



Case Study – Colorado River Basin

Why Robust Decision Making Supports Risk Management and What You Can Do About It

When there is significant uncertainty about how the future might unfold, it can feel impossible to optimize your resource management plan. What works under one scenario might fail catastrophically under a not-so-different scenario. That uncertainty sounds a lot like climate change, doesn't it? We know things are changing, but how much and when we'll see those changes is not so clear. How does one make a decision about the long term management of, say, their water system when they don't know what water supplies will look like even 5 years from now?

Robust decision making is a great place to start. Robust decisions lead to management plans that perform well under a variety of possible conditions. The good news is that you can incorporate robust decision making into almost every stage of the Iterative Risk Management roadmap. You can start using it now, no matter where you are in your decision making process.

There are several definitions of robust decision making. The two most common are:

1. Robust process for making decisions: Start wherever you are, using a variety of approaches to make plans and take actions that perform well under a variety of conditions.
2. Robust Decision Making: a specific decision process developed by Rand Corporation and others that uses thousands of scenarios to explore system behavior and tradeoffs among options using software modeling.

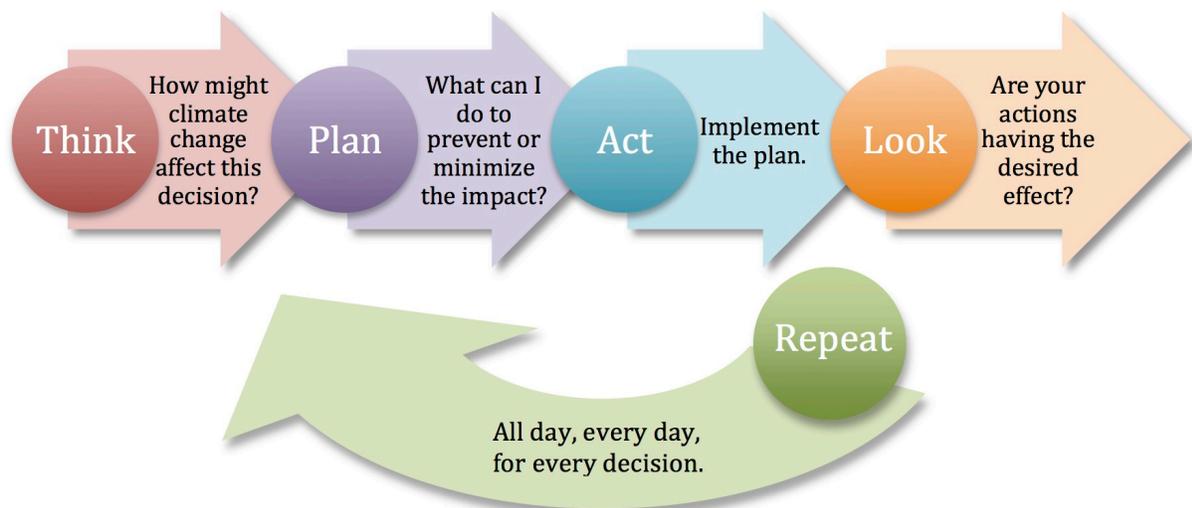
Our webinar on November 14, 2012 featuring guests Lara Hansen, Chief Scientist & Executive Director of EcoAdapt and Carly Jerla, Co-Study Manager for the US Bureau of Reclamation's Colorado River Basin Water Supply & Demand Study focused on the robust process in the first definition.

A Basic Robust Process for Climate Change Decisions

The steps for getting started with a robust decision making process are: (1) have a goal; (2) have a way to assess information and take action toward that goal; and (3) determine if your actions and decisions are effective. The final step is ultimately what makes the process robust,

since you can begin the process again if you find you aren't meeting your goal. These are very broadly defined steps that can be applied to highly scoped or very comprehensive problems. Many decision makers already do this, but just need to incorporate climate information within the process.

While considering climate change can be intimidating because there are so many sources of information and different types of analysis, the key is to start with what you know and practice. For example, for your next decision at work, you might ask: How might this be vulnerable to, or affected by, climate change? What can I do about that? What do I need to know to make that happen? Consider how climate interacts with your goal, what information and decision processes you already use, and what climate information you need to know to build on your existing information and decision processes.



Lara Hansen of EcoAdapt shared a simplified version of the Academy's Iterative Risk Management Roadmap that can help guide you through the robust decision making process.

Robust Decision Making in the Colorado River Basin

The Bureau of Reclamation's Colorado River Basin Water Supply and Demand Study is an example of analysis to support a robust decision making processes. The study objective was to assess future water supply and demand imbalances over the next 50 years, and then develop and evaluate opportunities for resolving imbalances where demand exceeds supply. The steps used to scope the study included:

1. *Identify the range of future conditions.* Used independently developed scenarios of water supply and demand.

