GEORGE PERKINS MARSH INSTITUTE

Traditional versus Sustainability Science

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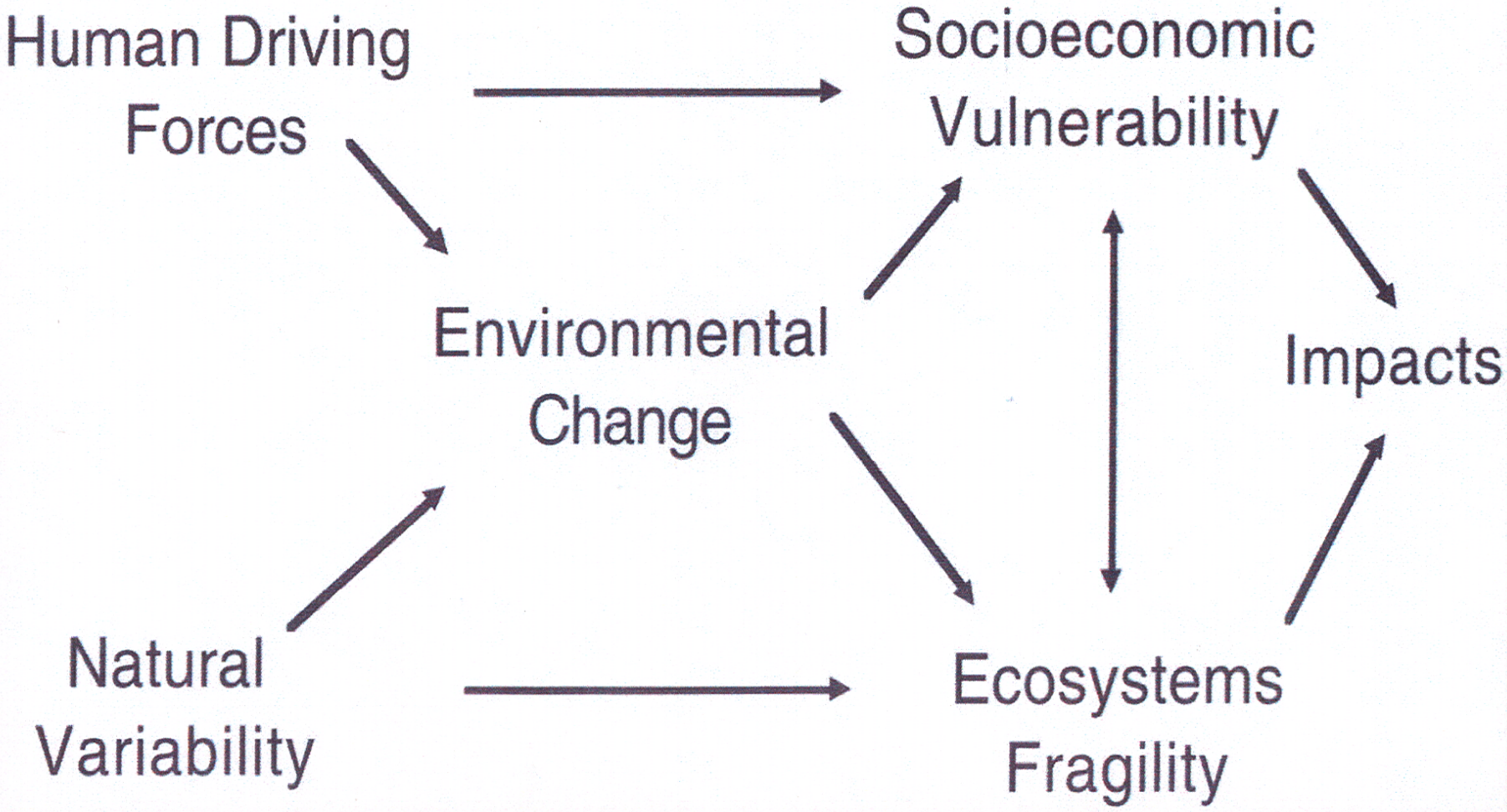
Presentation

- Global environmental change: A regional perspective
- Traditional science and sustainability science
- Vulnerable peoples and ecosystems
- Principles for building a sustainable region
- Challenges

Integrated Risk Assessment of Regional Environmental Change



Traditional Science versus Sustainability Science

<u>Traditional Science</u>

- Curiosity-driven
- Value free
- Divide and conquer
- No direct policy carryover
- Expert dominated
- Linear evolution of knowledge

<u>Sustainability Science</u>

- Problem-driven; problem-solving
- Value centered
- Holistic
- Policy relevant
- Co-production of knowledge
- Place-based analysis
- Capacity-building

Challenges

- Integrated analysis
- Collaborative research and capability building
- Alternative regional futures
- Protecting the most vulnerable
- Bridging science and policy: Engagement
- Linking the region with global processes
- Developmental pathways
- Adaptive management

Sustainability Science: Core Questions

1. How can the dynamic interactions between nature and society be better incorporated into models and conceptualizations?

