Complexity and Water Management Regimes: Ostrom’s IAD Framework Applied to South Florida
A Fresh Look

- Institutional Economics: An Emerging Field
- Introducing How to Frame Water Management Issues
- How to Categorize Water Management Studies

- A Research Agenda: Continuing the Complexity Theme ...
  - 2011: Complexity and Change: Primitive Concepts
  - 2012: Complexity and Institutional Arrangements: Water Management
  - 2013: Complexity and ...
The Basic Question

Institutional Configurations
(Settings & Attributes)

Outcomes
Some Key Words and Concepts

- Social-Ecological-Political Systems
- Water Management Regimes
- Action Situation
- Provision v. Production (Co-Production)
- Outcomes & Evaluative Criteria
- Polycentric Governance
Why Ostrom’s Framework?

- Nobel Prize in Economics, 2009
- Focus on Framing Questions Rather than Answers (although “answers” can of course be derived)
- Institutional (*Public Choice*) Approach to Public Policy missing at FAU
- Implementation is “in” the Institutions
- Recent work on agent-based models (complexity theory) to model rule configurations in institutional settings
- Direct inclusion of empirically verifiable outcomes
- The Workshop in Political Theory at Indiana University provided the conceptual basis for my PhD dissertation in the late 1970s (I was a student in one of Ostrom’s courses)
Our Symposium

Based on work in Seminar in Urban Planning (URP 6310), Spring, 2012

- Introduction & The Ostrom Oeuvre
  - David C. Prosperi, Henry D. Epstein Professor

- Applying the IAD Framework to the South Florida Water Management Regime
  - John Bradford (w/ P. Calvaresi & A. Scotti)

- Unpacking the Biophysical and Institutional “Exogenous” Contexts
  - Marianne Quinn (w/ A. Alvarez & J. Hsu)

- Efficiency in Water Service Delivery: Questions and Methods
  - Claudia Hasbun (w/ A. Davis & R. Madan)

- Equity in Water Service Delivery: Questions and Methods
  - Rasheed Shoyuto (w/ M. LaFrance & J. Root)

- Reactions
  - Don Norris, Professor of Public Policy, UMBC
The Ostrom Oeuvre: An Overview

- Meta-Methodological Questions
- The IAD Framework
- Meaning
A Short Bibliography


Meta Methodological Questions

The Problem of the Commons & “Public Goods"

Institutional Analysis

Frameworks-Theories-Models
<table>
<thead>
<tr>
<th>1950</th>
<th>2010</th>
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</thead>
<tbody>
<tr>
<td>➢ Externalities (Overconsumption and/or Underprovision of Public Goods)</td>
<td>➢ Externalities (Overconsumption and/or Underprovision of Common Pool Resources)</td>
</tr>
<tr>
<td>➢ Two “solutions”: Government &amp; Market</td>
<td>➢ “Polycentric” Governance Arrangements</td>
</tr>
<tr>
<td>➢ Homo Economicus</td>
<td>➢ Homo Bestus (Publicly Minded)</td>
</tr>
<tr>
<td>➢ Dominant effort was to fit the world into simple models and to identify gaps between reality and model formulation</td>
<td>➢ Dominant effort is to design institutional arrangements to produce better outcomes</td>
</tr>
</tbody>
</table>
Institutional Analysis:
A General Analysis/Design Framework

- Public Choice Approach
  • (1960s, 1970s)

- The Tragedy of the Commons
  • (Hardin, 1968)

- "New" Institutional Economics
  • (1970s, 1980s)

- Behavioral Game Theory
  • (1960s)
Frameworks-Theories-Models

Frameworks

How to Structure Our Thinking About a System (overall and its parts)

Theories

How System Elements are (Causally) Related to Each Other

Models

Measurement of Specific Relationships
The IAD Framework

Why, What Is It?

Schematic Form

Action Arena at Core, Five Points of Entry

Unpacking

Parsing / Identifying Relationships / Multi-scalar

The Components: A Brief Description
Why, What is it?

**Why**

- “Colleagues Associated with the Workshop in Political Theory and Policy Analysis … to develop the IAD framework … contains a nested set of building blocks that … can use … to understand human interactions and outcomes across diverse settings” (Ostrom, 2010, p. 6-7)

- The Framework was designed to enable analysis of systems that are composed of clusters of variables, each of which can be unpacked multiple times

**Builds on Theoretical Developments in**

- Transaction theory
- The Logic of the Situation
- Collective Structures
- Frames
- Scripts

**The Development of a Common Language!**
The Framework in Schematic Form
The core analytical unit ... is an ‘action arena’ in which participants (e.g., individuals, families, firms, voluntary associations, governmental units) interact in a structure of incentives generated by the characteristics of the goods involved, the rules-in-use, and the attributes of the community of participants involved” (Ostrom, 2005)

The arena may be represented as a formal game, an agent-based model, a detailed case study, or an analytical narrative (Ostrom, 2007)

An action arena is affected by three clusters of variables that are treated as exogenous for any specific analysis of the incentives and likely behavior within an arena, but become endogenous variables when analyzing institutional change (Ostrom, 2007)
Five Points of “Entry”

- External Components
- Action Situations
- Interactions
- Outcomes
- Evaluative Criteria
Unpacking
Example 1: Action Situations Described in Terms of External Criteria

Example 2: Outcomes Resulting from Interactions Defined by Specific Action Situation Attributes
Delivery Systems -> Outcomes -> That Can Be Evaluated

