STATE OF THE ART OF ECOSYSTEM SERVICES

BIENNIAL WATER FUNDS SUMMIT

BOGOTÁ, COLOMBIA

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CHALLENGE: DESIGNING APPROPRIATE INTERVENTION BUNDLES IN DIFFERENT CONTEXTS

Bogotá, DC, Colombia

Freeport, Texas, USA

(One-size does not fit all, see review of water funds: Bremer et al. 2016 Ecosystem Services)
INTERVENTION BUNDLES

A small set of evidence-based interventions for a specific social-ecological system and context that when used together provide better outcomes than generic or individual interventions.

(Adapted from Institute for Healthcare Improvement 2012)
THREE SCIENCE QUESTIONS

• WHAT IS GOING ON IN HUMAN-WATER SYSTEMS?
• HOW CAN WE IMPROVE THE SYSTEMS?
• DID WE SUCCEED?

EXPLORING THE SCIENCE

• WHAT ARE THE TRENDS?
• WHAT ARE SOME EXAMPLES?
• WHAT SHOULD WE ASK NEXT?
WHAT IS GOING ON IN HUMAN-WATER SYSTEMS?

Social-Ecological Systems

Governance Systems

Resources Systems

Actors

Resource Units

Trends

• Modeling linking ecosystems, services, beneficiaries
• Building empirical evidence base for changes in services
• Emerging research on actors’ behavior

(Photos: Sheila Reddy, Fuente de Agua, Joost Nelissen)

(SES Systems: Ostrom 2009 Science, Leslie et al. 2015 PNAS)
WHAT IS GOING ON IN HUMAN-WATER SYSTEMS?

Example: Public Goods and Gender, Upper Tana, Nairobi, Kenya

• Theory:
  • Mix gender groups manage public goods better
  • Trust is important because hard to monitor

• Experimental Results (preliminary):
  • Communication: Mix gender groups contribute most
  • No Communication: All females groups contribute least

• Potential Implications:
  • Need to engage both genders
  • Provide monitoring/enforcement
WHAT IS GOING ON IN HUMAN-WATER SYSTEMS?

New Questions:

- What are actors doing?
- Why do actors behave as they do?
- How do actors’ behaviors influence or get influenced by the ecosystem?

(Reddy et al. 2016 Conservation Letters, also see Morrison 2016 Biological Conservation)
HOW CAN WE IMPROVE THE SYSTEM?

Menu of Interventions

Approaches to Influence Actors’ Decisions

- Promoting awareness and concern
- Providing incentives (economic, social, intrinsic)
- Using behavioral nudges

Decisions Affecting Resource/Ecosystem

- Land Use:
  - Conservation/restoration
  - Agricultural practices
- Water Use

Trends

- Water Funds target land use; water markets/pricing target water use
- Evidence for approaches to influence actors’ decisions limited
- Emerging integration of interventions

## How Can We Improve the System?

### Example: Intervention Bundle for Quantity, Dow, Freeport, Texas

<table>
<thead>
<tr>
<th>Goal</th>
<th>Project</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase Supply</td>
<td>Management of water-hungry invasive plants</td>
<td>Not cost-effective, low water supply</td>
</tr>
<tr>
<td></td>
<td>Municipal wastewater recycling in wetlands</td>
<td>Not cost-effective, high water-supply</td>
</tr>
<tr>
<td>Decrease Demand</td>
<td>Irrigation efficiency</td>
<td>Cost-effective, low water savings</td>
</tr>
<tr>
<td></td>
<td>Municipal rebates for xeriscaping</td>
<td>Cost-effective, low water savings</td>
</tr>
<tr>
<td>Increase Value through</td>
<td>Floodplain restoration/reservoir reallocation (across time)</td>
<td>Cost-effective, medium water supplies</td>
</tr>
<tr>
<td>Transfers</td>
<td>Water trading (across users)</td>
<td>0-55% reduction in water price, small impact on shortages, economics losses</td>
</tr>
</tbody>
</table>

(Photos: Jen Malnar, Wynman Meinzer)

(Raddy et al. 2015 *Ecosystem Services*, Reddy et al. 2015 *Water Resources and Industry*)
New Questions:

• Considering actors and resources, what are the appropriate set of interventions for different contexts?
• How can we integrate interventions that address both quality & quantity goals?
• Can user fees pay a double dividend by reducing water use and funding source water conservation?
DID WE SUCCEED?

**Trends**

- Evidence for nature enhancing quality, emerging evidence on quantity
- Co-benefits articulated, not always quantified
- Return on investment analyses underway

**Dash Board**

- Water
- Habitat
- Return on Investment
DID WE SUCCEED?

Example: Return on Investment Analysis (ROI), Lima Water Fund, Peru

- >3X water availability
- ROI>1 for upstream and downstream communities
- Restoration not viable without irrigation improvement in bundle

(Kroeger et al. 2016 TNC)
New Questions:

• How does ROI change when we consider multiple beneficiaries and co-benefits?
• How effective are different approaches for influencing actors?
TAKE AWAYS

• Need to better use science to understand governance systems and actors
• Appropriate intervention bundles depend on social-ecological conditions
• Some interventions could pay double (e.g., user fees)
• Multiple interventions most successful
• Frontier is interventions that get triggered under new conditions (e.g., El Niño)