was sufficient and additional predictions and refinements that will hopefully be made for the next assessment report will make a significant difference for those along the coasts.

Another suggested improvement that would be useful is to present clear overlays (e.g., land use, demography, ecology, watersheds, etc.).

4. What do you feel are the roles and responsibilities of the federal government in addressing climate change

Federal Coordination:
A coordinating body for all federal agencies involved with climate change research is important to ensure that all different groups are brought together in harmony. There is still a need for resolving conflicts among scientists at the federal level, and clarifying scientific disagreements vs. policy and implementation disagreements.

The ways in which climate change science is being reflected through federal agency programs and projects may help to trickle down the pipe to the regional, state, and local level and thereby increase trust and confidence in federal science among stakeholders and end users.

In addition, we need to be looking holistically at the broader audience of who may be sensitive to the various consequences of climate change. Many sectors and representatives need to be involved in order for our efforts to be effective.

Education and Public Awareness:
Public discourse regarding climate change still remains. There is a need for increased education and awareness of the issues, especially regarding mitigation and adaptation. Despite all of the ongoing efforts to "fix" climate change, we will inevitably still need to adapt. We need to clearly, and honestly communicate this.

Provision of Data, Monitoring, etc.:
We need to continue to fund *at least* the efforts are currently underway in climate change science. Additional funding to fill research gaps is also critical. However, it is essential that the end users are able to provide input to their research needs prior to the research being done.

Data is needed on water use. USGS reports should be presented in a more regionalized fashion. Certain demands for water resources may result in big difference for future availability in some regions. For

example, power generation is one of the largest demands on water resources, and may cause big problems when water becomes scarcer and there is competition for limited resources.

A push is needed to move forward with new data sets for the future so we don't have to rely so heavily on historical data sets.

Guidance:
There is lack of guidance for state and local level adaptation plans. In particular, certain stakeholders are sometimes not involved with the development of such plans, such as water utility providers.

Someone needs to re-look at "probable" events and the definitions that are currently used for such events. The current definitions may no longer be relevant (e.g., 100 year flood).

Stationarity is dead with all of the changes already taking place. Regulatory planning and legislation needs to catch up. The impacts of the endangered species act on water utilities need to be addressed even further. How will implementation change with naturally occurring phenomena? A specific example was given with the Salmon of the Pacific Northwest. Salmon serve as a symbol of the region, but it is also a bull's-eye species with high risk from negative impacts related to climate change.

Appendix A.
CCSP Listening Session Participant List
AMWA Water Policy Conference
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Erica Brown
Director, Regulatory Affairs
Association of Metropolitan Water Agencies (AMWA)
brown@amwa.net

Emily Cloyd
U.S. Climate Change Science Program
ecloyd@usgcrp.gov

Biff Corning
RedOak Consulting
bcorning@pirnie.com

Greg Diloreto
General Manager
Tualatin Valley Water District
greg@tvwd.org

Jared Entin
NASA
jentin@hq.nasa.gov

Michael Finn, P.E.
Environmental Engineer
EPA
Finn.Michael@epa.gov

Josh Foster
Climate Adaptation Manager
Center for Clean Air Policy
jfoster@ccap.org

Harold Glaser
Director of Business Development
Kennedy/Jenks Consultants
Haroldglaser@kennedyjenks.com

Suzanne Goss
Government Relations
JEA
gossSE@jea.com

Dominic (Dan) J. Hanket
Assistant Director, Regulatory Compliance
Department of Public Utilities
City of Columbus
djhanket@columbus.gov

Kevin Hanway
Water Director
City of Hillsboro, OR
kevinha@ci.hillsboro.or.us

Ed Harrington
General Manager
San Francisco Public Utilities
eharrington@sfwater.org

Todd Heidgerken
Manager
Tualatin Valley Water District (OR)
todd@tvwd.org

Richard Holmes
Director of Environmental Resources
Southern Nevada Water Authority
Richard.holmes@snwa.com

Robert J. Hunter
Commissioner
Atlanta Dept. of Watershed Management
rhunter@atlantaga.gov

Patricia Jellison
USGS
pjellison@usgs.gov

Dale Jutila
Client Service Manager
CH2M HILL
Dale.jutila@comcast.net

John Kirner
Water Superintendent
Tacoma Water
jkirner@cityoftacoma.org

Francis T. Kung'u Ph.D
Director
DeKalb County Watershed
lphylton@co.dekalb.ga.us

Tanya Maslak
U.S. Climate Change Science Program
tmaslak@usgcrp.gov

Deirdre Mason
Project Coordinator
Association of State Drinking Water Administrators
damson@asdwa.org

Dean Moss
General Manager
Beaufort-Jasper Water and Sewer Authority
deanm@bjwsa.org

Linda McCrea
Deputy Water Superintendent
Tacoma Water
lmmcrea@cityoftacoma.org

David McNeil
Environmental Services
City of Tempe, AZ
David_mcneil@tempe.gov

Rosemary Menard
Director
Washoe County Water Resources (NV)
rmenard@washoecounty.us

Ronald Miller
General Manager
Portland Water District (ME)
rmiller@pwd.org

Charles Murray
General Manager
Fairfax Water
cmurray@fairfaxwater.org

Carolyn Peterson
Director, Communication
AMWA
Peterson@amwa.net

Mark Premo
General Manager
Anchorage Water & Wastewater
mark.premo@awwu.biz

Brian L. Ramaley
Director
Newport News Waterworks
bramaley@nngov.com

Dave Rager
Director
Greater Cincinnati Water Works
David.rager@gcww.cincinnati-oh.gov

Toni Reardon
Project Manager
Tampa Bay Water
cvecellio@tampabaywater.org

Robert Renner
Executive Director
Water Research Foundation
rrenner@waterresearchfoundation.org

Alan Roberson
Dir. of Security and Regulatory Affairs
American Water Works Association (AWWA)
aroberson@awwa.org

Peter Schultz
Office Director
U.S. Climate Change Science Program
pschultz@usgcrp.gov

Cheryll Stewart
Special Projects Manager
San Diego County Water Authority

Diane VanDe Hei
Executive Director
AMWA
vandehei@amwa.net

Doug Yoder
Deputy Director
Miami-Dade Water and Sewer
yoderd@miamidade.go