



Climate Change and the Water Sector

CRWU Webinar Series
US EPA Office of Water

Steve Fries, CSC
Jeremy Martinich, EPA
Dr. Casey Brown, UMASS
February 13, 2013

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bubble icons in the top left corner of your
screen to view accompanying script text for
each slide.*





CRWU Webinar Series

Topic	Next Event
Introduction to CRWU Initiative	<i>TBD</i>
Climate Change and the Water Sector	<i>TBD</i>
Introduction to CREAT	<i>February 27, 2013</i>
Extreme Events Workshop Planner	<i>March 6, 2013</i>
Adaptation Strategies Guide	<i>March 13, 2013</i>
Workshop Planner/ Adaptation Strategies Guide	<i>April 10, 2013</i>
Using CREAT for Planning and Decision Support	<i>TBD</i>

- Additional topics and dates under consideration
- Visit <http://www.epa.gov/climateredyutilities> for updates



Housekeeping

- Polling questions
- Mute/un-mute
- Hand raise function
- Questions
- Technical difficulties



Climate Ready Water Utilities (CRWU)

CRWU Mission Statement

To provide the water sector (drinking water, wastewater, and stormwater utilities) with the practical tools, training, and technical assistance needed to adapt to climate change by promoting a clear understanding of climate science and adaptation options.



Climate Ready Tools & Resources

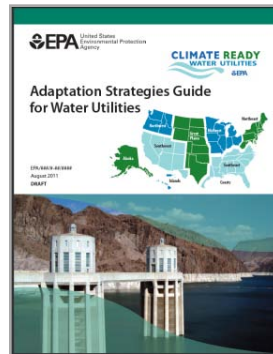
Climate Ready Process

Adaptive Response Framework










Explore Elements of Climate Readiness

Adaptation Strategies Guide



Learn Climate and Adaptation Basics

Toolbox

-  **Featured Resource**
-  **Region Map**
-  **Activities**
-  **Funding**
-  **Publications and Reports**
-  **Tools and Models**
-  **Training, Workshops and Seminars**

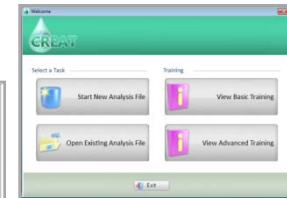
Research and Gather Information

Extreme Events Workshop Planner



Collaborate with Partners

Climate Resilience Evaluation and Awareness Tool



Assess Risks and Evaluate Opportunities



Overview

- Climate change
- Impacts to water utilities
- Available climate information
- Adaptation process
 - Assess and plan
 - Implement and evaluate
- CRWU initiative
 - Tools and resources
 - Connecting with CRWU



What is Climate Change?

Climate change refers to a significant change in weather patterns as observed over decades or longer time periods.



- Changes in average conditions
- Changes in extreme conditions
- Changes will vary by location



What Types of Changes Are Expected?

- Increasing temperatures
- Changing precipitation patterns
 - Less in some areas, more in others
 - Frequency and magnitude of extreme precipitation events
 - Changes in snowfall and snowpack
- Changing patterns of extreme weather events
- Rising sea level



Climate Change and the Water Sector

Degraded water quality and treatment challenges

Lower reservoir levels and water shortages

Stormwater management challenges

Earlier spring runoff

Coastal flooding from storm surges

Reduced groundwater recharge

Increased residential demand

Saltwater intrusion into coastal aquifers

Loss of wetlands and coastal ecosystems

Increased frequency and extent of floods

- Global average temperature has risen 0.14°F per decade since 1901
- Projections indicate continued warming, which leads to changes in **water quantity and quality**:
 - Reduced water supply when combined with decreased precipitation
 - Changes in surface water quality
 - Changes in demand for water and energy





Overall changes in climate will alter the total amount of precipitation (may be **less** or **more**, depending on local factors and season), contributing to:

- Changing lake and reservoir levels
- Altered groundwater recharge
- Reduced snowpack and reservoir recharge
- Changes in water quality (increased turbidity)
- Greater demand for water for irrigation





Coastal utilities should be concerned about sea-level rise, which can lead to:

- Increased flooding associated with coastal storm surges
- Increased saltwater intrusion into aquifers
- Accelerated loss of wetlands and coastal ecosystems