2. How are long-term trends in environment and development reshaping nature-society interactions?

3. What determines the vulnerability or resilience of nature-society systems in particular places, ecosystems, and livelihoods?

Sustainability Science: Core Questions (continued)

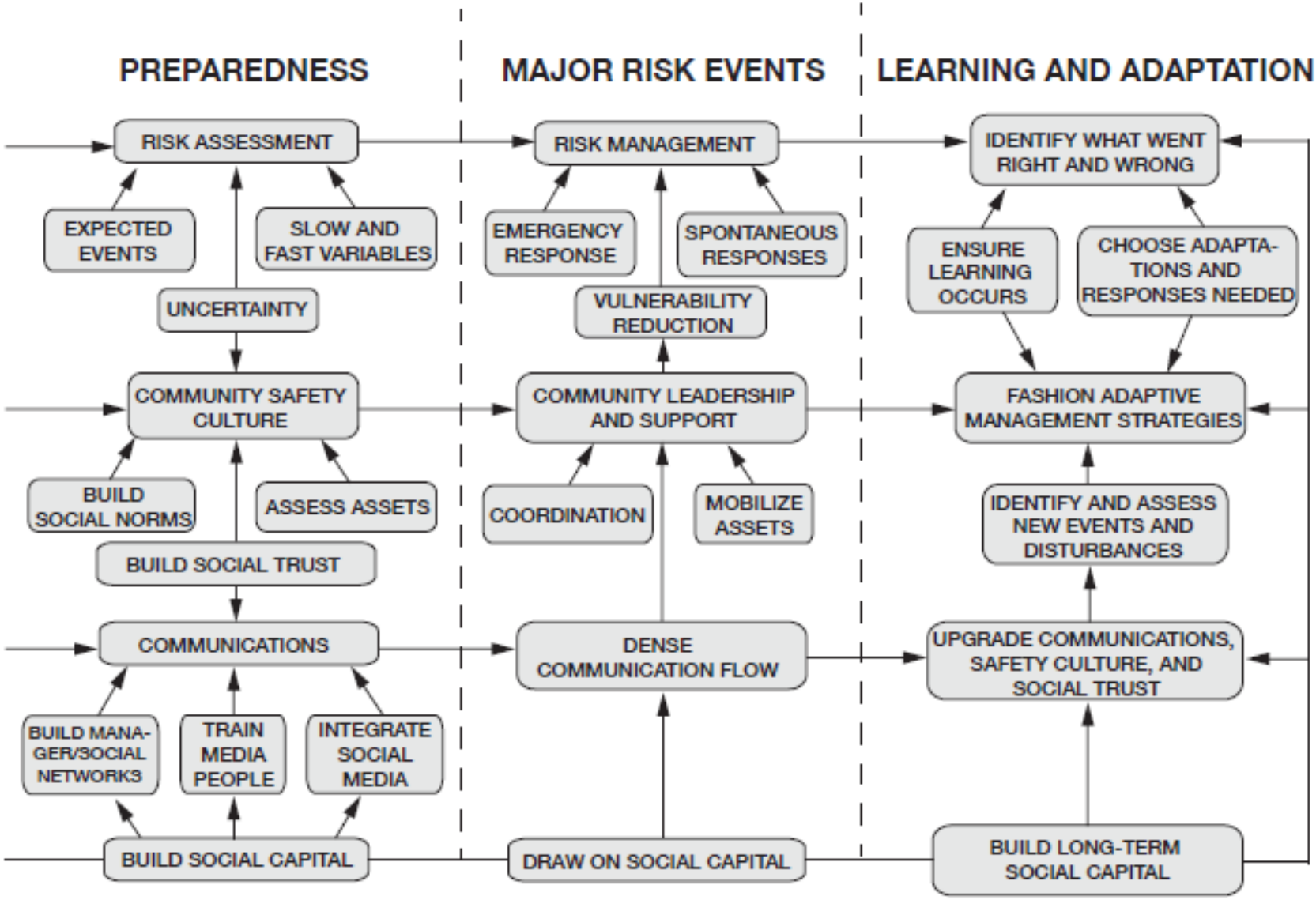
4. Can “limits” or “boundaries” be defined to warn of conditions of significantly increased risk?

