Community Resilience in Uncertain Times: A risk management perspective

“Tomorrow’s Clean Water Utility... Is the Future Already Here?

NACWA Winter Conference
February 3-6, 2013
Discussion points

- Review of risks to resilient infrastructure
  - Overarching uncertainty and costs of changing climate
- Overview of a tested approach and tools to manage risk and uncertainty
- Some examples
Today’s utility faces today’s and tomorrow’s risks

- Traditional agency organization
- Emerging integrated utilities
- Regional integration options
- Community engagement
- Environmental Justice
- Financial capability
- Green infrastructure options
- Wet weather
- Emergency resiliency
- Energy production
- Reuse/ resource recovery
- Nutrient management accountability
- Population change
- Land use change
- Decision processes
- “Failure to Act”
Super Storm Sandy: Bellwether of our risky future

- Perfect storm
- On heels of Hurricane Irene
- Significant tidal surge along east coast
Super Storm Sandy: *Bellwether of our risky future*
Overarching and strongly influencing our existing challenges...

Climate change affects the water cycle

- Temperature
- Precipitation
- Sea level change
  - Storm surge
  - Ice and snow melt
  - IDF curves
  - Flooding and drought
What are the costs of climate change?
Cost for addressing climate risk - variable and **BIG**

<table>
<thead>
<tr>
<th>Source</th>
<th>$ US Billion per year, current to 2010-2050</th>
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<tbody>
<tr>
<td>World Bank (2006)</td>
<td>9-41</td>
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<tr>
<td>Stern (2006, 2010)</td>
<td>4-37</td>
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<td>UNDP (2007)</td>
<td>5-67</td>
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<td>UNFCC (2007)</td>
<td>2-41</td>
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<td>Parry et al. (2009)</td>
<td>~2-3x UNFCC</td>
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<tr>
<td>Stern, World Economic Forum, Davos, January 2013</td>
<td>“I got it wrong on climate change—it’s far, far worse”</td>
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Closer to home: NACWA-AMWA report to Congress illuminated potential costs climate change-related W and WW utility costs costs through 2050

**SUMMARY**
- Drinking Water = $325 - $692 billion
- Wastewater = $123 - $252 billion

**GRAND TOTAL**
- Drinking Water and Wastewater = $448 - $944 billion

Does not include ~ $500B in estimated infrastructure needs already identified by EPA not specifically related to climate change, nor emergency response costs.
Considering the economic, social, and environmental consequences of our changing climate can be daunting. But needn’t be overwhelming.

The water community—in fact, all communities across sectors, need a

- Scalable
- Flexible
- Consistent
- Transparent
- Scientifically defensible approach
to assess and address climate risk...

that can be conducted in a timely manner—not decades
A tested, transparent, scientifically defensible, timely process for assessing and addressing risk and resiliencey exists

What infrastructure, operations, services, human health and safety, environmental, policy, and interagency issues should we consider to develop a resilient future?

1. Determine Goals
   - Identify overarching questions and goals driving resilience planning and implementation

2. Identify and Assess
   - Infrastructure and operations that are now influenced by climate variables (temperature, precipitation, sea level rise, extreme events)

3. Determine How
   - Climate is projected to change locally using state-of-the-art science expertise and models: i.e. CLIMsystems' SimCLIM

4. Assess How
   - The projected changed climate will affect infrastructure and operations determined to be influenced by climate variables

5. Identify Resiliency Solutions
   - Continue process for more in depth assessment of risk levels and resiliency solutions for other important infrastructure

- or portfolios of solutions and prioritize based on risk/cost, and policy considerations
Our approach and CLIMsystems’ SimCLIM quickly translate complex science to local, regional climate risk.

SimCLIM Bridges the Gap: translates global science to local action.
SimCLIM Input and Output

- Observed Data
- Emission Scenarios
- GCM Results
- Sea Level Rise
- Local Time Series
- Projected Air Temp/Precip. Patterns

IPCC AR5 Precipitation Patterns Available
Where has this basic approach been tested?

- CH2M HILL and our partners have used and are using this approach on multiple large strategic risk and resilience planning and infrastructure projects

- Easily customized for any scale or set of local requirements-technical or political
Climate change impacts on NYC drainage and sanitation system

- Potential climate and population change impacts on drainage and sanitation infrastructure resilience.
- Analyzing potential conditions for this century, under two climate scenarios
- Sea level rise, rainfall and temperature
- Vulnerability analysis (street flooding and sewer spills):
  - Hunts Point WWTP
  - Flushing Bay Watershed
- Screening and analysis of adaptation options:
  - Developing framework for Citywide adaptation planning
North Carolina sea level rise risk management

- State of North Carolina study of sea level rise and storm impacts on coastal flooding and erosion.
- Halcrow advised on the overall study framework, bringing experience/lessons from international climate adaptation work.
- Study scope includes:
  - 100-yr sea-level & storminess scenarios
  - Landform response
  - Flooding and erosion
  - Damages & economic impacts
  - Ecosystem impacts
  - Social vulnerability
  - Adaptation recommendations
Climate risk planning keeps Alexandria, Virginia above water

- Increasing extreme events flooding, storm surge in Alexandria
- Plausible future scenarios, SimCLIM, and local data for 2050 and 2100 climate risks:
  - Sea level changes
  - Changes in extreme events- IDF curves
- Sizing and redesign of storm sewer infrastructure
- Developing grey AND community-focused sustainable green infrastructure adaptations

Photo Credit: Mark Young/The Journal Newspapers
LA Bureau of Sanitation: Risk and resiliency analysis for City-wide drainage and sanitation infrastructure

- **Effluent water quality**
  - Changes in maximum temperature and other environmental variables
  - Potential for more stringent effluent limits

- **Infrastructure and operations, policy, and community resiliency**
  - Sea level rise and storm surge in coastal areas
  - Outfall elevations
  - Increased inland flood events
  - Critical infrastructure and service at risk
CH2M HILL leading consultant team for the climate risk assessment and adaptations for the Western US: Colorado River Basin Study

- **Colorado River System:**
  - 30MM people: M&I, agriculture, hydropower, Native American tribes and communities, ecosystems, recreation

- **Supply and demand imbalances exist and are increasing** related to climate change

- **Stakeholders,** USBR, and 7 states
  - developed plausible future scenarios through 2100
  - identified highest service risks
  - identified and tested more than 50 potential adaptation projects
  - Working with utilities, communities, tribes, states and fed to prioritize and synergize implementation
Summary

- Risk and resiliency are today’s and tomorrow’s challenges
- Multiple, inter-related impacts affect community function and economic resilience
- Impacts and costs are uncertain; are projected to grow
- CW agencies can be the leading-edge unifying force for integrated resiliency solutions
- Scientifically defensible, transparent, flexible approach and tools exist to expedite understanding and managing risk and uncertainty to create a more resilient future.
According to this report, climate change may cause serious flooding!
Well, we’ll cross that bridge when we come to it.
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