2. *Identify indicators of basin resource performance.* Focused on system reliability metrics for different system resources such as water deliveries, water quality, flood control, and more.
3. *Identify unacceptable outcomes for key metrics.* Focused on vulnerability thresholds.
4. *Identify attributes of option performance.* Developed criteria to characterize different adaptation options.

The use of scenarios and vulnerability thresholds were the new types of information that helped connect the existing process to climate change considerations. Adaptation options were organized into four portfolios that each included several different types of options.

Robust decision making helped Reclamation address uncertainty in their Supply and Demand Study by assessing vulnerability and helping make sense of the results of hundreds of scenarios. A key aspect of the study was using the scenarios to identify the conditions that “drive” the vulnerabilities, which helped to define signposts that indicate when specific adaptation options might be needed. By characterizing these vulnerabilities, Reclamation was able to develop “dynamic” portfolios of options, representing a more realistic adaptation strategy of implementing options within a portfolio only as they are warranted, as the future actually plays out.

The Colorado River Basin Supply and Demand Study highlights a common issue in considering climate change in short or long range planning: those who do analyses to support climate adaptation decisions are often not the people responsible for making the decisions. Those adaptation decisions may be made in a complex setting with many stakeholders and many possible options being considered. It is important to document the analysis process in ways that are usable by the decision makers, especially if the analyses are highly technical. This study also highlights the importance of having many different perspectives and skills in a collaborative group setting that can challenge existing processes that have not considered climate change. Basin stakeholders will consider the study successful if it provides a compelling technical basis for continued discussion by decision makers about climate vulnerabilities and options.

The Bureau of Reclamation website for the study, including the full report, fact sheets, and updates about outreach and discussions is:

<http://www.usbr.gov/lc/region/programs/crbstudy.html>

Tools

Training Tool:

[Preparing Hydroclimate Inputs for Climate Change in Water Resource Planning](#). This module is part of the COMET-MetEd program (developed and maintained by the University Corporation of

Atmospheric Research's Community Program, sponsored by NOAA and others) and describes the process of selecting the best available climate projection information and using it to develop "climate-adjusted weather" inputs to be used for modeling climate change impacts. It is available in an interactive or print form, and takes about 3 hours to complete. It is free, but requires registration. See: https://www.meted.ucar.edu/training_module.php?id=959

Guide Tools:

Climate Adaptation: Risk, Uncertainty, and Decision Making. This is the United Kingdom Climate Impacts Program (UKCIP) report that outlines in detail the Iterative Risk Management Framework that forms the basis of Carpe Diem West Academy's climate change planning roadmap. The overall objective of this report is to provide guidance that helps decision-makers and their advisors: 1) Take account of the risk and uncertainty associated with climate variability and future climate change; and 2) Identify and appraise measures to mitigate the impact or exploit the opportunities presented by future climate – that is, to identify good adaptation options. See: <http://www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf>

Climate Adaptation Wizard: This is a simplified version of the previous report, also produced by the UKCIP. The Adaptation Wizard helps assess an organization's vulnerability to current climate and future climate change, identify options to address an organization's key climate risks, and helps develop and implement a climate change adaptation strategy. See: <http://www.ukcip.org.uk/wizard>

Preparing Local, Regional and State Governments for Climate Change: This guidebook was prepared for ICLEI's climate resilient community program. Its purpose is to help a decision-maker in a local, regional, or state government prepare for climate change by recommending a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools. See: <http://www.icleiusa.org/action-center/planning/adaptation-guidebook>

Climate Resilience and Adaptation Tool (CREAT). This tool from the Environmental Protection Agency (EPA) allows users to evaluate potential impacts of climate change on their utility and to evaluate adaptation options to address these impacts using both traditional risk assessment and scenario-based decision making. The tool guides users through identifying threats based on regional differences in climate change projections and designing adaptation plans based on the types of threats being considered. Following assessment, CREAT provides a series of risk reduction and cost reports that will allow the user to evaluate various adaptation options as part of long-term planning. See: <http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>

Climate Change Handbook for Regional Water Planning. Developed cooperatively by the California Department of Water Resources, EPA, Resources Legacy Fund, and the U.S. Army Corps of Engineers, this guide provides a framework for considering climate change in water management planning. The Handbook includes: 1) The science of climate change, tools and links; 2) Evaluating the energy-water connection and greenhouse gas emissions; 3) Assessing regional vulnerability to climate change; 4) Measuring regional impacts; 5) Evaluating projects, resource management strategies, and Integrated Regional Water Management Plans with respect to climate change; 6) Implementing and quantifying uncertainty; and 7) Case studies illustrating a range of climate change adaptation and mitigation issues within and outside of California. See: <http://www.water.ca.gov/climatechange/CCHandbook.cfm>

Climate Adaptation Knowledge Exchange Case Studies Database: Developed by EcoAdapt, this collection of case studies provides information about on-the-ground climate adaptation projects. See: <http://cakex.org/case-studies>