5. What incentive systems can guide nature and society toward more sustainable trajectories?

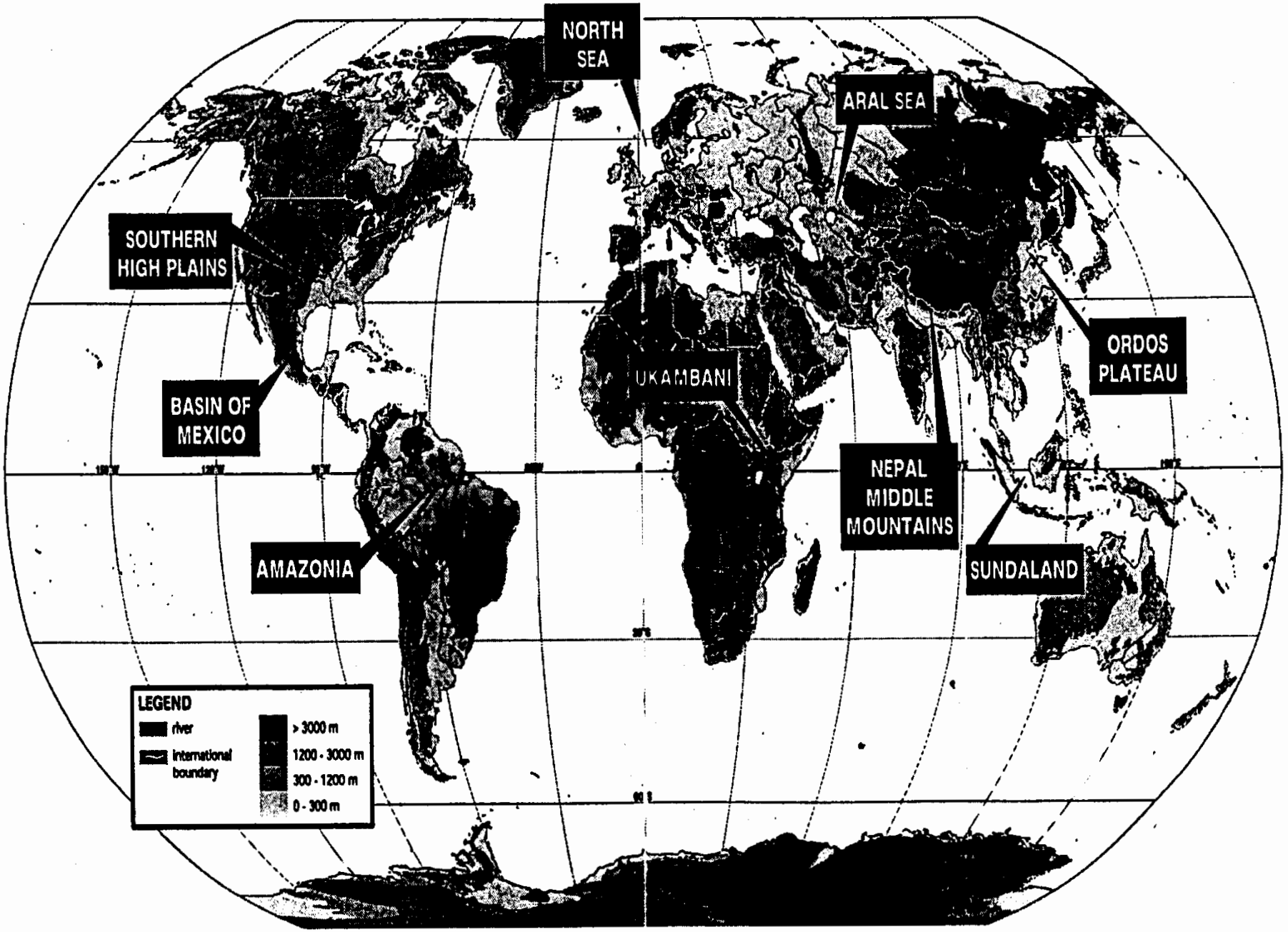
6. How can environmental and social monitoring systems better build a transition to sustainability?

