

# **“Public Water Supply Utilities Climate Impacts Working Group”**

## **WORKSHOP REPORT**

### **Workshop Six**

**Thursday, May 10, 2012**

**8:30 – 4:00pm**

**Prepared by  
Lisette Staal, Research Coordinator  
UF Water Institute**

**Hosted by  
Orlando Utilities Commission in Orlando, Florida**

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## **WORKSHOP Six– “Public Water Supply Utilities Climate Impacts Working Group”**

**Thursday, May 10, 2012, 8:30 – 4:00 pm, Orlando Florida**

### **Background:**

The Public Water Supply Utilities Climate Impacts Working Group (PWSU-CIWG) is bringing together interested stakeholders from public water supply utilities, local governments, water management districts and academic institutions in Florida focused on increasing the relevance and usability of climate change and variability data and tools to the specific needs of public water supply utilities. The partners are interested in understanding and addressing how climate variability/change and sea level rise may impact planning and operations of Florida’s public water supply utilities. Initiated by the UF Water Institute, in partnership with the Southeast Climate Consortium (SECC), Florida Climate Institute and the UF IFAS Center for Public Issues Education in partnership with six major public water supply utilities and three water management districts, participation continues to grow. Detailed information on the “PWSU-CIWG” is available at the UF Water Institute website [http://waterinstitute.ufl.edu/workshops\\_panels/PWSU-CIWG.html](http://waterinstitute.ufl.edu/workshops_panels/PWSU-CIWG.html).

This is a report of the sixth workshop ([all workshop reports are available on line](#)). Twenty-five people participated in this workshop, once again adding organizations that had not been represented previously (*see Appendix 1 for workshop participant list*).

### **Workshop Goal and Specific Objectives:**

The goal of the each of the workshops is to create spaces for discussion, sharing and capturing knowledge from the multiple perspectives and contexts of tool providers, users, and ultimately policy makers that will contribute to increased relevance and usability of climate and sea level rise data and tools for water managers in Florida.

The specific objectives of this workshop were to:

1. Recognize the conceptual framework guiding the PWSU-CIWG and where we are in the four phases.
2. Gain a greater understanding of the “User Perspective” and learn about operations and planning processes, challenges and opportunities for using climate information from several utilities.
3. Participate in discussions drawing on the “user perspective” and the “planning process” to a) inform the technical approaches being implemented by NOAA project task groups b) identify additional research gaps; and 3) suggest proposal/funding opportunities.
4. Move forward on Knowledge Management System development for the Working Group.
5. Determine next steps.

## Outcomes:

Participants noted several “take home messages” from the workshop regarding the “user perspective” and their organizational contexts. Some participants noted that since all utilities are different, and the role of climate information varied among utility companies, multiple sources are critical to maximize flexibility and potential use of climate information. Seeing that the planning/decision making is incredibly complex, those processes must be better understood to be able to see how climate information can be integrated, and how climate forecast models can be designed to help utilities. As the working group makes progress in technical areas, how to incorporate climate information in planning and how to communicate continue to top the concerns of the working group.

The following list includes specific workshop outcomes/actions

1. Knowledge Management System – Shared results of the needs assessment and formed a subcommittee to move forward on the Knowledge Management System. Volunteers included Jayantha Obeysekera and Alison Adams. Others who would like to participate in this discussion were encouraged to connect directly with Tracy Irani ([Irani@ufl.edu](mailto:Irani@ufl.edu)). Tracy will convene a meeting of interested people for the subcommittee in August.
2. Technical Teams of the NOAA CSI Project- Have moved forward with their research activities and will provide updates and results at the next workshop. (Technical Teams and leads include: Seasonal Scale Forecasts- Vasu Misra; Long-term Climate Scenarios- Wendy Graham; Sea Level Rise -Keith Ingram)
3. Research Agenda – Asefa Tirusew continues to lead the effort to build the utilities research agenda. The group noted a need, and agreed to augment the [draft utility research agenda](#) to address social issues. Jessica Bolson volunteered to lead subgroup to explore potential social science research projects and explore potential funding sources for utility relevant research. Volunteers for updating the social science perspective included Chris Martinez, Jayantha Obeysekera, Louis Murray, and Wendylin Bartels.
4. Information/Communication – The group expressed a desire to obtain additional information that would contribute to an understanding of the various climate organizations in the State and how their efforts are related to climate impacts and public water supply issues. Some topics and key contacts were suggested for consideration in upcoming activities and workshops. Potential contacts included: Julie Dennis, Florida DEO (Jayantha Obeysekera will contact). Dr. Ann B. Shortelle, FDEP Water Policy Director. (Wendy Graham will

connect). Invite Insurance companies to talk about Risk Management related to climate change.

5. Workshop Planning – Agreed to schedule the next PWSU-CIWG workshop for some time in September or October. A volunteer planning team (Nancy Gallinaro, Nicole Hammer, Keith Morris, Tirusew Asefa, Keith Ingram and Scott Laidlaw) will help with the planning. Some ideas suggested for the next workshop included – 1) continue to focus on unfolding the specific needs and potential uses for climate information by utilities and planners ; 2) report NOAA-CSI project progress and developments; 3) learn about recent National Climate Assessment 4) hear from guest speaker (s) as appropriate.

**Detailed Summary of Workshop 6:** *See APPENDIX 2 for the detailed agenda.*

### **Session 1 – Context and Background**

Welcome and interactive introductions - - Lisette Staal, the workshop facilitator, opened the workshop with brief welcome and moved directly into an interactive introduction exercise. The activity focused on helping participants understand a “user perspective” and to recognize the range of roles individuals play, and interact with, in and outside of the working group. Participants were asked to form 4 groups with people they knew least or have not had the opportunity to interact with much. They were asked to introduce themselves to each other, and then together, talk about, and draw together on a flipchart a picture with a range of actors ( users, practitioners, stakeholders, researchers, scientists, engineers, policy makers, others ) engaging in a situation related to climate change information. Each person in the group was asked to contribute to the drawing.



