The National Science Foundation's

Decision Center for a Desert City

Patricia Gober & Charles Redman, Co-Directors

Investigating Human Decision Making Under Climatic Uncertainty

P. Gober, C. Redman, B. Edwards, N. Jones. Decision Center for a Desert City, International Institute for Sustainability, ASU, Tempe, AZ 85287-3211

Introduction

The Decision Center for a Desert City (DCDC) is one of several new National Science Foundation-funded centers to investigate human decision making under climatic uncertainty. Increasingly, it is recognized that even the best science will not significantly reduce uncertainty about global climate warming and the climate cycles that cause droughts, floods and other severe weather events. Society must learn to make better decisions in the face of uncertainty. DCDC was founded to focus on water management decisions in the urbanizing desert of Central Arizona.

DCDC's core mission is to enhance and improve water management decision making. To that end, it seeks to:

- investigate the cognitive processes by which individuals and water managers make decisions
- apply the most sophisticated models of decision science to water allocation and use
- use meso-scale climate models to produce regional forecasts of temperature and precipitation
- develop GIS-based decision-support tools that foster better long-term and more integrated decision making
- engage the community in a conversation about itself and its water future
- develop innovative education programs organized around water, climate, and decision making.

http://dcdc.asu.edu

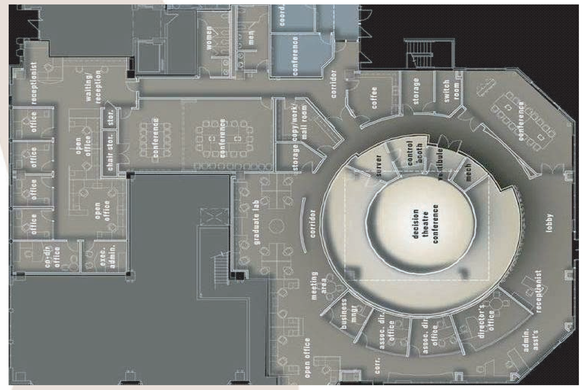
Current Projects

Agent Base Modeling
Bill Griffin from the Department of Family & Human Development is developing an agent-based model of what might happen in terms of human dynamics if the price of water increased or a "serious" conservation program were to be promoted by community leaders. Working with Bill are Brad Armendt (Philosophy), Tom Taylor (Mathematics & Statistics), Libby Wentz (Geography), Jana Hutchins (Information Technology), Shana Schmidt (Family & Human Development), Shade Shutters (Biology), and Suresh Ayyalsamy (Family & Human Development).

Decision Theater Visualization
Peter McCartney (International Institute for Sustainability) will integrate the output from the agent-based model into the Arizona Department of Water Resource's MODFLOW model of groundwater pumping and recharge.

Arizona Water Atlas
A planning team is at work developing a water atlas and regional water information system.

DCDC & Decision Theater – Orchid House in the Brickyard



DCDC Water/Climate Briefings

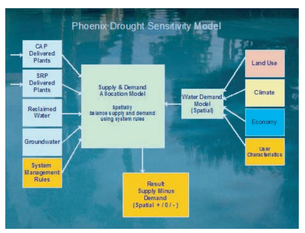
City of Phoenix Municipal Water Planning
[July 2004]

•Ray Quay, Assistant Director, Water Services Department
•Steve Rossi, Principal Water Resources Planner, Water Services Department
•Tom Buschatzke, Water Advisor, City Managers Office

❖**Planning Uncertainties**
- Growth, demand, length and severity of drought
- CAP shortage projections
- Environmental requirements

❖**Approaches to Uncertainty**
- *Scenario development & modeling*: Growth scenarios, variable demand levels, drought-based supply reductions, delays in water acquisition, infrastructure limitations
- *Analysis of potential future outcomes*: Identify boundary scenarios and trigger conditions, identify potential opportunities, threats and risk
- *Develop strategic concepts*: Strategies to balance risks and costs; prepare response as conditions develop; guide evolution of functional plans