7. How can research be better integrated with adaptive management and societal learning?

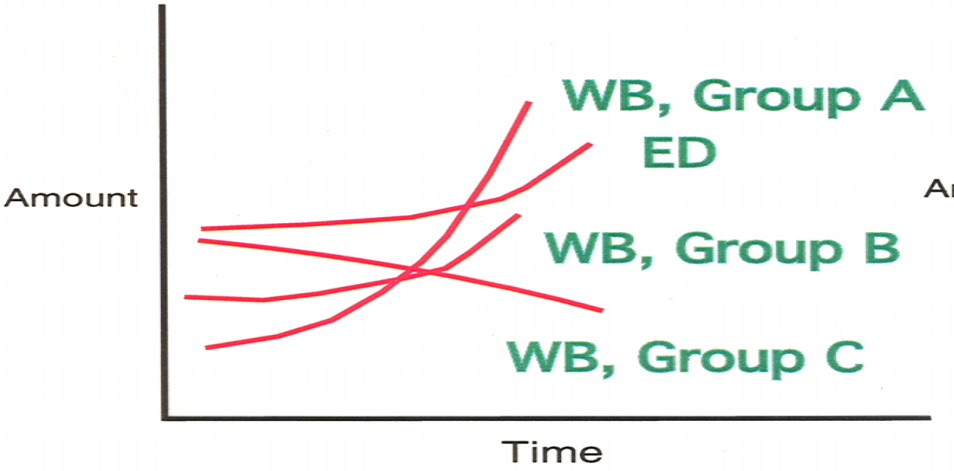
STAGES OF RISK MANAGEMENT AND RESILIENCE BUILDING



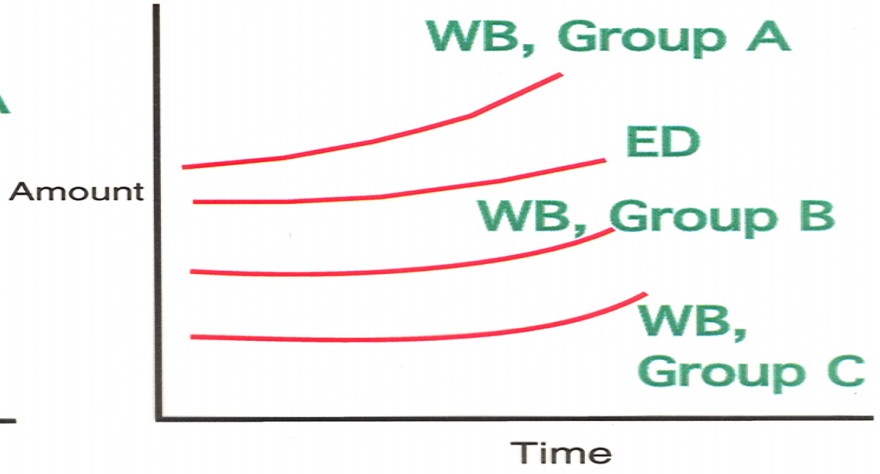
Potentially Critical Environmental Zones



