STATE OF THE ART OF ECOSYSTEM SERVICES

BIENNIAL WATER FUNDS SUMMIT

BOGOTÁ, COLOMBIA

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The Nature Conservancy

Protecting nature. Preserving life.

CHALLENGE: DESIGNING APPROPRIATE INTERVENTION BUNDLES IN DIFFERENT CONTEXTS

Bogotá, DC, Colombia

(Photo: Sheila Reddy)

Freeport, Texas, USA

(Photo: Wynman Meinzer)

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

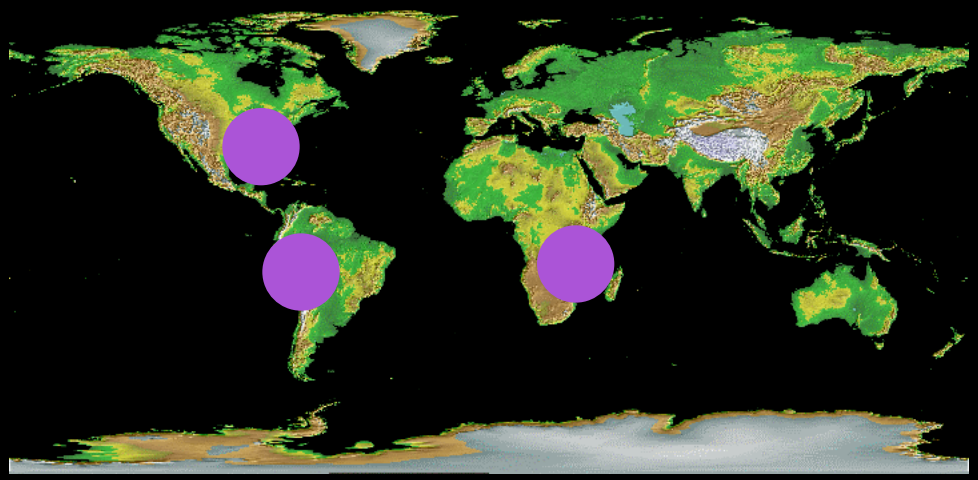
INTERVENTION BUNDLES

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

Actors

Resources Systems

Resource Units

Trends

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

(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

Yuta Masuda et al. (In Preparation)

WHAT IS GOING ON IN HUMAN-WATER SYSTEMS?

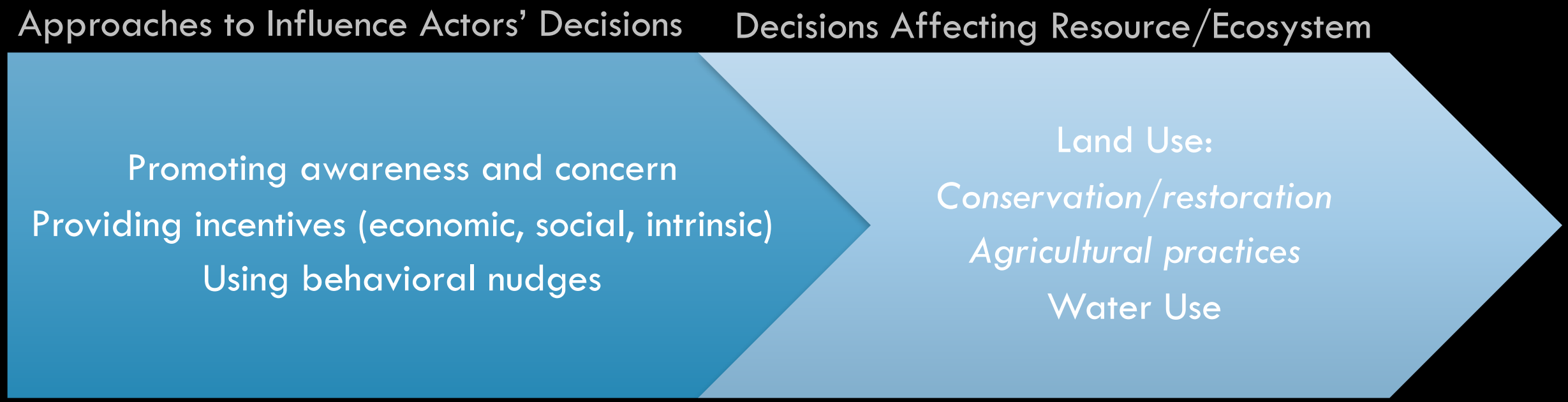
New Questions:

- 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



(Reddy et al. 2016 *Conservation Letters*) (Calvache et al. 2012 TNC, Stavins and Olmstead 2008 *FEEM*)

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

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


(Photos: Jen Molnar, Wynman Meinzer)

(Reddy et al. 2015 *Ecosystem Services*, Reddy et al. 2015 *Water Resources and Industry*)

HOW CAN WE IMPROVE THE SYSTEM?

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 SUCEED?

Trends

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

DID WE SUCEED?

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

Diversion-Infiltration System Restoration

Grassland Restoration

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

(Kroeger et al. 2016 TNC)

HOW CAN WE IMPROVE THE SYSTEM?

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)

Bogotá, DC, Colombia


(Photo: Sheila Reddy)

Freeport, Texas, USA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