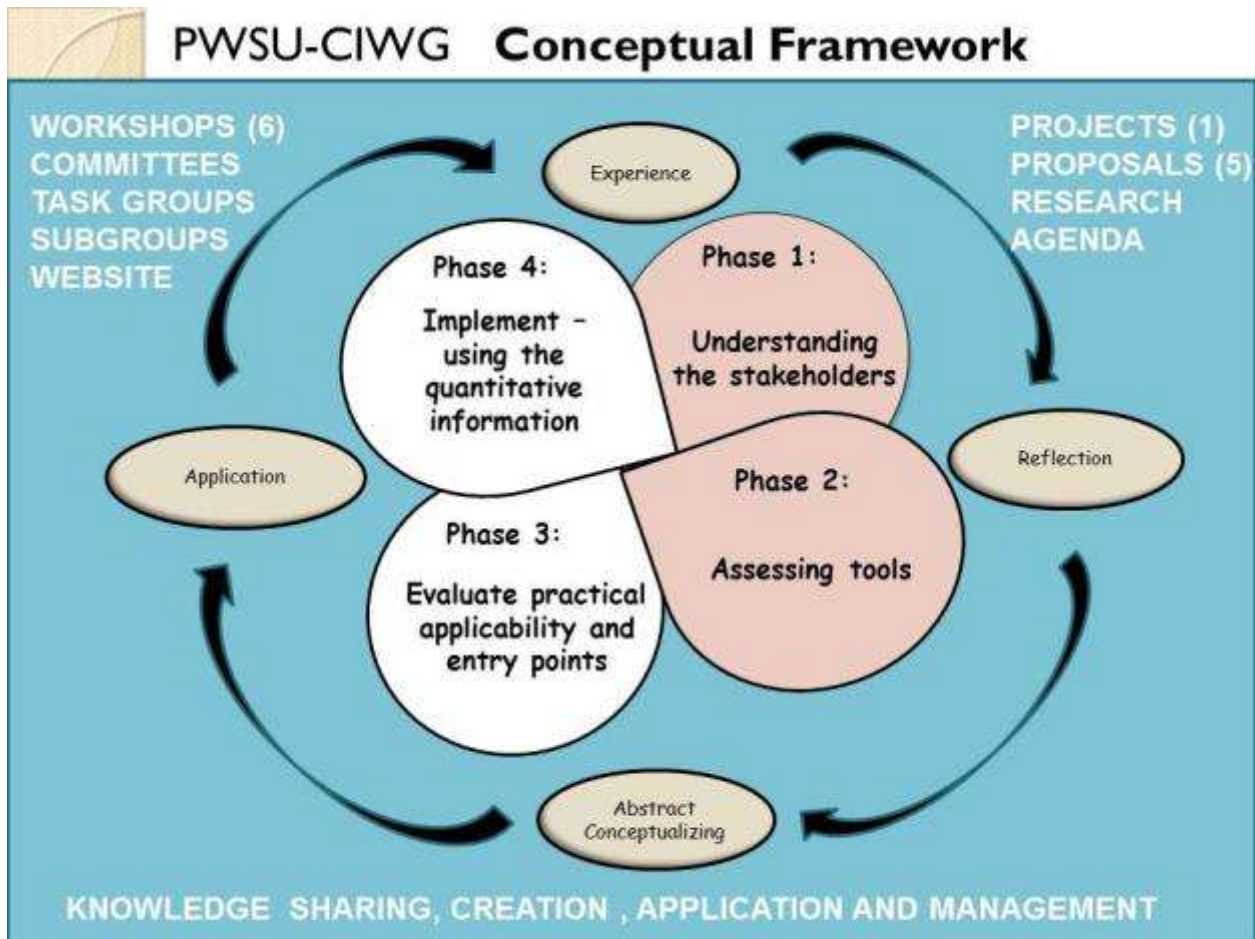
A representative from each group introduced their team members and shared their group's drawing and how it came together with the rest of the participants. The drawings and approaches to compiling the drawing varied ranging from depicting a group meeting around a table, to images of weather events and impacts, as well as natural and management/regulatory processes. The discussion focused on similarities across the drawings and what things people noticed as common themes.

Most groups' drawings and discussions referred to uncertainties, questions of the usefulness and 'rightness' of models and data, and usability of the information. Some key points made during the discussion included that there is an urgent need for information for both short and long term planning, and that the types of information needed and access to information varies by the situation as well as user. Also, when considering the 'user perspective' it is important to realize that not everyone is only one type of user at a time, but may have multiple roles and therefore needs and interests.



**PWSU-CIWG – Conceptual Framework.** Lisette briefly reviewed the conceptual framework that is guiding the working group process (see figure 1.). She emphasized the iterative nature and shared learning focus on developing relevant climate information, pointing out that the group is currently in both phase one and phase two of the framework. Moving

forward to phase three and four will require greater understanding of and attention to of the User Contexts (See [presentation](#)).



**Figure 1.**

### **Session 2 - Using Climate Information - understanding users and their contexts**



Presentations during this session were designed to help the participants better understand the climate information user perspective and included results of a research survey on water resource managers, master and integrated planning needs, as well as operational planning. Each presenter shared their organizational context and how they currently work with, or have a need for, climate information. Participants were asked to listen to

each presentation focusing on specific issues of relevance to the working group? *See listening guidelines (see Appendix 3)* encouraged participants to note the planning requirements, timeframes and documents that each organization used related to planning initiatives and consider the following questions. When and why would “the anticipated users” be interested in climate science? What are their key risks and vulnerabilities related to climate? When/what are their key decision points? When/where are opportunities for science to inform their process-decisions? When/where are barriers for science to inform their process-decisions?

a. Presentations – Overview of Climate Information Users and Climate Adaptation Planning

[Jessica Bolson](#) and Chris Martinez, University of Florida - [Use, needs, and views on climate information of water managers in Southeastern U.S.](#),

- [Barbara Powell](#), Water Resources Manager, Broward County Environmental Protection and Growth Management Department [Water Resources and Climate Adaptation Planning](#)



b. Presentations - Master and integrated planning in specific Utilities and how science can help.