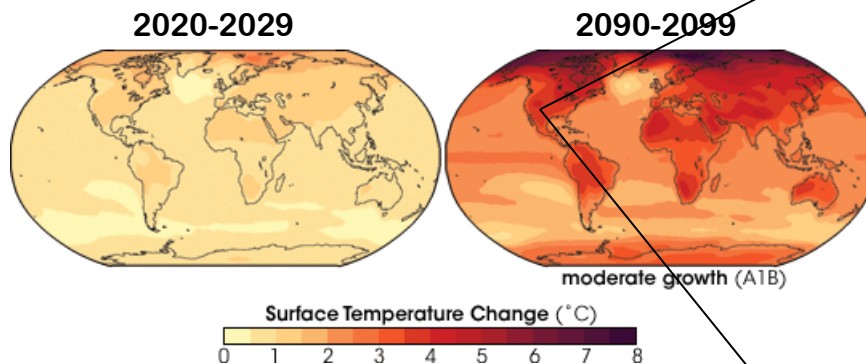
More frequent and severe extreme weather events can produce:

- More frequent and larger extent of flood damage to infrastructure
- Increased crop loss and more frequent water shortages during drought
- Property loss and erosion following wildfires
- Increased damage from coastal storm surges to low-lying utility infrastructure

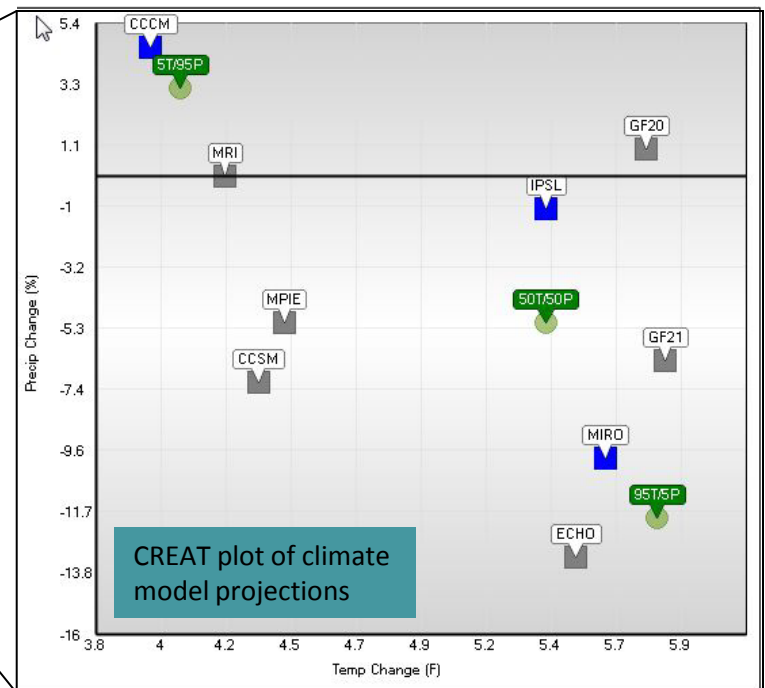


What Information and Data are Available?

- Models as basis for climate projections
- Down-scaling efforts to extend to local scales
- Challenge: connect changing climate to more direct consequences to water resources



Source: IPCC AR4 Projected
Temperature Changes for SRES A1B





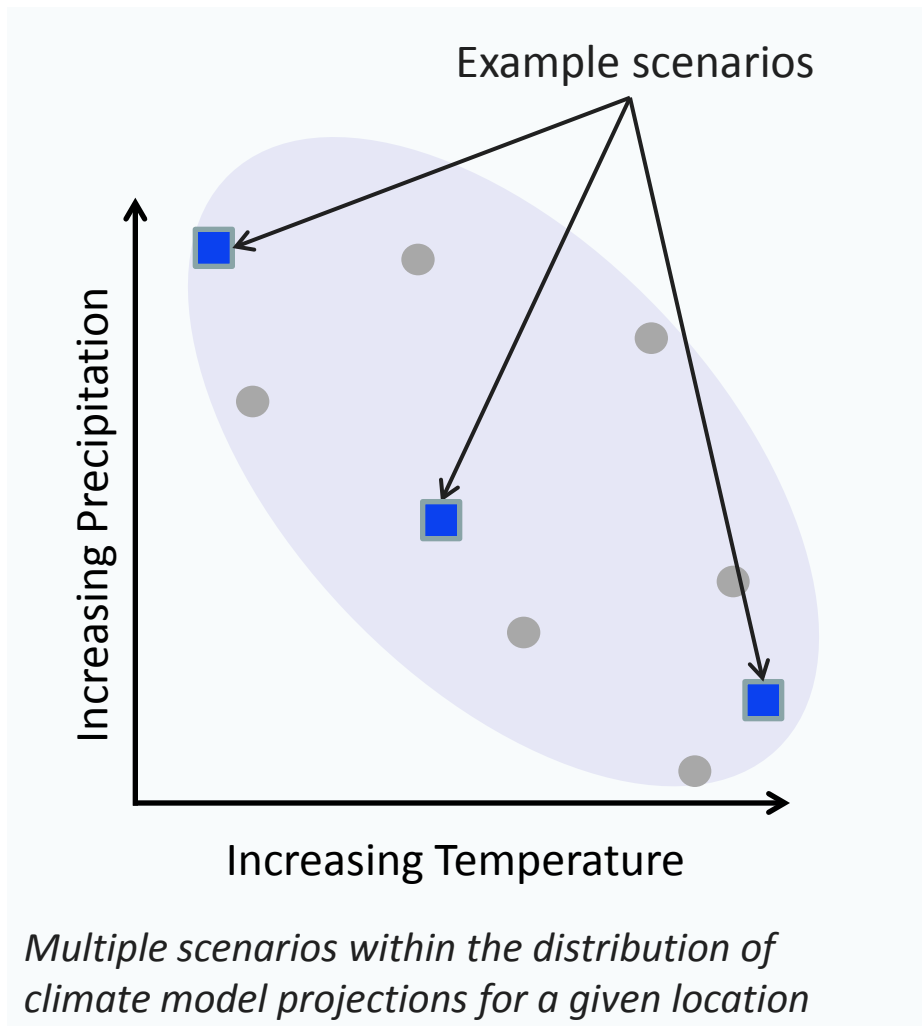
Why is the future climate uncertain?

