A research agenda to link stakeholder values with WaterSim, a quantitative, supply-demand model of water in the Phoenix region.

This research project explores the potential consequences of stakeholder values (what stakeholders want) regarding water resources in the greater Phoenix area. This is done through an innovative qualitative-quantitative approach to scenario construction. Key research questions include:

I. According to stakeholders, how should water be governed and used in the greater Phoenix area in the future?
II. What are the consequences of different stakeholder values should they be realized?

Integrated Scenario Methodology

1. Values Survey
   - Cross-sectional online survey
   - N=106 (response rate 32%)
   - 5 multi-item, Likert-like questions
   - Principal components analysis

2. Qualitative Scenario Analysis
   - Variables/projections construction
   - Qualitative system analysis
   - Consistency analysis
   - Scenario selection

3. WaterSim Simulations
   - Link projections & model variables
   - Run model
   - Sensitivity analysis

4. Sustainability Assessment and Scenario Revision
   - Sustainability metrics & thresholds
   - Participatory assessment

Results

Initially Selected Scenarios

<table>
<thead>
<tr>
<th>Variables</th>
<th>Supply</th>
<th>Delivery</th>
<th>Demand</th>
<th>Outflows</th>
<th>Cross-Cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>New water sources</td>
<td>Energy for water</td>
<td>New residential water use</td>
<td>Effluent water use</td>
<td>Water governance</td>
<td></td>
</tr>
<tr>
<td>Strong Groundwater and Demand Management</td>
<td>Not Pursued</td>
<td>100% Renewable</td>
<td>Growth controlled</td>
<td>Groundwater recharge and wildlife benefits</td>
<td>Active public engagement in decisions</td>
</tr>
<tr>
<td>Water Infrastructure for Megapolitan Development</td>
<td>Pursued</td>
<td>Mix. Renewable &amp; Non.</td>
<td>No growth control/ addl. regulations</td>
<td>Direct reuse as drinking water</td>
<td>Top-down with minimal consultation</td>
</tr>
</tbody>
</table>

Linking Qualitative Scenarios to WaterSim Model

Qualitative System Analysis

WaterSim Dynamic Quantitative Model

Future Scenarios of Water in Phoenix: Initial WaterSim Results

Scenario Variables Reduced from Values Survey

Supply
- New water sources
- Protected riparian areas
- Safe yield

Delivery
- Delivery infrastructure
- Energy for water
- Water quality regulations
- Canals

Demand
- Peri-urban farmland
- Industry water use & reg.
- Farm water use
- New residential water use
- Financial incentives

Outflows
- Effluent water use
- Grey water systems

Cross-Cutting
- Water governance