Actualizing panarchy within environmental policy: mechanisms for tweaking institutional hierarchies to mimic the social-ecological systems they manage

Ahjond S. Garmestani and Melinda Harm Benson[1]

[1] University of New Mexico, Department of Geography, Albuquerque, New Mexico, USA

Some keys to managing for resilience (Adaptive Governance):

Matching institutions to the appropriate scale
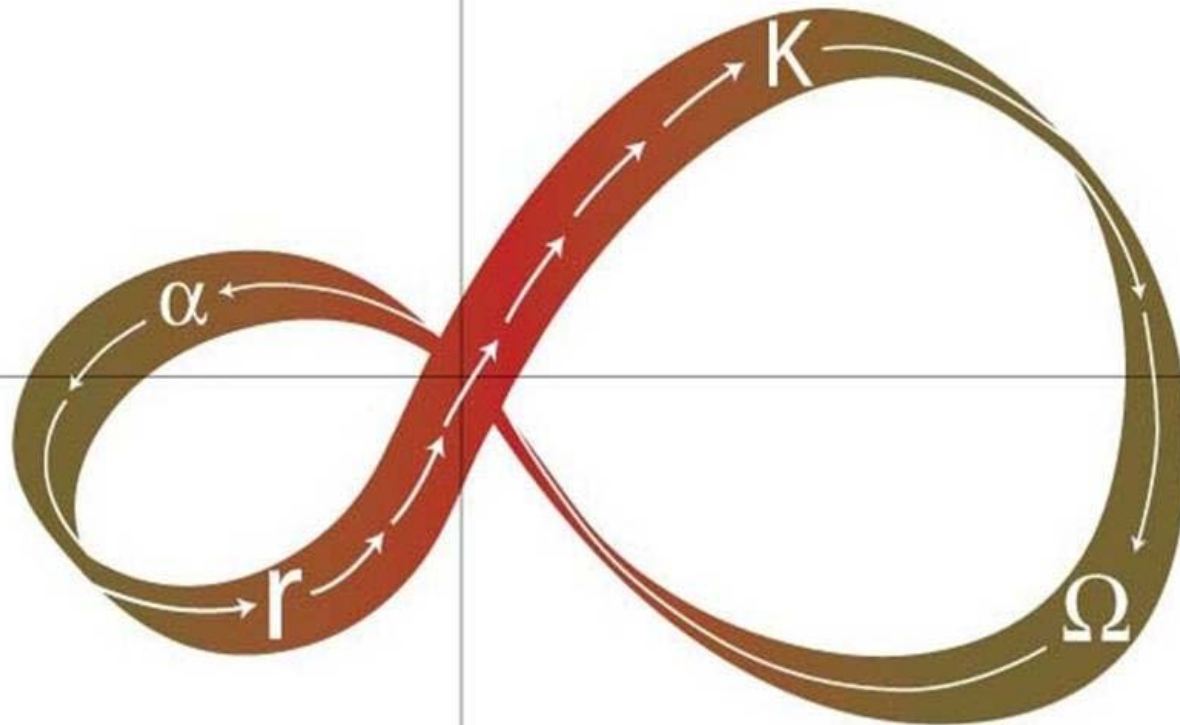
  *Panarchy

Legislation and Accountability

  *Legal reform (NEPA and Adaptive Management example)

 "Intermediaries"

