Climate Change and the Water Sector

CRWU Webinar Series
US EPA Office of Water

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February 13, 2013

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- Additional topics and dates under consideration
- Visit [http://www.epa.gov/climatereadyutilities](http://www.epa.gov/climatereadyutilities) for updates
Housekeeping

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

- Reduced groundwater recharge
- Earlier spring runoff
- Lower reservoir levels and water shortages
- Stormwater management challenges
- Coastal flooding from storm surges
- Degraded water quality and treatment challenges
- Increased residential demand
- Increased frequency and extent of floods
- Saltwater intrusion into coastal aquifers
- Loss of wetlands and coastal ecosystems
Increasing Temperature

- 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

Changing Precipitation Patterns

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

Extreme Weather Events

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

Example scenarios

Multiple scenarios within the distribution of climate model projections for a given location
• 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
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<td>Intergovernmental Panel on Climate Change (IPCC)</td>
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<td>Global Climate Change Impacts in the United States</td>
<td>US Global Change Research Program (USGCRP)</td>
<td>2009</td>
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<td>Confronting Climate Change: An Early Analysis of Water and Wastewater Adaptation Costs</td>
<td>National Association of Clean Water Agencies and Association of Metropolitan Water Agencies (NACWA/AMWA)</td>
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<td>Daily documentation for Dataset 9101, Global Daily Climatology Network, version 1.0</td>
<td>National Climatic Data Center (NCDC)</td>
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<td>Evaluating Decision Support Methods for Incorporating Climate Change Uncertainties into Water Planning</td>
<td>Water Utility Climate Alliance (WUCA)</td>
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<td>Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset</td>
<td>World Climate Research Programme (WCRP)</td>
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<td>MAGICC/SCENGEN 5.3: <a href="http://www.cgd.ucar.edu/cas/wigley/magicc/">http://www.cgd.ucar.edu/cas/wigley/magicc/</a></td>
<td>National Center for Atmospheric Research (NCAR)</td>
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• 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
Adaptive Management

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

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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[www.epa.gov/climatereadyutilities](http://www.epa.gov/climatereadyutilities)
Contact CRWU: CRWUhelp@epa.gov

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View EPA climate change activities:
http://www.epa.gov/climatechange
Thank you
Any questions?

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