WATER RESOURCES IMPACT

DENVER WATER'S APPROACH TO PLANNING FOR CLIMATE CHANGE

Laurna Kaatz and Marc Waage

INTRODUCTION

Climate change is a new and pressing issue facing water managers. Unfortunately, with this challenge, utilities do not have a one-size-fits-all strategy for preparing for the possible changes coming our way. Climate conditions vary significantly from region to region, and in many areas (including Colorado) climate model projections do not agree about the direction of precipitation changes and about the timing and magnitude of temperature changes, so a single strategy is not a beneficial solution. Planning for this large amount of uncertainty is a relatively new practice for many water utilities. To add to this, climate change is a politically heated topic, creating additional barriers for planners and utilities to maneuver through.

Here we present some concepts and principles that the staff at Denver Water use to help deal with the challenges of planning for climate change.

DENVER WATER'S CLIMATE CHANGE PLANNING PRINCIPLES

Attribution

Climate change, specifically human-induced (anthropogenic) climate change, is a politically charged topic. We have found it helpful to steer away from this debate. We portray the range of possible changes and implications that could occur in the future and try to focus on looking for the best way to prepare for that uncertainty. This approach helps avoid alienating people who are more skeptical about climate change and keeps the focus on preparedness and adaption.

Adaptation

There are two main ways to deal with climate change: mitigation and adaptation. Mitigation focuses on identifying ways to lessen or stop anthropogenic climate change, including reducing greenhouse gas emissions. Adaptation identifies ways to adjust practices and plans as climate conditions change to reduce the negative impacts of climate change. Denver Water works on both areas, but our main focus is on adaptation. There are agencies and sectors much more equipped to lead the way in mitigation than a water utility, but we do our best to lead by example.

Knowledge Development

Climate change is a new planning consideration for utilities. For us, it required additional time and resources to learn and digest the science and projections, perform various sensitivity assessments (simple to sophisticated), figure out how to incorporate this new information into planning, and get to a point where an informed and well-scrutinized strategy can be implemented. Key to the development of this basic knowledge about climate change was the establishment of a climate adaptation coordinator position.

We have found it important to not only build this knowledge within the utility planning functions but also through other functions of the utility. This is challenging because we are asking people to fundamentally change how they think about and prepare for the future.

By spending time developing and maintaining our expertise on the subject, it keeps us on the forefront of emerging thinking and conversations, and helps us to push the science community to focus on research that better meets our needs.

Regional Collaboration

In Colorado, many water utilities use water from the same watersheds. Because of our long term record of streamflow, most utilities also use streamflow as the hydrology input for their water system models. Therefore, many utilities need to develop hydrology models so the temperature and precipitation change projections that come from global climate models can be converted into projections of streamflow changes.

Denver Water led an effort that engaged several other Front Range utilities to develop two hydrology models for our shared watersheds. This approach not only allowed our Front Range group to pool resources (financial and staff), but also helped us work together to develop a methodology we could all agree to. The effort resulted in generated streamflows based on a set of climate scenarios selected by the group that can be used in our planning. From here, we intend to compare results and continue our discussions as we incorporate the information into our water system models.

As Denver Water develops strategies to meet the needs of different futures conditions, we will identify areas of overlap across the strategies, eventually finding the best near-term strategy to prepare for multiple future conditions

An additional benefit of working together is that it allowed utilities with varying perspectives on climate change to participate. Some utilities could not embark on a climate change effort of their own because of the political nature of the subject. Working in a collaborative manner gave them the opportunity to take part.

Lastly, we were able to command attention from the science and research community in a way that would not have happened if we were working independently. This helped to make our methods more scientifically defendable, and it assisted the water utilities in developing strong working relationships within the research and academic communities. This presented opportunities for invaluable conversations and discussion about the appli-

cation of climate science in water resources, uncertainty planning, approaches to assessments, adaptation efforts, utility limitations, and other planning considerations. In particular, we found the Western Water Assessment, a Regionally Integrated Sciences and Assessments program (funded by the National Oceanic and Atmospheric Administration and the University of Colorado) to be the most effective and beneficial model for meeting our education and assessment needs.

Having completed developing a hydrology model and new streamflow projections, the Front Range group now meets on a quarterly basis and has plans to continue to communicate and embark on a next phase of regional analysis as we each take steps toward adapting to climate change.

National Collaboration

Our collaborative efforts go beyond state borders. Denver Water has found it valuable to work with utility industry groups such as the Association of Metropolitan Water Agencies, the American Water Works Association, the Water Research Foundation, the Water Reuse Foundation and the International Water Association. Each helps their constituents address climate change, and each has a different focus and expertise.