Interaction
Outcomes
Evaluation

Outcomes Are Evaluated!
- Economic Efficiency
- Fiscal Equivalence
- Sustainability
- Conformance to Values
- Accountability
- Redistributional Equity
Multi-scalar “frameworking”
The Components

External Components

Interactions

Evaluative Criteria

Action Situations

Outcomes
1. External Components

- Bio-physical Conditions
- Community Attributes
- Rules-in-Use
Biophysical Conditions

The Environment as a System

- Ecology
- Climate
- Biodiversity
- Etc

Some Fun Facts

- As of 2007, there were 321 known articles about the application of IAD to water management problems (many of them about river basins)

- IAD has been applied to:
  - Fisheries
  - Forestry
  - Irrigation
  - Water Management
  - Animal Husbandry
Community Attributes

Basic SES attributes, which may also include history of prior interactions, internal homogeneity or heterogeneity of key attributes, and knowledge and social capital of those who may participate or be affected by others.
Rules-In-Use

Common understanding of those involved related to who must, must not, or make take which actions affecting others subject to sanctions.

- Rules-in-use may evolve over time as those involved in one action situation interact with others in a variety of settings or self-consciously change the rules in a collective choice or constitutional-choice setting.
## Rules

<table>
<thead>
<tr>
<th>Rule Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>Boundary Rules</td>
<td>The number of participants, their attributes and resources, whether they can enter freely, and the conditions they face for leaving.</td>
</tr>
<tr>
<td>Position Rules</td>
<td>Establishes positions in the situation.</td>
</tr>
<tr>
<td>Choice Rules</td>
<td>Assign sets of actions that actors in positions may, must, or must not take.</td>
</tr>
<tr>
<td>Scope Rules</td>
<td>Delimit the potential outcomes that can be affected and, working backward, the actions linked to specific outcomes.</td>
</tr>
<tr>
<td>Aggregation Rules</td>
<td>Affect the level of control that a participant in a position exercises in the selection of an action at a node.</td>
</tr>
<tr>
<td>Information Rules</td>
<td>The knowledge-contingent information sets of participants.</td>
</tr>
<tr>
<td>Payoff Rules</td>
<td>The benefits and costs that will be assigned to particular combinations of actions and outcomes, and THEY ESTABLISH THE INCENTIVES AND DETERRENTS FOR ACTION.</td>
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2. Action Situations

Remember, This is the First Step ...

- “The first step in analyzing a problem is thus to identify a conceptual unit – called an action situation – than can be utilized to describe, analyze, predict, and explain behavior within institutional arrangements.

- Action situations are the social spaces where individuals interact, exchange goods and service, solve problems, dominate one another, or fight (among the many things that individuals do in action situations).

Actors ...

- Actor assumptions about four clusters of variables:
  - The resources that an actor brings to a situation
  - The valuation actors assign to states of the world and to actions
  - The way actors acquire, process, retain, and use knowledge contingencies and information; and
  - The processes actors use for selection of particular courses of action

- A major portion of theoretical work here focuses on motivational and cognitive structure of the actors (as givens)

Ostrom, 2011, p. 11
Internal Structure

Figure 2. The Internal Structure of an Action Situation.  
Source: Adapted from E. Ostrom (2005, p. 33).
Rules Affecting Action Situation

Figure 3. Rules as Exogenous Variables Directly Affecting the Elements of an Action Situation. Source: Adapted from E. Ostrom (2005, p. 189).
3. Interactions

Production

Consumption

Inputs ➔ Outputs

Outcomes

Outputs
- Describable in terms of amounts available at certain prices

Outcomes
- Describable in terms of amount consumed!

It this best described as a two-stage linked production-consumption function?
4. Outcomes

Patterns of Behavior / Patterns of Consumption

Map G: Zip Code Employment Percentage of Total for 2005 in S. Florida
5. Evaluation Criteria

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<tr>
<td>Economic Efficiency</td>
<td>- Determined by magnitude of net benefits associated with an allocation of resources</td>
</tr>
<tr>
<td>Fiscal Equivalence</td>
<td>- Two principal means: (1) on the basis of the equality between individual’s contribution to an effort and the benefit they derive; and (2) on the basis of differential ability to pay</td>
</tr>
<tr>
<td>Redistributional Equity</td>
<td>- Policies that redistribute resources to poorer individuals</td>
</tr>
<tr>
<td>Accountability</td>
<td>- In regards to the development and use of public facilities and natural resources</td>
</tr>
<tr>
<td>Conformance to Values of Local Actors</td>
<td>- Basically, ethics</td>
</tr>
<tr>
<td>Sustainability</td>
<td>- The ability to respond to ever changing environments</td>
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</table>
Meaning ...
General Considerations

- The World is More Complicated Than Simple Models
- Single Policy Descriptions Often Fail
- Government is Not Always the Answer to Ensuring [Environmental] Objectives
- The Challenge is to Match Institutions to the Structure of Social-Ecological Systems
- ... in a Multi-Scalar Framework that includes how its “parts” interact
- Humans have a complex motivational structure and more capacity to solve social dilemmas that posited by earlier rational-choice theory

Bottom Line: Designing Institutions

That move from “nudging” self-interested individuals to achieve better outcomes to facilitating the developing of institutions that bring out the best in humans!
Thank you for your attention!

Let’s Now Explore the IAD Framework as it might be applied to the South Florida Water Management Regime