Vulnerability and Resilience to Climate Change, Variability, and Growth in Tucson, Arizona

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Outline

- City of Tucson Water Department and Tucson Active Management Area
- Water use trends and changing demand
- Vulnerability
  - Drought
  - Resource dependence
  - Effluent
  - Conservation
- Adaptive water management
- Implications for policy and planning
Tucson Water’s Water-Resource Utilization Plan

- **Millions of Cubic Meters**
- **Year**
- **Acre-Feet**
- **Additional CAGRD Ground Water Incidental Recharge Total Demand Potable Demand**
- **2032**

- Tucson Water’s Water-Resource Utilization Plan
Vulnerability is tied to

- Prolonged drought and climate change
- Resource dependency on narrow range of available water resources
- Differential impacts of lack of availability or access to water
- Perceptions of respective entitlements to the resource
- Capacity of individuals and system managers to adapt and maintain livelihoods
Drought

“Drought can extend for a single season or last for several years. Our current drought has lasted for about ten years and we have no indications of when this drought will end.”

Summer monsoon:
- June-September rainfall averages 6.06 inches (154 mm)
- 1989 and 2004 - 40 percent of the long-term average

Social and institutional factors influence Tucson’s capacity to respond to drought:
- Water conservation practices
- Long-term storage (aquifer recharge and recovery)
Managers’ & planners’ perspectives: Tucson’s vulnerability to climate

- “Drought and climate change represent the vulnerability we never dealt with in the past.”
- “We know about global warming and drought, yet we continue our dependence on groundwater.”
- “We need to match climate uncertainty with sustainability principles that form the core of integrated water resources management.”
Managers’ perspectives: Water resources planning

• “We excessively use groundwater and face a potential reduction in our CAP allotment... We need to increase use of reclaimed water and to move customary uses of potable water to reclaimed water, especially more treated effluent to augment groundwater”

• “Take the initiative now to establish regional conservation practices, develop and deploy regional infrastructure, and develop alternate water resources . . . to meet the needs of today’s—and tomorrow’s—customers”
Managers’ perspectives: Public perceptions

• “Most people don’t understand either the **whole water cycle or the carrying capacity** of the region.”
• “The **public** needs to appreciate the true value of reclamation & the amount of energy it requires.”
• “It’s crazy to call reclaimed water ‘**wastewater**’; it’s definitely water that shouldn’t be wasted.”
• “**Growth** will occur regardless of the status of water or water reclamation. Having or not having reclaimed water will not promote growth, but will enable water managers to deal with it.”
• “The public asks, ‘Why conserve for future **growth**?’”
Effluent as a hedge against water sector vulnerability

- 15,750 acre-feet of effluent mostly for golf courses, schools, public parks
- Small fraction available to residential users in 3 Tucson neighborhoods
- Effluent for habitat restoration in Santa Cruz River
- Water banking credit
- 9 percent of Tucson’s water demand
Concerned about future water supplies
Reuse will conserve groundwater
Reuse will increase water security
Reuse will reduce vulnerability to shortage
Reuse will reduce dependence on CAP

- Disagree: 1%, 11%, 15%, 25%, 7%
- Neutral: 2%, 3%, 4%, 15%, 12%
- Agree: 97%, 82%, 75%, 48%, 66%
- Don't know: 1%, 11%, 15%, 25%, 15%
Conservation & demand ‘hardening’

- If conservation takes all the ‘slack’ out of the system (and growth consumes the water saved), there’s little opportunity to adapt to future shortage.

Water utility paradox

- Higher water sales pay for operation and maintenance, but utilities are charged with decreasing consumption.
Adaptive water management

Adaptive management identifies uncertainties, and then establishes methodologies to test hypotheses concerning those uncertainties.

Adaptive management must be a social as well as scientific process and focus on the development of new institutions and institutional strategies.

Examples: Scenario planning, City/County Water/Wastewater Study
Implications for policy and planning

- Underscore Blue Ribbon Panel efforts to increase water reclamation and recycling
- Promote regional planning across multiple jurisdictions
- Media campaign and televised townhall-like opportunities to discuss potential solutions
- Encourage conservation, reduced outdoor landscaping, incentives for rainwater harvesting and greywater (careful of wastewater flows)
- Substitute effluent for non-potable uses
**Growth implications**

- Planning and conservation will be hampered if growth is not effectively regulated.
- Further research required on the policy options and implications of growth, particularly with respect to water resources in Tucson and more generally across the case studies considered in this SARP project.
THANK YOU!

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