  *Bridging organizations and networks

Panarchy

Based on hierarchy (rank-order of variables)
Differences:
- "bottom up" change is common
  - Captures "surprise" in CAS
- Levels are not static
  - Interconnected adaptive cycles
- Resilience
  - Dependent upon cross-scale dynamics and structure
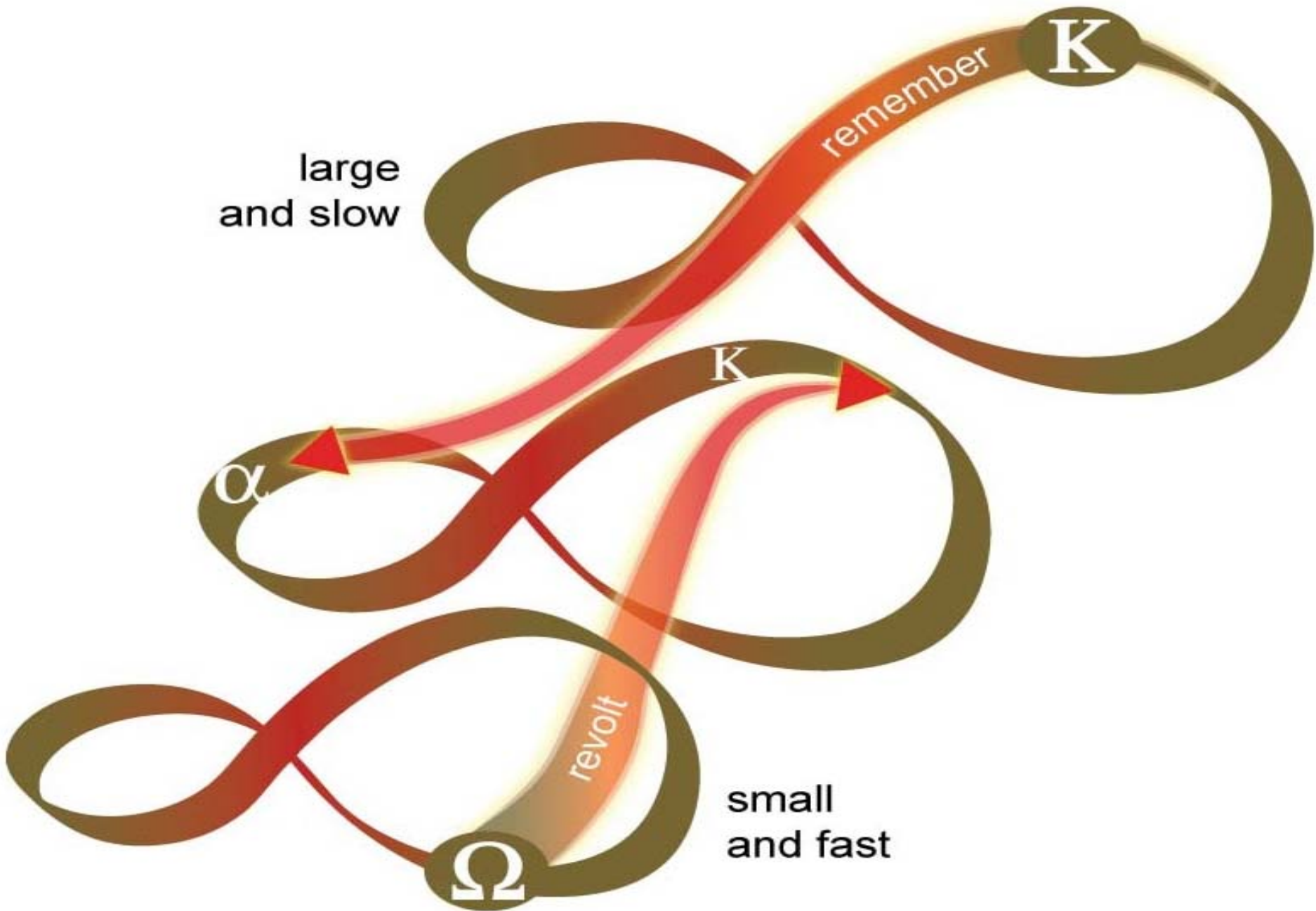
large
and slow

remember

K

K

α

Ω

revolt

small
and fast

Cumulative impacts

- "Scale up"
- Wetlands degradation
  - Numerous small conversions ("Death by a 1000 cuts")
  - Cumulative effect of small conversions manifests in large-scale degradation
  - Loss of ecosystem services associated with wetlands

