

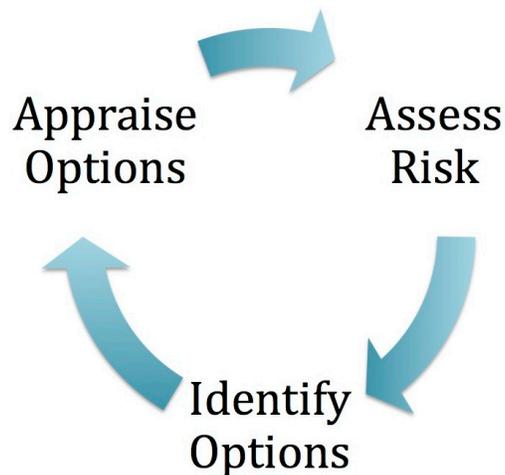
## Case Study – Denver, CO

### How to Get Started on Your Vulnerability Assessment

#### Introduction

In the Academy’s first webinar, we talked about the “Adaptation Bottleneck.” This phenomenon describes the challenges facing decision makers who have awareness of the broader impacts of climate change but find it difficult to move forward in the development of adaptation policies or actions.

One common adaptation bottleneck results from endless analysis and reanalysis. In particular, steps 3, 4, and 5 in the Iterative Risk Management Roadmap can lead to “analysis paralysis” if people are not confident that their analyses are sufficient for decision making, or find it’s simply easier to do additional studies than establish priorities and make choices.



It’s easy to get stuck in the analysis loop on the Iterative Risk Management Roadmap, leading to the “analysis paralysis” adaptation bottleneck.

Climate change vulnerability assessments address Step 3 in the Roadmap by considering exposure to climate risks (their character, magnitude, rate of change), the sensitivity of the systems being evaluated, and the capacity of the systems to adapt to changing climate conditions, assessing both qualitative and quantitative aspects of vulnerability. The assessments then help decision makers begin to formulate adaptation policies, practices, and priorities – and leave the bottleneck behind!

## **Moving Through the Adaptation Bottleneck with Vulnerability Assessment**

Vulnerability assessment has three main objectives:

1. Identify who or what has the most exposure to climate change
2. Determine the range of tolerance of these entities
3. Characterize the ability of the system to accommodate climate change, including social and institutional factors

Our March 21, 2012 webinar *Getting Through the Bottleneck: Vulnerability Assessment* with guests Curt Baranowski, Team Lead, Climate Ready Water Utilities Initiative at US EPA and Laurna Kaatz, Climate Scientist, Planning Division at Denver Water, focused on the first two objectives – identifying the exposure to climate change and the sensitivity of water supply and demand.

### **Climate Ready Water Utilities**

The Climate Ready Water Utilities Initiative of the US EPA is aimed at providing drinking water, waste water, and storm water utilities with practical tools, training, and technical assistance that they may need to adapt to climate change. The initiative fosters a clear understanding of climate science and available adaptation options.

The initiative's vulnerability assessment tools build on a decade's worth of preparation for terrorism-based hazards by trying to determine what it means to be "climate ready." Soliciting the assistance of their stakeholder water utilities through the National Drinking Water Advisory Council, the team has identified:

- ▶ Key attributes for a water utility to be climate ready
- ▶ Climate change-related tools, training and products to address utilities' short and long-term needs
- ▶ Mechanisms that would facilitate the adoption of climate adaptation strategies by the water sector

The Council's report has 4 recommendations related to climate vulnerability assessments:

1. Build on and strengthen existing decision support models and tools
2. Increase the knowledge of other sectors about water-related climate risks and what the water sector may need from them
3. Improve the availability of locally relevant and understandable climate information
4. Better integrate climate change information into existing technical assistance initiatives

Vulnerability assessments provide the groundwork for assessing the potential benefits of implementing adaptation options. It can be especially helpful to assess how those options can

provide benefits now, as utilities are challenged by extreme events, in addition to considering future climate change risks. Options that have benefits now and in the future can be considered 'no regrets' options and utilities may find it easiest to gain support for these kinds of options. However, 'no regrets' does not mean 'cost free'. Every management plan comes with tradeoffs and opportunity costs.

### **Vulnerability Assessments: Lessons from Denver Water**

Although the magnitude and timing of warming shown by projections of possible future climate varies, warming is one of the most consistent messages emerging from climate model studies. Colorado has already experienced warming temperatures that have hydrologic implications, including changes in snowpack, evaporation, soil moisture and its importance in translating snowpack into runoff, and wildfire frequency, intensity, and impact.