- [Bertha Goldenberg](#)- Bertha M. Goldenberg, P.E., Assistant Director, Miami-Dade Water and Sewer Department, (20 Minutes)

- [Barbara Powell](#), Water Resources Manager, Broward County Environmental Protection and Growth Management Department (20 minutes)

- [Nancy Gallinaro](#)- Director, Strategic Planning, Palm Beach County, Water Utilities Department (20 minutes)



c. Presentations - Operational planning issues and how climate science can help

- [Alison Adams](#), Source Rotation and Environmental Protection Manager, Tampa Bay Water (10 minutes)

- [Kevin Morris](#), Science and Technology Officer, Peace River Manasota Regional Water Supply Authority (10 minutes)





Participants asked questions both during and after each individual presentation for both clarification and supplementing information, and engaged in an overall discussion focused on all of the presentation. Some key points made by the participants included:

- There is a lack of connection between planners and utilities - they come at things in different ways and measure things differently.
- A challenge on how to communicate information to the stakeholder – understanding risks and vulnerabilities... how can data contribute to the dialogue?
- Water Management District representatives added that they do not use forecast information rather, they use water levels. They would need information to be able to optimize water supply.
- How can we connect the climate information into the process of the particular organization? Time frames matter. Can the information be tailored to the timing of operations? We need to be clearer on understanding the use of the terms “Forecast” vs. “Outlook”
- Another major question highlighted risks and uncertainty. How do you incorporate uncertainties in general? What are the risks of “NOT USING INFORMATION” compared to “USING WRONG INFORMATION”?

### Session 3 - Linking Climate Science to User Perspective

The individual responses to the active listening sheet that were filled out during the presentations were compiled on flipcharts. Flipcharts (*see Appendix 4*) were posted during lunch and Session 3 began with a large group discussion reflecting on the responses to the active listening activity. Key issues that resonated across users potentially impacting the use of climate science and tools included:

- Communication
- Regulations
- Costs (willingness to pay)
- Political process, positions
- Uncertainty of information and risk of using something new versus using old
- Confidence in the science
- Geographical/contextual difference – quite pronounced.



The afternoon discussion focused on bringing together what we know from users and what that means to our actions as individuals (researchers/scientists/ engineers/ climate information users? planners? policy makers) and as a working group in order to: a) inform the technical approaches being implemented by NOAA project task groups, and b) identify additional research gaps and suggest additional research ideas, proposals/funding opportunities. (*Originally planned as small group activity, the group decided it would be best to engage in large group discussion*)

**a) NOAA Project Technical Roadmaps.** Do the current technical roadmaps for the NOAA Project fit the utility planning and operation contexts and needs? **WHAT WOULD YOU CHANGE OR DO DIFFERENTLY?** The lead of each of the task groups presented a brief reminder of the “roadmaps” outlined for each of the technical areas (*see Appendix 5*).

The general consensus of the group was that most of what the technical groups have planned and that is currently articulated in the roadmaps would not need to be changed at this point. Each of the groups has made outreach to the group, and as the work moves forward, a key consideration of the end user will remain a central concern. In particular, Wendy Graham reiterated that she has connected with several Utilities to ask for their perspective on what they would define as:

1. Hydrologically significant extreme rainfall events (durations and frequencies of rainfall events (both high and low) that are of interest to you)
2. How your agency would define a flood or drought from a water supply perspective (i.e. characteristics of rainfall, groundwater levels, streamflow, soil moisture that might cause you to declare a drought or operate differently)
3. Are there other rainfall, temperature or ET statistics you would be interested in analyzing predictions for.

**b) The PWSU-CIWG Research Agenda.** Does the current Research Agenda reflect the utility planning and operation contexts and needs? **WHAT ARE THE RESEARCH GAPS?** The research agenda was initiated by a task group following the second workshop was briefly described by Tirusew Asefa, who is leading this effort. Copies of current research agenda was provided (*See appendix 6*) or [click here](#).

During the discussion it was noted that the current research agenda does not include research topics from the social perspective. Several potential research topics were suggested:

- Carry out comparative studies, looking at situations, actions and issues.
- How to understand, and take into consideration the quick turnover in ‘players’ amongst the utilities, planners and other potential users of climate information. This will require a way to address continuity. One way is to have (develop) “champions” in order to better deal with longer term issues.
- How to make things actionable

- Understanding longer and short term impacts
- Useful to understand other how other states or regions are addressing these issues (for example ACF) and ways of having impact on Policy and Federal implications.
- Better understand the policy, media, and public interaction
- What kind of scenario planning would help a planner make decisions?
- Help focus on actionable research--- focusing on applied issues of relevance to users.
- Interest in better understanding how to communicate information and to impact practices... Water conservation model can provide insights to this process

**Session 4: Knowledge Management System Development** - Tracy Irani and Deidra Slough shared results of the needs assessment for a knowledge management system being developed as part of the NOAA project ([see presentation](#)). A volunteer subcommittee was formed to move forward on the Knowledge Management System and Tracy Irani will follow up with them directly. Volunteers included Jayantha Obeysekera and Alison Adams. Others were encouraged to connect directly with Tracy if they are interested in volunteering.

#### **Session 5: Reflection, Next Steps, and Evaluation**

**Reflection:** In an open plenary discussion, Lisette briefly reminded the group of the four phase conceptual framework guiding our process --Phase 1) understanding the context/situation; phase 2) assessing tools; phase 3) evaluating practical applicability; and phase 4) using the quantitative climate information in actual planning and decision making processes (see figure1.). She asked participants to connect with t the person next to you and tell them one thing that you discovered today, and one thing you think we need to do next.