Legal certainty

Does not mesh well with environmental unpredictability

Aspects of a society that make it free (e.g., certainty of law) are not in concert with ecological realities (e.g., non-linear systems and responses)
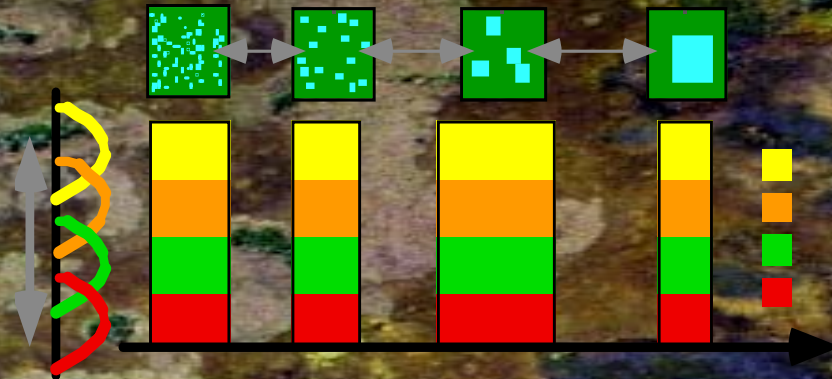
The crux of the issue

- Rigidity of current environmental law
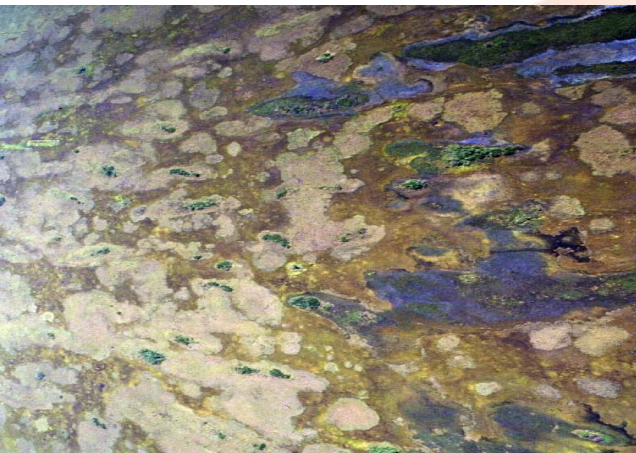 - Successful at protecting the environment for many years
  - Aspect of the law that does not allow it to confront emerging, cross-scale and cross-boundary challenges

Cross-scale dynamics

- **Tremendous challenges for the management of ecological systems and ecosystem services**

large
and slow

small
and fast

Adaptive Management

- Iterative process
- Monitoring the implementation and management policies as rigorously as the initial formation of said policies
- Adaptively assessing responses in order to improve the implemented management or policy

Adaptive management

- Fundamental constraint to adaptive management:
  - Current state of administrative law
  - Policy evaluated on the "front-end" (due to public and legal scrutiny and the need for certainty (e.g., procedural rules))
    - Squelched agencies' appetite for adaptive management (sensu Holling)

"Regulatory home" for AM is likely necessary

  those outside the agency can enforce the agencies' commitment to AM

Section 101 of NEPA

  substantive provision

  requires **"environmentally sound"** decisions

  substantive goal never realized

    Courts' interpretations of the law:

   aspirational statement lacking the necessary detail for enforcement

Reform of National Environmental Policy Act (NEPA)

Federal agencies must take a "hard look"

Provisions (currently equilibrium based) reconfigured to embrace new understanding of the dynamics of social-ecological systems

Substantive provision allows for reform (Sec. 101 of NEPA)