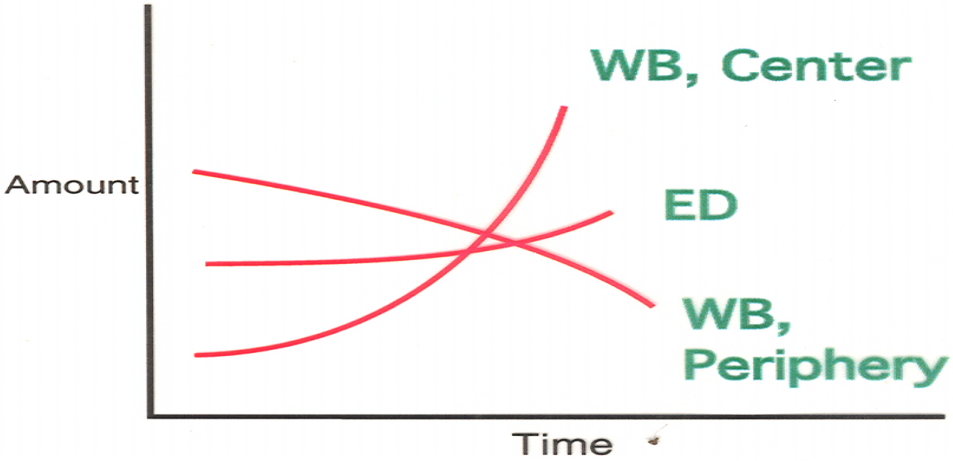
Case A: Social Polarization



Case B: Trickle-Down



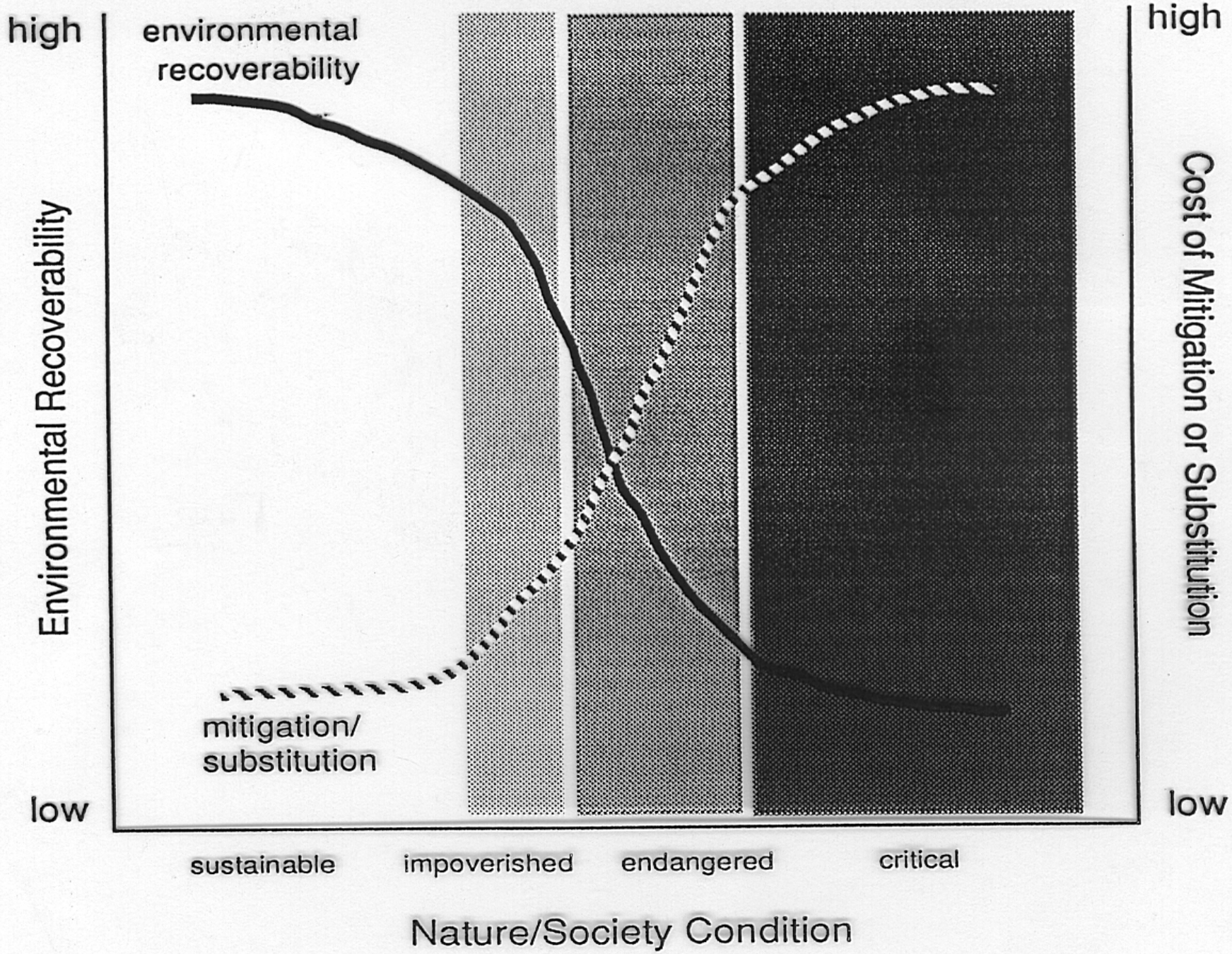
Case C: Exploitation of Periphery



ED: environmental degradation

WB: well being

Three Cases of Regional Social Processes Causing or Interacting with Environmental Degradation



The IPAT Plus Formulation

I = P x A x T x Plus Factor *where*

I = Environmental degradation

P = Population

A = Affluence

T = Technology

and the Plus Factor includes:

- State policy
- Political economy
- Linkage to global economy
- Beliefs and values
- Institutional systems

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Analyzing Environmental Endangerment

1. Environmental endangerment is an interactive phenomenon that relates to:
   - types of rates of environmental change
   - the fragility of the ecosystem
   - the vulnerability of the impacted population, and
   - the response capabilities.
2. Such endangerment must be assessed within particular landscapes and cultures, and in historical and spatial context.
3. Human-environment trajectories appear likely to lead to criticality where some combination of:
   - economies strongly dependent upon local resources.