The participants were asked to indicate what they believed the next steps should be for the group to continue moving forward. Comments were noted on the flipchart and included the following:



#### **Next steps:**

- Knowledge Management System (KMS) - Tracy Irani will convene the volunteer subcommittee for moving forward on the Knowledge Management System. Volunteers included Jayantha Obeysekera and Alison Adams. If there are others who would like to participate in this discussion please connect directly with Tracy Irani ([Irani@ufl.edu](mailto:Irani@ufl.edu)). The subcommittee will connect by email to contribute to the next steps in designing the KMS to get a system up soon. **Action: Tracy Irani with convene the group.**

- Technical teams NOAA PROJECT -will continue moving forward with their research activities and will provide updates and results next workshop. (Seasonal Scale Forecasts- Vasu Misra; Long-term Climate Scenarios- Wendy Graham; Sea Level Rise -Keith Ingram) **Action: Technical leads will continue on the roadmap**
- PWSU-CIWG research agenda - Focus on incorporating Social Science issues to the Utility Research Agenda. A subgroup volunteered (Jessica Bolson-lead, Chris Martinez, Jayantha Obeysekera, Louis Murray, and Wendylin Bartels to explore potential social science research projects and directions for the PWSU-CIWG, and to brainstorm ideas for research and for potential funding sources for utility relevant research. **Action: Jessica Bolson will convene the group.**
- Information/Communication – The group expressed a desire for additional information that would contribute to an understanding of the various climate organizations in the State and how their efforts are related to climate impacts and public water supply issues. Some suggested topics included:
  - a) Understanding of the various climate organizations across the state and how they might link to the group’s mission. Interest in knowing if a comprehensive collection of climate information networks exists. Suggested inviting someone from Florida DEO that could be help provide a broader perspective. – Julie Dennis, Florida DEO could address issues of water sustainability and resilience. Action: **Jayantha Obeysekera will connect.**
  - b) Gain an understanding on where the state regulatory community is heading regarding water policy and climate. Suggested to invite Dr. Ann B. Shortelle, FDEP Water Policy Director. **Action: Wendy Graham will connect.**
  - c) Invite Insurance companies to talk about Risk Management related to climate change.
- Workshop #7 - Schedule the next PWSU-CIWG workshop for some time in September or October. Lisette Staal, UF, will work with the volunteer planning team (Nancy Gallinaro, Nicole Hammer, Keith Morris, Tirusew Asefa, and Scott Laidlaw) to develop an agenda addressing the groups’ interests. **Action: Lisette Staal will follow-up with the planning team** (please let me know ([lstaal@ufl.edu](mailto:lstaal@ufl.edu)) if you are interested in joining the planning discussions) on ideas suggested that could be part of the next workshop including –
  - a. Invite (Jim Jones or Jayantha Obeysekera) to talk about National Climate Assessment report

- b. NOAA project progress and developments - research results and next steps, and knowledge management system
- c. Invite a guest speaker to
  - 1. Share information on the various climate organizations across the state and how they might link to the PWSU-CIWG mission. Suggested inviting Julie Dennis, or someone from someone from Florida Department of Economic Opportunity (DEO) that could be help provide a broader perspective. *Jayantha Obeysekera, SFWMD will help with this.*
  - 2. Provide perspective of the State regulatory community and the new environment for climate issues in water policy. Suggested inviting Ann Shortell (*Wendy Graham will help with this*)
- d. Continue to focus on unfolding the NEED FOR CLIMATE INFORMATION by utilities and planners. Although more clear as to how models are and can be used in OPERATIONS- we still need to address the gap in understanding of opportunities for climate scenarios and prediction models for PLANNING. We should explore ways to do this. One way would be learning from those that have done it successfully (invite speakers for engaging in discussion, i.e., invite someone from the Southeast Climate Compact. Another might be proposing projects for funding that will help build our experience, i.e.; consider how to get climate change into a master plan; explore how planners might use scenarios? Probabilistic forecasts?
- e. How to exploit funding opportunities to advance our interests?

## Evaluation

As in each workshop, a feedback form was distributed and input requested from the participants. Overall satisfaction was slightly lower than previous workshops with a totals ranging from 3.76 to 4.0 in all categories on a scale of 1.0 – 5.0 with 5.0 being the highest. Looking by different groups, there was a wide variation. The overall average score by those identified as **Utility was 4.9, Government was 4.2, Water Management District 3.9, and University 3.8.** The highest average score for each group (4.0) was for Participation and Involvement. A brief summary of exit feedback survey responses appears in Appendix 7.

Lisette Staal thanked the participants for their contributions and OUC for hosting the workshop.