Current NEPA process
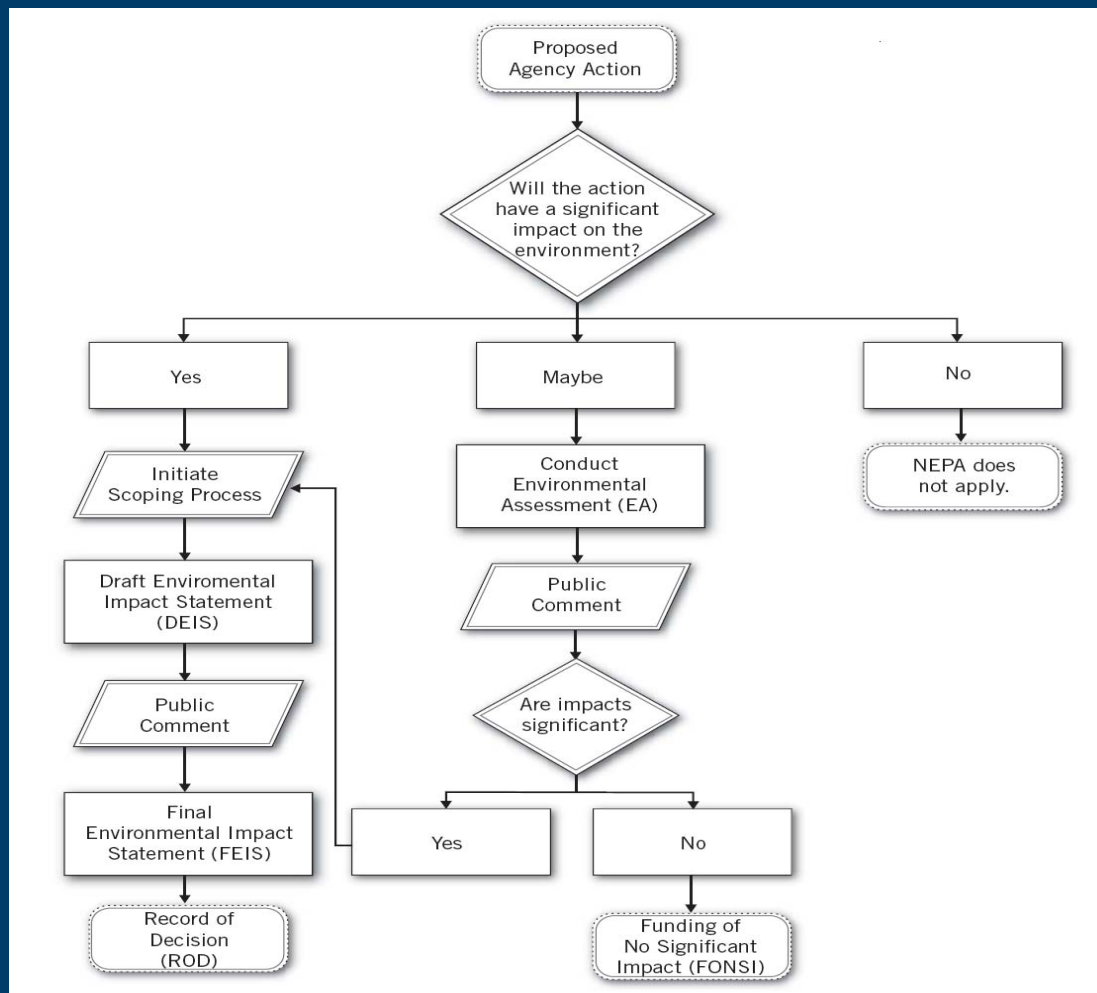
NEPA reforms for AM

1) "Front end" approach reworked for iterative processes

   Possible via "tiering"

      agencies sequence NEPA documents

         Broad-scale "programmatic" EIS (larger policy issues and/or the initial stages of project; involves planning and then project implementation) and then:
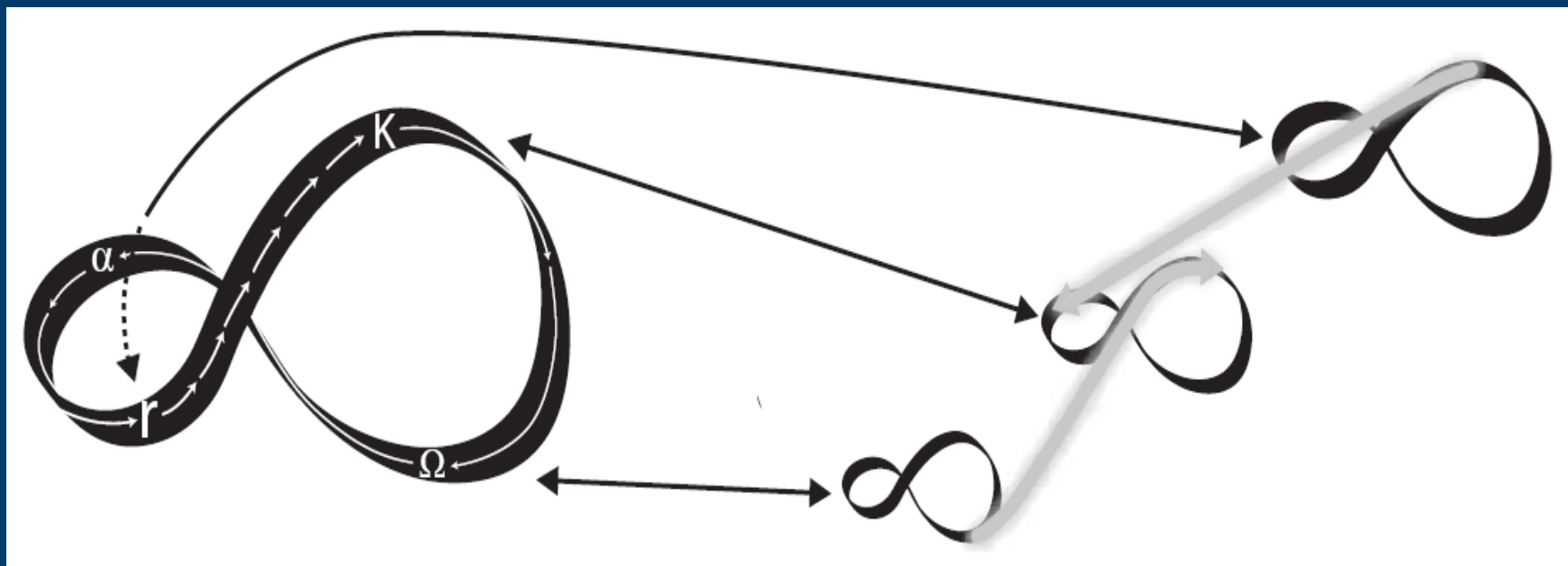
         Smaller-scale site-specific analyses