❖**Drought Sensitivity Model**
- Tests water supply and demand scenarios



Phoenix Drought Model

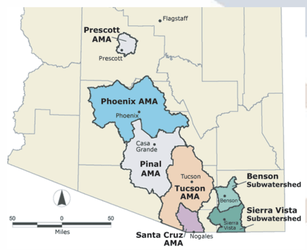
Arizona's Water Management Framework and Current Challenges
[September 2004]

- Jim Holway, Assistant Director, AZ Department of Water Resources
- Kathryn Sorensen,, Water Resources Coordinator, City of Mesa
- Brad Hill, R.G., Water Resource Manager, City of Peoria
- Karen Smith, Division Dir., Water Quality, AZ Dept. of Environmental Quality

❖**Arizona Department of Water Resources (ADWR)**
- Water Management Policy
- Management Tools
- Groundwater Management Act: to secure and allocate groundwater resources
- Management Structure: Active Management Areas, state-wide provisions, irrigation non-expansion areas

❖**City of Mesa—Meeting future demand**
- Efficient use of reclaimed water resources
- Water banking/adequate well capacity
- Drought/climate change
- Working cooperatively

❖**Peoria—Water policy & challenges**
- Link growth and sustainable water supplies
- Access additional surface water supplies
- Siting new water supply wells
- Educate public

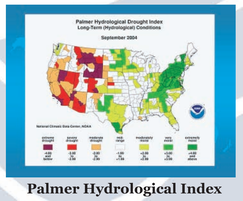


Active Management Area

Update from the Climate Science Team
[October 2004]

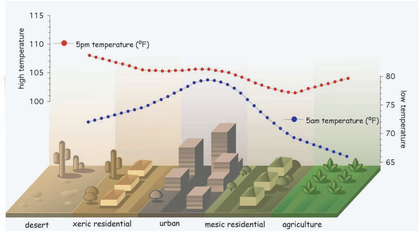
•Robert Balling, Professor, ASU Department of Geography
•Joseph Zehnder, Professor, ASU Department of Geography

❖**Impact of Climatic Uncertainty on Colorado River Basin Water Supply**
- Palmer Hydrological Index: identifies central Arizona as anticipating severe drought
- Pacific Decadal Oscillation Patterns
  - ✓Increased data gathering efforts with links to hydrology and human use; develop drought indices; explore decision tools



Palmer Hydrological Index

❖**Urban Heat Island**
- Over past 30 years, daytime temperatures have experienced little change
- In the same period, nighttime temperatures have increased 3 degrees
- The spatial distribution of increased heat expands with growth
- Current metropolitan area will not get hotter



Urban Heat Island

Central Arizona Project, CAP Rates: An Example of Government Decision—Making about Water Use
[November 2004]

•Grady Gammage, Jr., Senior Fellow, ASU's Morrison Institute; CAP Board Member
•Ted Cooke, Assistant General Manager, CAP
•Sid Wilson, General Manager, CAP

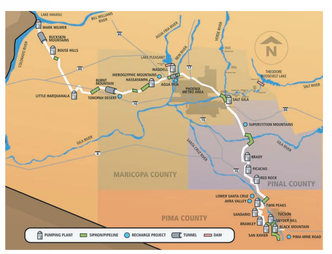
Government Decision-Making
❖Rate-Setting Decisions: CAP rate reduction during a regional drought

❖Management: popularly elected Board of Directors (10 from Maricopa County, 4 from Pima, 1 from Pinal)

❖CAP Rate-Setting Policy
- Recover costs
- Encourage full use of apportionment
- Financial stability
- Price stability

❖Rate Setting Considerations
- Availability of other revenue sources; reserve strategy; contractual; rate subsidies; support for recharge

❖Reduced reserves by 20%
❖Reduced property taxes and capital charges



Central Arizona Project