## APPENDIX 1 – List of Participants

Last name	First name	Organization
<b>Adams</b>	Alison	Tampa Bay Water
<b>Asefa</b>	Tirusew	Tampa Bay Water
<b>Bartels</b>	Wendylin	University of Florida/Florida Climate Institute/ Southeast Climate Consortium
<b>Bastola</b>	Satish	FSU
<b>Bolson</b>	Jessica	Miami University
<b>Cera</b>	Tim	Saint Johns River Water Management District
<b>Gallinaro</b>	Nancy	Palm Beach County Water Utilities
<b>Goldenberg</b>	Bertha	Miami-Dade Water and Sewer Department (WASD)
<b>Graham</b>	Wendy	University of Florida Water Institute
<b>Hernandez Hammer</b>	Nicole	Florida Atlantic University
<b>Hwang</b>	Syewoon	University of Florida
<b>Ingram</b>	Keith	University of Florida/Florida Climate Institute/ Southeast Climate Consortium
<b>Irani</b>	Tracy	University of Florida Center for Public Issues Education
<b>Laidlaw</b>	Scott	Saint Johns River Water Management District
<b>Martinez</b>	Christopher	University of Florida/Florida Climate Institute/ Southeast Climate Consortium
<b>Misra</b>	Vasu	Florida State University/Florida Climate Institute/ Southeast Climate Consortium
<b>Morris</b>	Kevin	<a href="#">Peace River Manasota Regional Water Supply Authority</a>
<b>Murray</b>	Louis	USGS-Florida Integrated Science Center
<b>Nag</b>	Bappaditya	FSU- COAPS
<b>Obeysekera</b>	Jayantha	South Florida Water Management District
<b>Powell</b>	Barbara	Broward County Environmental Protection and Growth Management Department, Natural Resources Planning and Management Division
<b>Schneider</b>	Natalie	Administrator, Intergovernmental Coordination
<b>Slough</b>	Deidra	University of Florida
<b>Staal</b>	Lisette	University of Florida Water Institute
<b>Teegarden</b>	Robert	Orlando Utilities Commission

## APPENDIX 2 – Agenda



### **“Public Water Supply Utilities Climate Impacts Working Group” WORKSHOP 6 –Agenda**

**Thursday, May 10, 2012 8:30 – 4:00pm**

Orlando Utilities Commission (OUC), Safety & Training Conference Room  
at the Gardenia Avenue office, 3800 Gardenia Avenue, Orlando, FL

**Objectives:** By the end of the workshop participants will:

1. Recognize the conceptual framework guiding the PWSU-CIWG and where we are in the four phases.
2. Gain an understanding of the “User Perspective” and learn about operations and planning processes, challenges and opportunities for using climate information from several utilities.
3. Participate in discussions drawing on the “user perspective” and the “planning process” to a) inform the technical approaches being implemented by NOAA project task groups, b) identify additional research gaps; and 3) suggest proposal/funding opportunities.
4. Move forward on Knowledge Management System development.
5. Determine next steps.

Agenda:

8:30 – 8:45 Registration and Coffee

8:45 – 9:30 Day’s agenda, introductions, Updates (Lisette Staal)

9:30 – 10:30 Using Climate Information – understanding users and their contexts

- d. Presentation: Use, needs, and views on climate information of water managers in Southeastern U.S. Jessica Bolson and Chris Martinez, University of Florida
- e. Presentation: Understanding the Planning Process – moving from conceptual need to implementation Barbara Powell, Water Resources Manager, Broward County Environmental Protection and Growth Management Department

10:30 – 10:45 BREAK

10:45 – 12:30 Utilities' Planning and Operations - integrating climate information

Presentations:

- a. Bertha Goldenberg, P.E., Assistant Director, Miami-Dade Water and Sewer Department
- b. Barbara Powell, Water Resources Manager, Broward County Environmental Protection and Growth Management Department
- c. Nancy Gallinaro, Director, Strategic Planning, Palm Beach County, Water Utilities Department
- d. Alison Adams, Source Rotation and Environmental Protection Manager, Tampa Bay Water
- e. Kevin Morris, Science and Technology Officer, Peace River Manasota Regional Water Supply Authority

Discussion

12:30 – 1:30 LUNCH

1:30 – 2:45 Linking climate science to the user perspective - Integrating into planning

Interactive group activity and discussion - Drawing on the morning presentations to engage in small group discussions to) inform the technical approaches being implemented by NOAA project task groups, 2) identify additional research gaps; and 3) suggest additional research ideas, proposals/funding opportunities. (Lisette Staal)



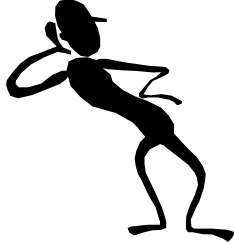
2:45 - 3:00 BREAK

3:00 – 3:30 Knowledge Management System Development - (Tracy Irani)

3:30 - 4:00 Next Steps, Reflection and Evaluation (Lisette Staal)

### APPENDIX 3 – Active Listening Guide

Listen for planning requirements, timeframes, types of planning documents used...  
 Consider the following questions:



1. When and why would “the anticipated users” be interested in climate science?
2. What are their key risks and vulnerabilities related to climate?
3. When/what are their key decision points?
4. When/where are opportunities for science to inform their

Jot down your thoughts in the matrix below from what you hear that will help us understand the users?.....

Interest in Climate Science?	Risks and Vulnerabilities?	Key decision points?	Opportunities for science to inform?	Barriers to being informed by science?

(turn over for more space)

#### Appendix 4 – Flipcharts of compiled responses from Listening activity

<p><b>Barriers to being informed by science</b></p> <ul style="list-style-type: none"> <li>• Lawsuits</li> <li>• Trust</li> <li>• Spatial timescale resolution</li> <li>• regulations</li> <li>• policies</li> <li>• Politics</li> <li>• Communication</li> <li>• Lack of champions</li> <li>• Lack of knowing products available</li> <li>• Insufficient staff training</li> <li>• Not flexible</li> <li>• Lack of agreement on uncertainties</li> <li>• Lack of "forcing to optimize water supply" ---</li> <li>• Policy makers</li> <li>• Property owners</li> <li>• Developers</li> <li>• Insurance</li> </ul>	<p><b>Opportunities for Science to Inform</b></p> <ul style="list-style-type: none"> <li>• Can inform master plans</li> <li>• Access to expertise</li> <li>• Provide improved skill</li> <li>• Inform success stories</li> <li>• Communication strategies</li> <li>• Webinars</li> <li>• Public awareness- inform newsworthy events</li> <li>• Access to data- easy to use/unbiased</li> <li>• Help with flood control/water supply</li> <li>• Goals</li> <li>• Forecast for riverflow</li> <li>• Need to Define terms- i.e, forecast vs outlook</li> <li>• Data credibility</li> <li>• Link to finance and insurance industry</li> </ul>
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<p><b>Interest in Climate Science</b></p> <ul style="list-style-type: none"> <li>• Assist in drought, supply planning, planning mixes of resources (surface and groundwater), extremes in time of occurrence</li> <li>• Infrastructure planning - Sea level rise, wastewater plans, stream flow forecasts (monthly, seasonal, watershed scale)</li> <li>• Manage risk and climate</li> <li>• Communication and Public messaging (information and tools)</li> </ul>	<p><b>Risks and vulnerabilities</b></p> <ul style="list-style-type: none"> <li>• Uncertainty in demand and supply</li> <li>• Competition for water (different resources, institutions, potential conflict)</li> <li>• Cumulative effects and impacts on property owners</li> <li>• Finances</li> <li>• Planning facilities that may not be needed</li> <li>• Reliability of models (also difficulty in understanding)</li> <li>• Being wrong</li> <li>• Providing information to the public (too much, too little, misinterpretations, individual stakeholder concerns)-- Droughts, floods, saltwater intrusions Inundations map,</li> <li>• Ocean outfalls stopped 2025</li> <li>• Using injection wells</li> </ul>
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### **KEY DECISION POINTS in planning**