2) Require monitoring

3) Require mitigation of environmental impacts

4) Insert NEPA back into agency planning

Proposed iterative NEPA process

Networks:

Organizational learning rarely incorporated into natural resources management

Learning facilitated by networks

Networks need venues for dialogue and debate

Universities = venues

Bridging organizations

Examples:

- Assessment team: comprised of actors across sectors in a socio-ecological system

- NGOs: arena for trust-building, learning, conflict resolution and adaptive co-management

- Scientific community: can act as a "watchdog", as well as a facilitator for adaptive management

Communication and information flow must inform policy and management at multiple scales

Disconnect between science and management

Intermediaries must "bridge" the disconnect (i.e., threshold) between scales in an institutional hierarchy
  *No mandate for formation….expected to emerge via the self-organization of institutional milieu

Not the best approach for managing for resilience
*Intermediaries should be established via legal mandate

"Intermediaries"

Type will "depend"

BO for Sweden

Networks for U.S.
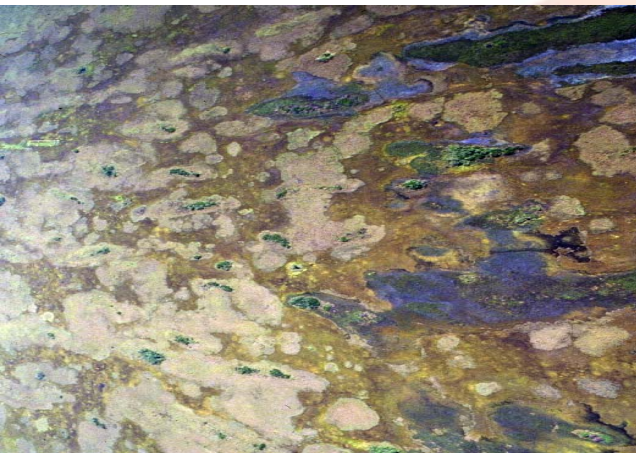
United States

- Intermediaries
  - Federal law, so enforceable

  - But, delegate to states so they have "wiggle room"
    - Can be creative so long as communication and information flow occur

large
and slow

small
and fast

"Intermediary"

Conclusion

Traditional ecosystem management

 collect enough information

 reduce uncertainty to zero

  *Ecosystems are characterized by an inherent degree of unpredictability

Given the capacity for "surprise" in ecosystems

AG couched within Panarchy

 "good" environmental management

Synthesis

Multiple mechanisms to deal with non-linear dynamics in social-ecological systems:

Monitoring

Leading indicators

Scenario planning

Communication and information flow

Suite of policy instruments (e.g., command and control, collaboration, market mechanisms, etc.)