A Risk Management Framework for Evaluating Climate Change Impacts on Water Supply Reliability

Jack C. Kiefer, Ph.D. Hazen and Sawyer, P.C.
John M. Clayton, Ph.D., P.E. Hazen and Sawyer, P.C.
Damann L. Anderson, P.E. Hazen and Sawyer, P.C.
Alison Adams, Ph.D., P.E, Tampa Bay Water

Climate change represents one of several planning uncertainties that are faced by municipal water providers. Through its effects on prevailing weather conditions, climate change will affect both the supply and demand for water and indicators for water supply reliability. A risk management framework is invaluable for evaluating the potential impacts of climate change in light of other planning uncertainties and available supply-side and demand-side management alternatives.

This paper describes how a probabilistic approach to water supply reliability forecasting helps reveal the risks associated with climate change in the context of other confounding factors. A future water needs algorithm developed by Tampa Bay Water will be used as a case example for simulating alternative scenarios of climate change and exploring the implications of these scenarios on projections of water supply reliability. The paper will address the following questions:

- How might climate change affect average climate and the distribution of weather events that affect supply and demand? Do historical weather records contain sufficient variation to express future climate scenarios?
- How does climate change alter existing (current) forecasts of water supply and demand? Do climate change scenarios improve or worsen the long-term outlook of water supply reliability in the Tampa Bay area? How do the effects of weather and climate compare with uncertainties surrounding future growth and socioeconomic trends?
- Do climate change scenarios suggest a new or refined portfolio of long-term management options? Can changes in demand be managed through water conservation? Are available water supply development options sufficient to meet demand with high probability or do alternative sources need to be identified?

This paper will discuss why and how climate change considerations are not unlike other factors that are variable and uncertain over a utility's planning horizon. In doing so, the paper will demonstrate how probabilistic, risk-based, approaches to planning can help portray climate change in a more realistic and systematic fashion for decision makers.