- Water supply drives hydro models
- Input into models
- Master plan - greenprint, etc.
- Regulations
- Beginning of month in the dry season
- Beginning of hurricane season
- Beginning of recharge season
- Storage and conservation
- Planning timeframe vs. point of committing to project
- Infrastructure
- When and how to present information matters
- Economic impacts --- Property values, rate structures

## APPENDIX 5 - Roadmaps outlined for each of the technical areas of NOAA CSI Project Roadmap - Seasonal Scale Forecasts (Vasu Misra)

Participants: Tirusew Asefa, Louis Murray, Mike Cullum, Chris Martinez, Ben Kirtman , Bappaditya Nag, James Buckingham

**Objective:** The overarching objective of this group is to robustly (methodically and unambiguously) diagnose seasonal predictability and forecast skill for all 4 seasons (winter, spring, summer, and fall) of stream flow in seven watersheds in Florida and 23 other watersheds spread around the southeast US. The seven watersheds in Florida are Peace River at Arcadia, Ochlockonee River near Havana, Choctawhatchee River at Caryville, Escambia River near Century, St. John's River near Deland, Tampa Bay watershed, and the Lake Okeechobee watershed in the South Florida water management district.

**Technical approaches:** The FSU group will be pursuing the study on the following watersheds: Florida are Peace river at Arcadia, Ochlockonee river near Havana, Choctawhatchee river at Caryville, Escambia river near Century, St. John's river near Deland. The water institute in Florida will pursue the study on Tampa Bay watershed and SFWMD will pursue the study on the Lake Okeechobee watershed. We will be using the NMME set of seasonal hindcasts (<http://iridl.ldeo.columbia.edu/SOURCES/.Models/.NMME/>), which are from seven different global coupled ocean-atmosphere models. In addition FSU is also running seasonal hindcasts from 1982-2010 for winter and summer at 50km resolution using the Florida Climate Institute Global Spectral Model (FCI-GSM), which will also be used in this study.

**Relevance to utilities:** Peace River, St. Johns River, SFWMD, and Tampa Bay would be most likely the first of the few water authorities in the country that will have a sound scientific analysis to convince themselves of the benefits and limitations of using seasonal climate forecasts for their operational needs.

**Any bottlenecks:** The availability of NMME data that is relevant for the proposed hydrological study is not available yet. The request will be formally made to NMME.

**Next steps:** The volume of data from NMME and the FCI-GSM will be huge (~ several Terabytes) that will be mined for detecting forecast skill as function of lead time, season, size of watershed and geographical location of the watersheds. We will approach this problem by taking one model, one season, one ensemble member at a time to wrap around this voluminous task. At the time of the possible next meeting in fall of the PWSU-CIWG we may have covered at least one model and one season completely. However as we repeat this procedure over several models and over other seasons the analysis will accelerate with the experience.

## Roadmap - Long term Climate Scenarios (Wendy Graham)

**Participants:** Alison Adams, Syewoon Hwang, Rick Hutton, Janyantha Obeysekera, Lydia Stefanova, Tracy Irani

**Objectives:** The objectives of this group are to:

1) Evaluate and share with the working group the ability of large-scale (e.g.  $\sim 2.5^\circ$ ) reanalysis data, dynamically-downscaled<sup>1</sup> reanalysis data, statistically-downscaled<sup>2</sup> reanalysis data, retrospective raw GCM output, dynamically-downscaled retrospective GCM output and statistically-downscaled retrospective GCM output to reproduce:

- a) ENSO-SST patterns and their teleconnections to rainfall over Florida
- b) Monthly and seasonal climatology (means and variances of precipitation, average number of rainy days, temperature, and evapotranspiration by month) over Florida
- c) Daily rainfall transition probabilities, by month, over the state of Florida
- d) Statistics quantifying diurnal rainfall characteristics over the state of Florida
- e) Intensity-Duration-Frequency of hydrologically significant extreme rainfall events over Florida
- f) Spatial statistics of daily precipitation over Florida (i.e. variogram, Moran's I index, Geary's C index spatial variance of rainfall vs magnitude of spatial average precipitation. number of rainy grids vs magnitude of spatial average precipitation)
- g) Monthly and seasonal hydrologic patterns (means and variances of surface flows and/or groundwater elevations over five watersheds in the state of Florida)
- h) Recurrence intervals for "hydrologically-defined" floods and droughts over five watersheds in the state of Florida

2) After "kinks" have been worked out with the reanalysis and retrospective evaluations, the future projections from the GCMs will be downscaled and evaluated in a similar manner, and changes from the retrospective simulations quantified.

