An Integrated Framework for Assessing Climate Change Impacts on Water Supplies

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The global water crisis and the related influences of climate change on water supply now are universally recognized. The World Economic Forum's January 2008 meeting in Davos, Switzerland made water supply a top priority, with discussions of the effects of population growth and climate change on water management dominating the program. In March 2008, eight major U.S. water agencies united to form the Water Utility Climate Alliance, acknowledging that plans for future investment in water infrastructure must accommodate climate change projections. Clearly, the specter of increasing climate variability is recognized by the water community as a significant challenge to sustainable and reliable water supplies.

Among the most important impacts of climate change on water supplies are those related to the influence of increasing temperatures on seasonal patterns of precipitation and evapotranspiration. Projected changes indicate increased precipitation at higher latitudes and reduced precipitation in the subtropics (including the U. S. Southwest). Precipitation will be more intense, but less frequent resulting in longer periods of drought thus increasing evapotranspiration and reducing soil moisture. During the winter, increased temperatures are expected to result in "warmer" storms with more rain and less snow that will affect reservoir storage and distribution strategies throughout the intensely irrigated western U.S. Finally, the increased frequency of extreme weather events, such as hurricanes and floods, will challenge water supply infrastructure and sustainability world-wide.

Climate change affects the entire water cycle; thus, remedies for those effects must recognize the interrelated nature of the components of the water cycle and focus on integrated solutions. Integration of two powerful tools: climate change risk assessment and total water management provides a basic framework to determine the vulnerability of water management systems to climate change and exploration of strategies for adaptation.

Adaptation strategies require a wide range of temporal and spatial climate information. Historical climate information is required to assess trends in climate element variability such as the winter snow/rain ratios that affect runoff timing and amounts in the West. Historical climate data must be integrated with downscaled Global Climate Change projections and/or upscaled terrestrial observations to operate hydrologic models used to assess water system vulnerability and risk. Once system risk is characterized, a total water management approach can be employed to increase the resiliency of the system to climate change effects.

This presentation describes the framework and climate information needed to support a total water management approach for long-term planning, enhanced sustainability, optimized use of water resources, flexible solutions, enhanced communication, and community support as we navigate the uncertainties of a changing climate.

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