- Future emissions of Greenhouse Gases (GHG)
 - Only significant after 2050
 - Irreducible
- Climate sensitivity to GHG emissions
 - Significant
 - In theory, reducible
- Limitations in ability to model the climate system
 - Significant
 - No uncertainty reduction in sight (could increase)
- Natural variability of the climate system
 - Significant, dominant at scales of adaptation
 - Irreducible (downscaling doesn't help)

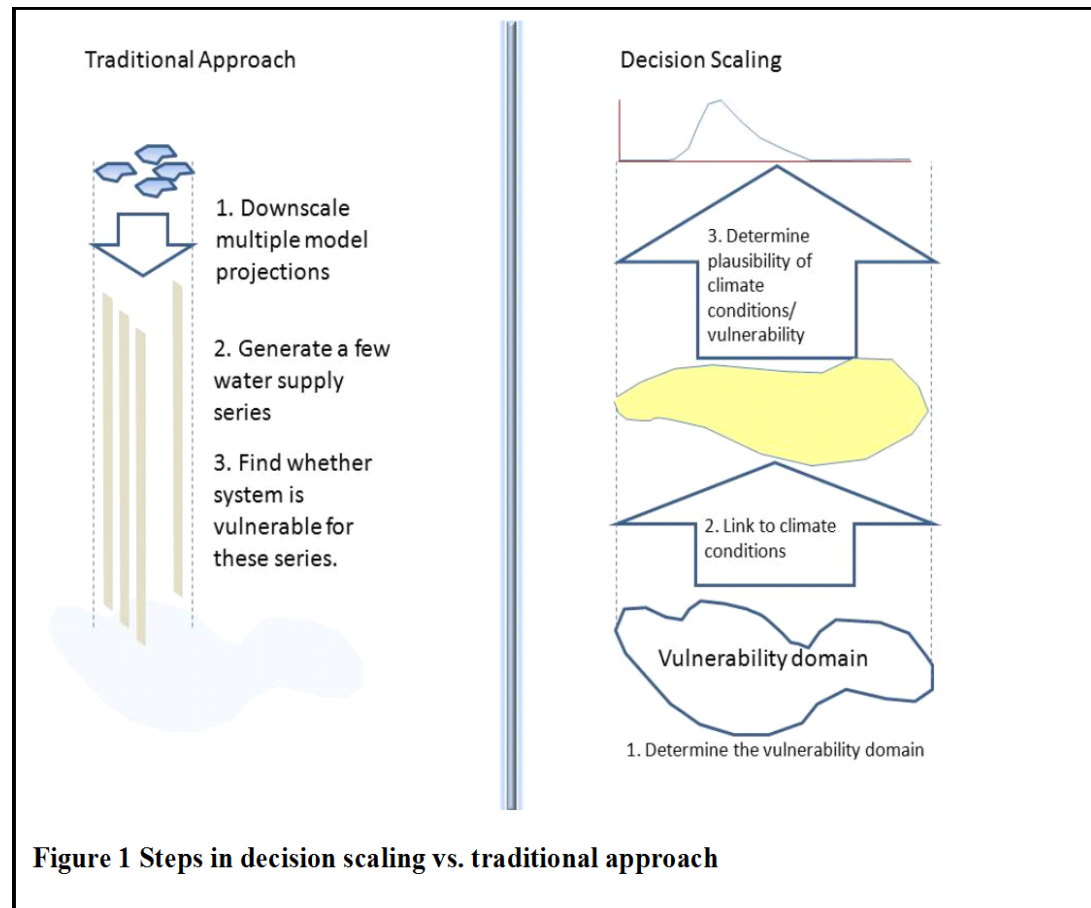


Dealing with Uncertainty

- Level of uncertainty in climate change projections
- Similar to other uncertain factors in decisions
- Adopt scenarios to assess performance over a range of possible futures



- Focus on identifying the vulnerabilities of the system
- Identify climate changes that are problematic
- Evaluate options to improve robustness to such climate changes



Source: "Decision Scaling", Brown and Wilby, 2012 (EOS)



What Can You Do?



Learn more about your climate risks



Exchange information with other utilities



Plan, implement, and evaluate adaptation at your utility



Learn About Your Climate Risks

- Research and understand climate change impacts at the national, regional, and local level
- Know the risks to your utility's assets and operations
- Use your research to help prioritize options to increase resilience
- Access academic sources and CRWU tools



Information Sources

Report or Website	Source	Year
Climate Change 2007: The Physical Science Basis	Intergovernmental Panel on Climate Change (IPCC)	2007
Global Climate Change Impacts in the United States	US Global Change Research Program (USGCRP)	2009
Confronting Climate Change: An Early Analysis of Water and Wastewater Adaptation Costs	National Association of Clean Water Agencies and Association of Metropolitan Water Agencies (NACWA/AMWA)	2009
Daily documentation for Dataset 9101, Global Daily Climatology Network, version 1.0	National Climatic Data Center (NCDC)	2002
Evaluating Decision Support Methods for Incorporating Climate Change Uncertainties into Water Planning	Water Utility Climate Alliance (WUCA)	2010
Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset	World Climate Research Programme (WCRP)	2008
