Will Phoenix Have Sufficient Water? A Workshop to Assess Stressors to an Urban Water System

Mark Neff, Netra Chhetri, Dan Sarewitz, Lori Hidinger, Megan O'Shea, Aliya Buttar, Uven Chong

Phoenix, Arizona, located in the desert Southwest, is one of the fastest growing metropolitan regions in the United States. Concerns are mounting in the popular press and the academic literature about the vulnerability of the Phoenix water supply to a variety of stressors, including climate change, population growth, and water quality. Regional water managers in general do not express much concern about the adequacy of the water supply for the rapidly growing region because the growth is displacing agriculture, a significant consumer of water. In order to assess the vulnerability of the Phoenix water system to a variety of stressors, we conducted a two-day intensive workshop consisting of 24 scholars with relevant expertise. Prior to the workshop, we wrote a discussion paper in which we extrapolated published predictions about a variety of potential stressors on the system in order to rank their relative importance by the year 2025. Participants were asked to review the paper, challenge our assumptions, and refine our ranking of stressors. A variety of disciplinary backgrounds was represented in the workshop, including sociology, geography, climatology, hydrology, economics, and engineering. Participants were reluctant to rank the importance of stressors, but brought to light a variety of concerns that we were unable to represent in our original discussion paper. This poster reports the results of our workshop to rank stressors on the Phoenix, AZ water system, including our ranking and participants' reactions to that ranking.

Will Phoenix Have Sufficient Water?

A Workshop to Assess Stressors on an Urban Water System

Mark Neff, Netra Chhetri, Dan Sarewitz, Lori Hidinger, Megan O'Shea, Aliya Buttar, Uven Chong

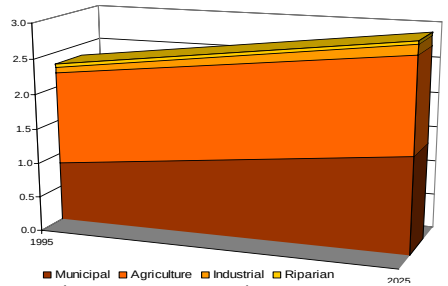
Consortium for Science, Policy, and Outcomes, Arizona State University

Water in central Arizona

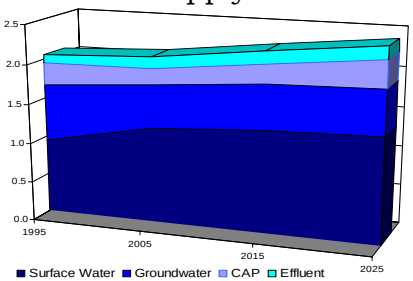
The Phoenix metropolitan area has a mean annual precipitation of 7", making it highly dependent on water from outside of the region. The region's population is expected to rise from 2.5 million in 1995 to 6.3 million in the year 2025. Water managers plan on using water currently allocated to agricultural uses to meet the increasing demand. Our project is designed to assess the importance of climate and other stressors on the system's ability to meet demand between now and the year 2025.

Projected supply barely meets demand

Projected water demand



Projected water supply



Official projections suggest that water supply will barely be able to keep up with demand for the coming decades. Our project seeks to assess the relative importance of stressors on this optimized system.

Source:TMP-ADWR, 1999 (water demand) and MAG, 2003 (population projection prepared for Central Arizona Project) based on current use scenario by sector, Phoenix AMA, 1995-2025

Initial ranking of system stressors

Identify stressors from literature

↓

Identify cause/effect relationships and how they are modeled in the literature

↓

Extrapolate trends to year 2025

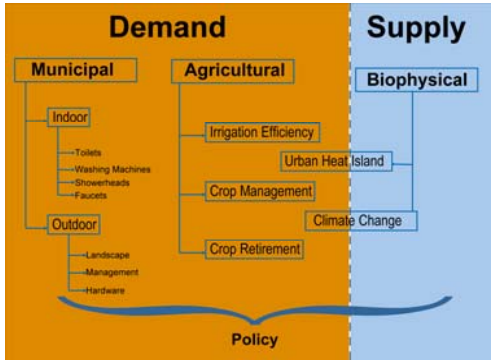
↓

Compare expected effects on water supply/demand

↓

Convene **workshop** with relevant researchers to refine the ranking

Factors included in stressor ranking



Stressor ranking

Stressors		Potential changes in water supply or demand (acre-feet)	Ranking
Inefficiency	**Municipal**	328,180	
	Indoor water use	88,830	**4**
	Outdoor water use	239,350	**1**
	Agriculture	127,022	**3**
Biophysical Stress	**Biophysical**	241,551	
	Additional demand due to UHI	25,357	**5**
	Reduction of surface water due to climate change	216,194	**2**

Workshop to refine ranking

In early November, 2006, we hosted a two day workshop with 28 participants to review and refine our initial ranking. Participants included academics from a diversity of fields that study the central AZ water system, including ecology, economics, engineering, climate modeling, legal studies, physical and cultural geography, and sociology. The participants did not reject our ranking, but a number of themes emerged from the discussion that they felt should be addressed in future ranking exercises.

Themes emerging from workshop

- **Water quality-** Supply is not the only issue, as some of the water is becoming too saline for agriculture and other uses.
- **Agriculture and resilience-** Conversion of agricultural water to other uses reduces the resilience of the system.
- **Lack of urgency-** Problems may emerge outside of the 18 year timespan in this study.
- **Climate change as a motivating factor-** Participants wondered if climate change could inspire managers to focus on building resilience into the system.
- **Uncertainty around climate change-** Future climate is very uncertain, especially on local to regional scales.
- **Price-** The relationship between pricing structure and water use is highly uncertain. Equity in water-scarce times was also a concern.
- **Legal/Policy framework-** The biophysical system is embedded in a complex water law system, a factor which must be included in an analysis of stressors.
- **Importance of institutions-** Water management is done by a variety of institutional actors, each with its own set of motivations and constraints. This complexity should be acknowledged in the stressor ranking.

Next Steps

Feedback from workshop participants is being integrated into a second draft of the water ranking paper. A modified version of this method will be used to assess the various stressors on a selection of tropical coral reefs. Climate is often invoked in the literature as a significant stressor on these systems, and we intend to assess how important it is in comparison to other stressors.

The workshop report and white paper are available at www.cspo.org

Acknowledgements

This material is based upon the work supported by the National Science Foundation under Grant Nos. SES-0345604 and SES-0345945. Funding support for this project also comes from Decision Center for Desert City (DCDC) at Arizona State University. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.