**Technical approaches:** We will all use ERA40 and NCEP-DOE R2 re-analysis products. We will use the CCSM, GFDL and HADCM3 GCM outputs. Dynamical downscaling (with possible bias-correction) will be conducted by FSU using the RSM model. Statistical downscaling will be conducted by UF and will use the BCSA method (developed by Hwang) and/or the BCCA method developed by (Brekke et al). Comparisons will be made using a to-be-agreed upon set of historical gridded and point measurements of precipitation and rainfall. The FSU group will pursue hydrologic implications for the Peace river at Arcadia, and the St. John's River near Deland. The UF group will pursue hydrologic implications for the Tampa Bay region (Hillsborough and Alafia River watersheds) and SFWMD will pursue hydrologic implications for the Everglades region.

Note: If time permits NARCAAP products may also be analyzed.

**Relevance to utilities:** Input from utilities will be sought to establish the definition of "hydrologically significant extreme rainfall events" over each utilities service area, and

“hydrologically-defined” floods and droughts for the seven watersheds. Results of the analysis will help utilities understand the uncertainty associated with using current climate data/models predictions at utility relevant space-time scales.

**Any bottlenecks:** Time and human resources!

**Next steps:**

1. Agree on gridded and point climate observation data sets to use for evaluating retrospective predictions (Alison, Vasu, Obey, Wendy, Syewoon)
2. Request input from all utilities on the definition of “hydrologically significant extreme rainfall/temperature events” for their operation (Wendy)
3. FSU to perform dynamic downscaling and evaluations for GFDL and HADCM3 models (CCSM already completed)
4. UF to perform statistical downscaling and evaluations for the ERA40 and NCEP-DOE R2 reanalysis data as well as the retrospective data for CCSM, GFDL and HADCM3
5. FSU, UF and SFWMD to conduct hydrologic evaluations.

**Roadmap - Sea Level Rise** (Keith Ingram)

Participants: Barbara Powell, Kathryn Frank Nancy Gallinaro, Bertha Goldenberg, Scott Laidlaw, Kevin Morris, Deidra Slough

The Sea Level Change (SLC) group had a broad ranging discussion, which focused on four specific themes:

1. **Improve access to information that is already available.** Assemble available maps, models, data, and tools that are germane to the region. Conduct webinars or conference calls to inform working group and others about how to use them.
2. **Catalog current projects and programs on SLC.** Start with a survey of information at the Georgetown site. Look for SLC impacts that people already observe and find out what they are doing. This information will be particularly useful when informing decision makers. If they see others taking action, they are more likely to act themselves.
3. **Develop and implement plan on how best to move from science to policy and action.** Members of the Working Group communicate well and collaborate well, but tend to stumble when we need to affect policy. There is a disconnect between the technical world and the boardroom. We need to communicate better establish buy-in from the local governments and their representatives. Planners need to better understand the scientists so that we can represent the information. The key for getting from science to policy is for us to gain a better understanding of what motivates decision makers, and then build on those motivations. A major concern is the potential loss of tax base as SLC damages infrastructure and people move away. Economic assessment is needed to understand SLC impacts on utilities. Identify critical infrastructure, vulnerable populations and properties. Communicate clearly that the worst case scenario is one with no action. Many local decision makers face conflicting interests – the opportunity to make money and increase the current tax base versus protecting people and properties from exposure to SLC.

4. **Governance structures.** Investigate the role of governance structures related to responses to SLC, especially with respect to expenses borne by a single utility. What are alternatives that would be more equitable and effective? One example could be cost sharing. We should strive to learn more from insurance companies as they are expert in risk assessment and management.

#### **Information time frames for SCL decisions by water utilities**

Time, years	Decision
50	Water treatment plant construction
20	Water supply planning
10	Comprehensive planning
3-6	Capital expenses
<3	Operational

**Next Steps:** We will focus first on themes 1 and 2 with the following actions. Once these are well in hand, we will develop plans for themes 3 and 4.

#### **Theme 1: Improve access to existing information**

1. Organize webinars for various Sea Level Change viewers that are available.
  - a. Sea Level Rise and Coastal Flooding Impacts Viewer  
<http://csc.noaa.gov/digitalcoast/tools/slrviewer/>
  - b. Sea Level Rise Map Viewer [http://sarasotabay.org/slrmap/slrmap\\_viewer.html](http://sarasotabay.org/slrmap/slrmap_viewer.html)
  - c. Surging Seas <http://sealevel.climatecentral.org/> - Note that this viewer has generated a fair amount of discussion on at Linked In [Climate Change Adaptation Florida](#)
  - d. NASA Sea Level Viewer - This viewer shows sea level anomalies as observed by satellite altimeters, not sea level change.  
<http://climate.nasa.gov/SeaLevelViewer/seaLevelViewer.cfm>
2. Invite PWSU-CIWG to attend next ACF Drought Briefing webinar to see if we should develop a similar effort for FL.
3. Discuss availability of SLOSH and SLAM model outputs from G. Kiker. Perhaps we should invite Greg to present those results to next PWSU-CIWG meeting.
4. Incorporate NCA reports, Annotated Bibliography of Linhoss et al (2012), and other relevant reports into project Knowledge Management System.

#### **Theme 2: Catalog existing impacts and projects**

5. Review NCA impact reports, State Dept of Economic Opportunity project listings, and Georgetown U climate adaptation web site for Florida relevant projects, SLC impacts, and information.