MAGICC/SCENGEN 5.3: http://www.cgd.ucar.edu/cas/wigley/magicc/	National Center for Atmospheric Research (NCAR)	2008



Exchange Information

- Research case studies of actions taken in response to climate risks by others in the water sector
- Reach out to water utilities with similar challenges
- Attend climate-related workshops, seminars, and conferences with other water utilities



- Once you have identified your priorities, include both short- and long-term actions in your adaptation strategy
- Continually evaluate your efforts and track your progress
- Collaborate with the community and local government agencies whenever possible



Flexible decision making with room for adjustment in the face of uncertainties

- Well suited for the uncertainty of climate projections, which are updated through time
- Need to continually evaluate climate adaptation in light of new data, models, and observations



Adapted from: National Research Council. 2004. Adaptive Management for Water Resources Planning, The National Academies Press. Washington, DC.

Climate Ready Tools & Resources

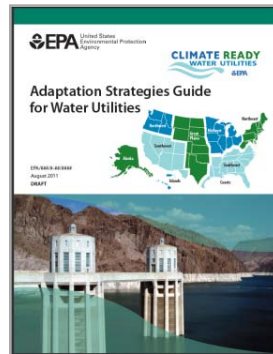
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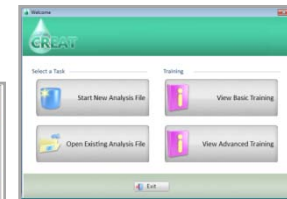
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Assess Risks and Evaluate Opportunities



Connect with CRWU

We always appreciate feedback and collaboration when it comes to climate resiliency at utilities.

- Send questions to CRWUhelp@epa.gov
- Host pilot projects and exercises to improve and learn about available tools
- Share your success stories with CRWU and other utilities as part of future releases



Upcoming Events

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To register for these events and download resources, visit the CRWU website:

www.epa.gov/climateredyutilities



For More Information

Contact CRWU: CRWUhelp@epa.gov

Sign up for e-newsletters:

EPA Climate Change and Water News: Send a blank email to water_and_climate_change_listserve-subscribe@lists.epa.gov

View EPA climate change activities:

<http://www.epa.gov/climatechange>



Thank you

Any questions?

Curt Baranowski

Baranowski.Curt@epa.gov

John Whitler

Whitler.John@epa.gov

Amy Posner

Posner.Amy@epa.gov

Laura Dubin

Dubin.Laura@epa.gov

CRWUhelp@epa.gov

