

Principles of Water Utility Adaptation to Climate Change

The purpose of this document is to provide a brief overview of the fundamental considerations that must be addressed for water utilities to not only effectively plan to adapt to climate change but also to raise awareness among government and non-government policy makers and leaders of the needs of the water sector. The Intergovernmental Panel on Climate Change (IPCC) acknowledges the urgency of addressing adaptation by noting that "...water and its availability and quality will be the main pressure on, and issues for, societies and the environment under climate change." Water utilities will experience some of this pressure given that utilities provide a key service to the public for the benefit of society. Without reliable water service, a functioning society breaks down. Climate change presents many new challenges and exacerbates existing challenges to water utilities. Managing these challenges will require adaptation, attention and commitment of water utilities, as well as local, national and international governments. Additionally, climate change adaptation and mitigation options are increasingly interrelated. While this document focuses on adaptation, it is also critical that greenhouse gas mitigation and engagement in policy discussions on the energy/water nexus be part of a water utility's overall climate change strategy.

All must work together to develop policy frameworks that support adaptation at the local level and identify and pursue research that addresses the needs of the water sector. All must also ensure that critical information and tools gathered from research and observations are disseminated to water utility managers and decision makers so that the long-term viability of water supply and society can be sustained while ecosystem function is maintained. And most importantly, all must support the implementation of integrated and well-developed climate adaptation options for water utilities.

Given the critical role of water in adapting to climate change, we believe that:

- 1. Understanding the range of impacts and implications of climate change, developing appropriate adaptation options and effectively communicating these issues to its stakeholders are core responsibilities of a sustainable water utility.**
- 2. Adaptation takes place on the local level but regional and national initiatives are necessary in order to assess the impacts of, and maintain a coordinated response to, climate change.**
- 3. Engagement with the climate research community is essential in order to ensure that the water sector has access to the best available climate information.**
- 4. Including climate change factors in decision support analyses is essential for planning and preparing for a range of potential impacts, from average to extreme in nature, and for managing the uncertainty of climate change.**
- 5. Important early steps for water utilities include identifying, preserving and developing adaptation options that enhance system resiliency, maintain management flexibility under a range of possible climate impacts and consider the energy/water nexus.**

6. **Collaboration among water utilities, other governmental agencies, non-governmental organizations and other sectors can generate synergies that enhance the adaptive capacity within a region.**
 7. **Engagement with local/national/international governments is essential for transferring knowledge, establishing policy frameworks and climate services, and developing funding mechanisms that support adaptation at the local level and adapting regulatory frameworks.**
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1. Understanding the range of impacts and implications of climate change, developing appropriate adaptation options and effectively communicating these issues to its stakeholders are core responsibilities of a sustainable water utility.

Utilities should be responsible for understanding the implications of climate change and its impact on the system or systems they manage. This analysis is the foundation for developing adaptation options and should include an assessment of simultaneous impacts on multiple sources, the impacts on hydrology and demand patterns, and assessments on water quality and ecosystem impacts that are related to water supply and or quality. Effective communication of impacts, implications and response strategies is essential for water utilities to achieve the public support needed to implement the required adaptation strategies.

2. Adaptation takes place on the local level but regional and national initiatives are necessary in order to assess the impacts of, and maintain a coordinated response to, climate change.

Water utilities are essential community entities that routinely interact with a number of other local government offices. Utilities and municipalities at large must recognize the importance of integrating utility planning for climate change with other local and state planning efforts. Relevant and implementable adaptation options must involve water utilities.

3. Engagement with the climate research community is essential in order to ensure that the water sector has access to the best available climate information.

The water sector should engage with the research community to make certain it has access to the best available climate research. Engagement is pivotal to ensuring that the water sector can help shape research agendas that reflect the research needs of the water sector. Utilities should explore potential collaborations with federal programs, such as NOAA's RISA program in the United States, or with regional climate centers that exist at various universities. Access to extensive and continuous monitoring and observation data is critically important for understanding potential trends and for enabling dynamic system operations.

4. Including climate change factors in decision support analyses is essential for planning and preparing for a range of potential impacts, from average to extreme in nature, and managing the uncertainty of climate change.

Traditionally, water utilities have relied upon a variety of decision analysis methods to inform long-term planning decisions in the context of uncertainty. To date, this planning has assumed a stationary climate. Climate change calls into question that assumption and amplifies the uncertainty utilities have always faced. While advancements in climate modeling and downscaling can help to project what the changes in climate will be, there will continue to be, at least in the short term, significant uncertainty associated with projecting the impacts of climate change. Therefore, utilities should include climate change factors in decision support analyses in order to enable the development and implementation of appropriate adaptation options.

5. Important early steps for water utilities include identifying, preserving and developing adaptation options that enhance system resiliency, maintain management flexibility under a range of possible climate impacts and consider the energy/water nexus.

Instead of waiting for truly actionable science or preparing for one of many possible climate change impacts, water utilities should consider preserving and developing adaptation options that can be implemented in the future when more is known about the timing and/or magnitude of actual impacts. This process would include assessing/testing the adaptive capacity for operational adjustment of the existing system as well as re-engineering of water systems in tandem with making investments in infrastructure renewal and replacement. Utilities should also consider enhancing their existing data monitoring programs to include new information that would help identify triggers for when climate adaptation options should be implemented. Consideration of the energy/water nexus by water utilities is important when evaluating the range of climate adaptation options.

6. Collaboration among water utilities, other governmental agencies, non-governmental organizations and other sectors can generate synergies that enhance the adaptive capacity within a region.

Water plays an important part in the development of a sustainable city. Integrating utility planning for climate change with other local and state planning efforts, including sustainable urban design, is a critical success factor for water system resiliency and reliability. Direct collaboration with other local utilities is important in order to evaluate the potential benefits of regionalization, efficiencies in some aspects of service delivery, reliability and stability.

7. Engagement with local/national/international governments is essential for transferring knowledge, establishing policy frameworks and climate services, and funding mechanisms that support adaptation at the local level and adapting regulatory frameworks.

Climate change is a global challenge that will necessitate international/national/local governments working cohesively in the development of strategies resulting in the greatest benefit. Innovation should be encouraged by increasing incentives, reducing barriers and investing in applied research and development.

This spans the spectrum from engaging key users of climate data and tools such as water utilities at the start of research initiatives, and providing easy access of usable climate data to those users, to relating information in a way that can be implemented in decision-making. It also includes the development of federal legislation and the modification of regulatory frameworks to reflect the impact of climate change on species, habitat, water quality and flow regimes.

About the Water Adaptation Principles

This document was developed by the Association of Metropolitan Water Agencies, American Water Works Association, International Water Association, Water Research Foundation and Water Utility Climate Alliance in conjunction with *Climate Change Impacts on Water: An International Adaptation Forum*. At this Forum, water utility managers, climate scientists and environmental leaders from around the world came together to share experiences and to discuss initiatives for addressing the unavoidable consequences of climate change on global drinking water supplies. This document has been improved upon based on the insights of and lessons learned from the Forum's speakers and participants. For more information about the Forum, visit www.waterclimateforum.org.