Denver Water assessed their system sensitivities and vulnerability to these changes using two methods, one simple and the other more complex, built on coordinated approaches considered by the Water Utilities Climate Alliance (WUCA). The simple approach looked at what impact 2 and 5 degree (F) temperature increases could have on water yield and water demand. The results showed decreases in yield, increases in demand, and limitations in the ability of existing demand estimate tools to address the larger climate changes. The simple analysis also looked at what precipitation increase would be needed to offset the impacts of the 2 and 5 degree warming. The more sophisticated assessment found that a 5 degree temperature increase would reduce system yield by over 20% and increase water demand by 20% - a scenario which would be "game changing" for Denver Water.

A more recent study, available from the Water Research Foundation, conducted in collaboration with other water utilities on Colorado's Front Range, identified an approach to screen the many (121) climate projections available to evaluate their system sensitivities, without having to use all of them in their hydrology models. They also identified static offsets for temperature and precipitation that could be used independently of the climate projections.

From their experience, Denver Water identified some useful questions to consider when designing a vulnerability assessment:

- ▶ Why are you doing this assessment?
- ▶ Are there any assessments, tools, or data out there already, that you can use?
- ▶ Can you join forces with others? Working with other utilities or organizations can make your analyses more cost-effective as you work with regional experts and share staff, lead to an approach that will be regionally accepted, facilitate the sharing of findings, and

help get the attention of experts who are often too busy to respond to individual requests.

- ▶ How much information do you really want to generate? For example, how many and which climate change projections and hydrology models do you want to use, and for which locations? The possibilities can seem endless, so it's worth prioritizing efforts here.
- ▶ What is best for your agency in terms of engagement of decision makers and stakeholders? The reality is that these types of studies can generate challenges for planning, and ongoing public struggles related to policies and expectations. A vulnerability assessment, because it does focus on challenges, can be used against a utility in ongoing planning processes, especially where there are existing public struggles. Effective presentation of findings is key, but may not be sufficient.
- ▶ How will this fit into your planning? Denver Water changed from considering a single static future to considering multiple possible futures that change over time. If your planning processes have not considered climate change before, you may want to start with a simple approach.
- ▶ Will this get you where you want to go? Before you spend a lot of time and money on a study, make sure you will be able to, in the end, address your original question about why you are doing the assessment.

### **The Bottom Line**

Figuring out how to incorporate climate change adaptation in your planning is really difficult. Water utilities need to appreciate that climate science for applied purposes will continue to evolve. The expectation should be that utilities keep track of changes in the science and methods.

By considering climate projections as possibilities rather than predictions, the outputs of a vulnerability assessment can be useful even without everyone agreeing on a specific projection. They can identify options that can increase a utility's resilience to extreme conditions that may be experienced in the short term. And while these kinds of studies can take a lot of resources, from tens to hundreds of thousands of dollars, by working together or building on the efforts of other utilities, even utilities with limited resources can do some sort of vulnerability assessment.

The key is to not get stuck in an endless loop of analysis – analysis paralysis. Identify the issues that really matter for your system and commit to taking some kind of action!

## Tools

Reports:

USEPA, 2010. [Climate Change Vulnerability Assessments: A Review of Water Utility Practices](#). This report identifies characteristics of climate change vulnerability assessments emerging from a review of the steps taken by eight water utilities. The report describes the approaches, steps, information needs, and judgment required for conducting useful vulnerability assessments for water utilities.

See: <http://water.epa.gov/scitech/climatechange/upload/Climate-Change-Vulnerability-Assessments-Sept-2010.pdf>

USEPA, 2011. [Climate Change Vulnerability Assessments: Four Case Studies of Water Utility Practices](#). This report provides a detailed look at how four water utilities conducted their vulnerability assessments. The examples span small to large utilities, qualitative and quantitative approaches, and a wide range of potential climate impacts and system vulnerabilities.

See: <http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=233808>

National Climate Assessment, 2011. [Uses of Vulnerability Assessment for the National Climate Assessment](#). This report reviews the process of vulnerability assessments, including the strengths and weaknesses of existing practices. Section IV is especially helpful because it provides criteria for evaluating vulnerability assessments, suggestions for data sets, a diagram to help scope vulnerability assessments, and guidance for communication of results.

See: <http://downloads.globalchange.gov/nca/workshop-reports/vulnerability-assessments-workshop-report.pdf>

[Local Climate Impacts Profile \(LCIP\)](#). This tool is part of the UKCIP toolbox. The LCIP process highlights a locality's current vulnerability to severe weather events, including assets, infrastructure, and service delivery capacity. While written for United Kingdom communities, the guided steps and tips are broadly applicable to the U.S. West. See: <http://www.ukcip.org.uk/lclip>

[EPA's Climate Resilience Evaluation and Awareness Tool \(CREAT\)](#). CREAT allows water utilities to evaluate potential impacts of climate change on their systems and to evaluate adaptation options. The tool guides users through identification of threats based on climate change projections and design of adaptation plans based on the types of threats considered. CREAT provides a series of risk reduction and cost reports as well. See: <http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>