The most valuable national collaboration has come from working directly with other large utilities that are actively dealing with the same problems that we are. We achieve this by participating in the Water Utility Climate Alliance.

New Planning Methods

Deciphering climate model data and projections and figuring out how to use the information is a daunting task. Some climate scientists advise selecting projections from climate models that best simulate observed conditions. Others recommend choosing those that best simulate climate processes that most directly and significantly influence your area. Still others say that using all of the information is the best way to go. And of course, there is the thought that models with the most agreement should be selected. There are numerous approaches, each supported with one theory or another, but when it comes to planning with the model projections, we feel there is still a long way to go before we can definitively identify one climate model as more predictive for our region than another.

Our approach is to consider the projections from each model and emission scenario to be equally plausible. Because it is not feasible for our utility to consider all projections, we take a scenario approach. In our first assessment, we selected a small set of simple temperature and precipitation change factors. In the more sophisticated approach with the Front Range group, we selected a subset of climate projections that incorporated most of the range of the data for our region. In both cases, the scenarios were then used in assessments to establish

streamflow sensitivity to adjusted temperature and precipitation data. Next, we plan to use these streamflow sequences to develop and test developed strategies for strengths and weaknesses to arrive at the best adaptation plan. This is sometimes called the "no regrets" or "low regrets" approach to climate planning.

Our caution when going through this process is to consider the infancy of climate science and its application in water resources planning. It is tempting to think of commonality within a suite of global climate model projections as representing a probability distribution function, but we feel model agreement (precision) does not insinuate model accuracy in predicting future climate conditions. We hope that this approach could eventually become one way of reliably sifting through climate projections as the science improves.

There are a number of ways to plan for uncertainty. Several were presented in a paper that Denver Water helped develop called, "Decision Support Planning Methods: Incorporating Climate Change Uncertainty Into Water Utility Planning" (released by the Water Utility Climate Alliance in January 2010). The approaches addressed climate uncertainty through scenarios (considered equally plausible), probabilities, or a combination of the two. Because many utilities cannot wait to make planning decisions until better climate information is available (that is wait for "actionable science") and some are eager to consider climate change in their planning, applying one or more of these methods helps to dissolve the planning barrier that tends to impede the adaptation process.

Being skeptical of the probability approach, Denver Water is using a traditional scenario planning approach for its long-range water planning, which will consider climate change as well as a number of other uncertainties that were identified in the process. In this approach, planners consider multiple different future conditions (whether they be different climate projections or different uncertainties entirely) without having to get our utility to agree to a single future condition to plan for. The scenarios are developed by identifying what the utility considers to be the most important but least predictable driving forces of change. As Denver Water develops strategies to meet the needs of different futures conditions, we will identify areas of overlap across the strategies, eventually finding the best near-term strategy to prepare for multiple future conditions.

In one of our scenarios, called the Hot Water future, we are testing the implications a 5°F temperature increase has on meeting future demands. Though simple, this scenario is one step in the direction of climate change strategy development, and as we become more versed in this approach, we intend for our climate scenarios to become more sophisticated.

CONCLUSION

Denver Water is active in our planning for climate change, but we are still struggling along with everyone else to make sense of all the available information and stay up-to-date as new science emerges. We find that focusing on adaptation, knowledge development, regional and national collaboration, and new planning methods help us prepare for climate change. We intend to continue to challenge and evolve our thinking and philosophy as this field continues to grow and change over the years to come.

AUTHOR LINK Laurna Kaatz
Climate Adaptation Coordinator
Denver Water
1600 W. 12th Ave.
Denver, CO 80204
(303) 628-6424 / Fax: (303) 628-6852

E-MAIL Laurna.Kaatz@denverwater.org
Marc.Waage@denverwater.org

Laurna Kaatz is the climate adaptation coordinator for the Planning Division at Denver Water. Her primary responsibility is to coordinate climate investigations and implement the findings into the planning process. Laurna's work incorporates many areas of water resource planning, including climate and drought planning, operational and water rights analysis, and long range integrated resource planning. Before her career at Denver Water, Laurna was a Professor of Physics at Sweet Briar College, and then went to work as a climate science researcher with Aurora Water. Laurna has a Master's degree in physics and a Bachelor's in physics and mathematics. She is a Colorado native and enjoys all the outdoor activities it has to offer

❖ ❖ ❖