APPENDIX 6 – Current Research Agenda (potential research of interest)

PUBLIC WATER SUPPLY UTILITIES- CLIMATE IMPACT WORKING GROUP UTILITY RESEARCH AGENDA DRAFT May-11 (updated May 2012)					
CLIMATE AREAS	UTILITY NEEDS	AVAILABLE TOOLS	RESEARCH NEEDS	CURRENT RESEARCH PROJECTS	ADDITIONAL RESEARCH NEEDS
Temperature Impacts			Urban ET estimates associated with temp impacts; EDA on historical temperature vs demand across different sectors		
	Daily and monthly max temperature and Seasonal Temp. Change	NOAA forecasts; SECC - AgroClimate.org			
	Irrigation Demand Changes			1. Drought Index/Irrigation water balance forecasts using CPC 3-month outlooks (Martinez) 2. Downscaled/bias corrected reference Evapotranspiration across the SE USA (Martinez)	
	1. How seasonal temp. forecasts impact irrigation demands 2. Proportion of water demand for irrigation	WASD submeter billing records			
	Cooling Demand changes				
	1. How could cooling water demand change with temp?	Downscaled IPCC projections and other sensitivity experiments conducted in COAPS ; Winter-Summer variation for current metered flow	Bias correct the projections	COAPS/USGS-La Florida & COAPS/ORAU project (Vasu)	
Rainfall Impacts					
	Regional rainfall predictions				
	1. Long term rainfall forecasts - 10, 20, 50 years, downscale global climate models to Florida regions	Global Climate models - AR4, NARCAST	Downscale models to Florida, calibrate w/ FI data		
	2. Long term changes in rainfall patterns in Florida	Change in ENSO pre and post 1960	Demand vs rainfall; r/p between rainfall and temperature for demand estimation		
	2. Short term forecasts for winter-spring dry season, available Jan 1 for 3/1-6/15	IASCLIP FORECAST FORUM - IFF, winter forecasts better		Downscaled GFS and CFS forecasts (Martinez)	Better predictions in spring
	3. Length of wet or dry season and its variability	ENSO effects	hydroperiod durations; development of indicators		
Storms/Hurricanes					
	Predict Nos./ likelihood of Florida hurricane impacts	Good models for total nos. of hurricanes			Predictions for nos. hurricanes to hit Florida
	Model inundation and damage	GIS inundation model	Climate Compact doing Action Plans		
	Storm surge impacts (regional or local)	Storm surge models			
	Impact of Storm/Inundation on salt water intrusion	coupled surface/Groundwater models	coupled surge/surface/groundwater models to better predict surge impact on SWI		Hydrodynamic model for salt water intrusion
	Forecast hurricane tracks with 10-15 day lead time				

**APPENDIX 7 – Summary of feedback survey responses (1 low - 5 high)**

	Public Water Supply Utility	Water Management District	University	Government	n/a	TOTAL
Output	5.0	4.0	3.6	4.0	3.5	3.76
Organization	5.0	4.0	3.7	4.0	3.5	3.76
Use of Time	5.0	3.5	3.7	4.0	3.5	3.76
Participation-involvement	4.75	4.5	4.0	4.0	4.0	4.0
Next Steps clear	4.75	3.5	4.0	5.0	4.0	3.94

**6. What do you view as today's take home message regarding the "user perspective" and their contexts?**

- The role of climate information varied among utility companies.
- We have a long way to go to connect.
- Should figure out a better framework for CUP, but WAY, WAY above my pay grade to actually implement anything.
- Need to work more on designing how climate forecast model help utilities
- All utilities are different. Multiple sources are critical to flexibility and potential use of climate information.
- Planning/decision making is incredibly complex and must be better understood to understand how climate info can be integrated.
- Keep pursuing to adapt to and concern about climate change, but now is not the timing to deal with climate science.
- Users' needs and priorities are varied and are likely not implicitly obvious to researchers.
- Utilities have issues/concerns that fit this workshop' mission.
- How to incorporate climate info in planning and how to communicate
- The southeast coast of Florida and West coast of Florida have different needs for climate change data in terms of long term and operational planning.
- How is climate change going to be used in water supply plans... science or policy?

**7. Do you define yourself as a researcher or as a user of climate information, or both (or neither)?**

- Researcher = 8
- User = 5
- Both = 2

**8. Following today's discussions, what do you perceive as the main challenges/barriers for using climate information in operations and planning processes?**

- existing planning and operation processes; Inherent uncertainty in climate information.
- Confidence
- Too complicated with minor benefits for our operations management group, which is focused on flood management
- Availability; credibility.
- Still not clear which decisions would be based on climate information. Or who would make those decisions, or how they would use the data.
- Practical context of how decisions are made or the political processes and uncertainty.
- Confidence or level of climate science? Not sure.
- Figuring out how to diplomatically walk the tightrope between political realities and due diligence.
- Funding
- time and space scale issue; understanding

- Having no correct data for the use intended
- ?; location of tools; info
- Awareness
- Communication
- Changing processes to use probabilistic information (right now use landuse projects, popular projections ad deterministic qualities.)
- Agreement on a point has to come
- There is need to have a better understanding of what the utility planner are in need of...

**9. Following today's discussions, what do you perceive as key opportunities for using climate information in operations and planning processes?**

- Linking low frequency climate variability with planning processes.
- Continue to integrate what is known in to daily-short term planning
- If needed to optimize with additional objective functions.
- Assist with planning process
- Na
- ID decisions being made to see where info fits in. Perhaps in master plans?
- workshops and conversations like today
- na
- na
- na
- to make more informed decisions for water supply use and infrastructure needs
- Useful for long-term water supply planning
- Na
- Incorporating uncertainty of climate projection
- I don't see it yet
- Prediction to minimize damage
- Case studies?

**10. Thinking about what you learned today, take a moment to reflect on your own current practice as a researcher (developing science) or as a user (Incorporating climate science into operations and management.) Do you foresee any changes needed to your practice based on these reflections?**

- Na
- need to discuss with policy makers
- possibly, but not my call
- Learn more how climate data could be applied
- More of a redirection than a major change.
- I need to re-engage and go to more meetings in the water community
- Na
- Yes, we have not yet incorporated climate change factors into our CIP or master plan
- Not really
- No
- No
- Changes would include the use of climate change for long-term water supply planning and to supplies themselves.