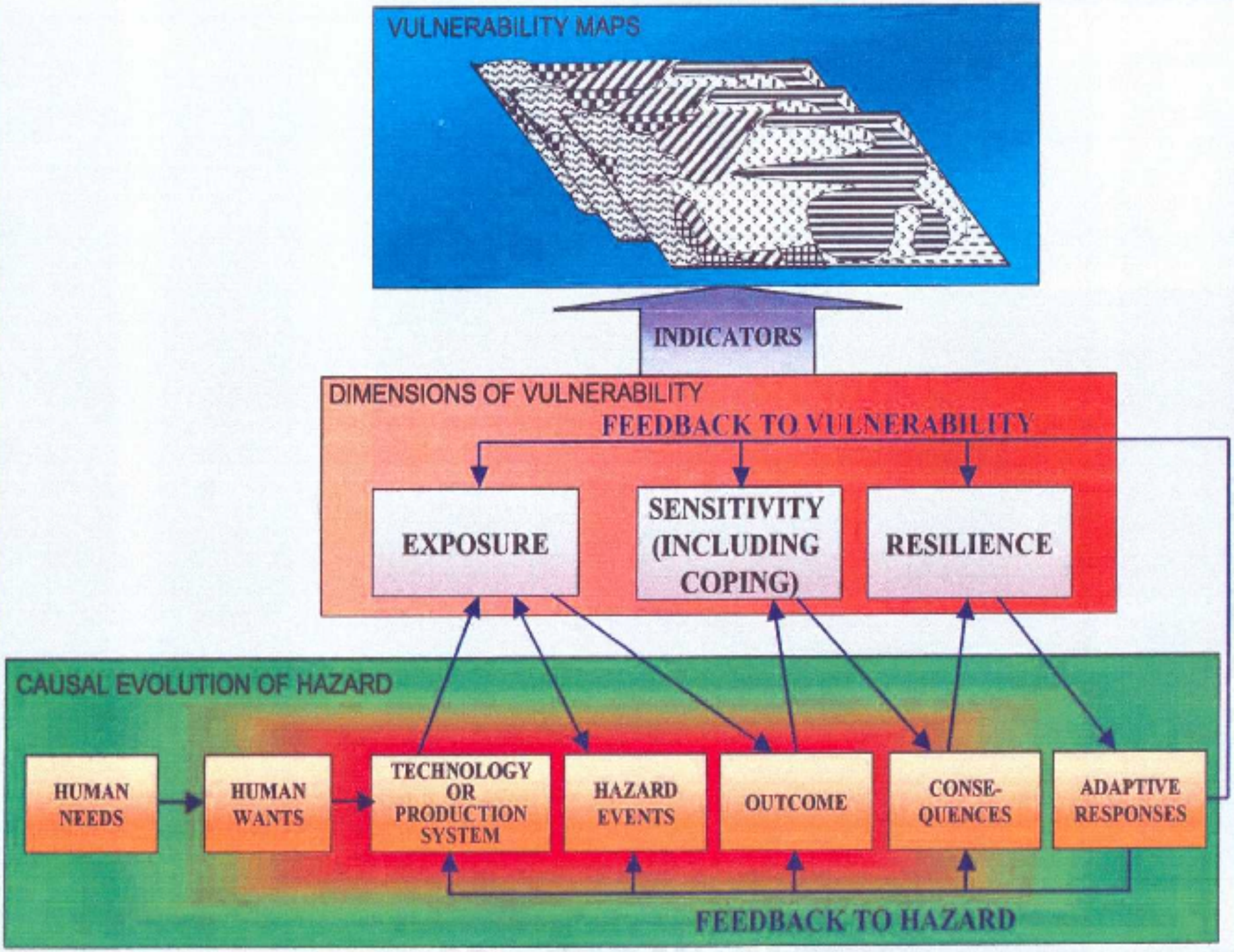
Analyzing Environmental Endangerment (continued)

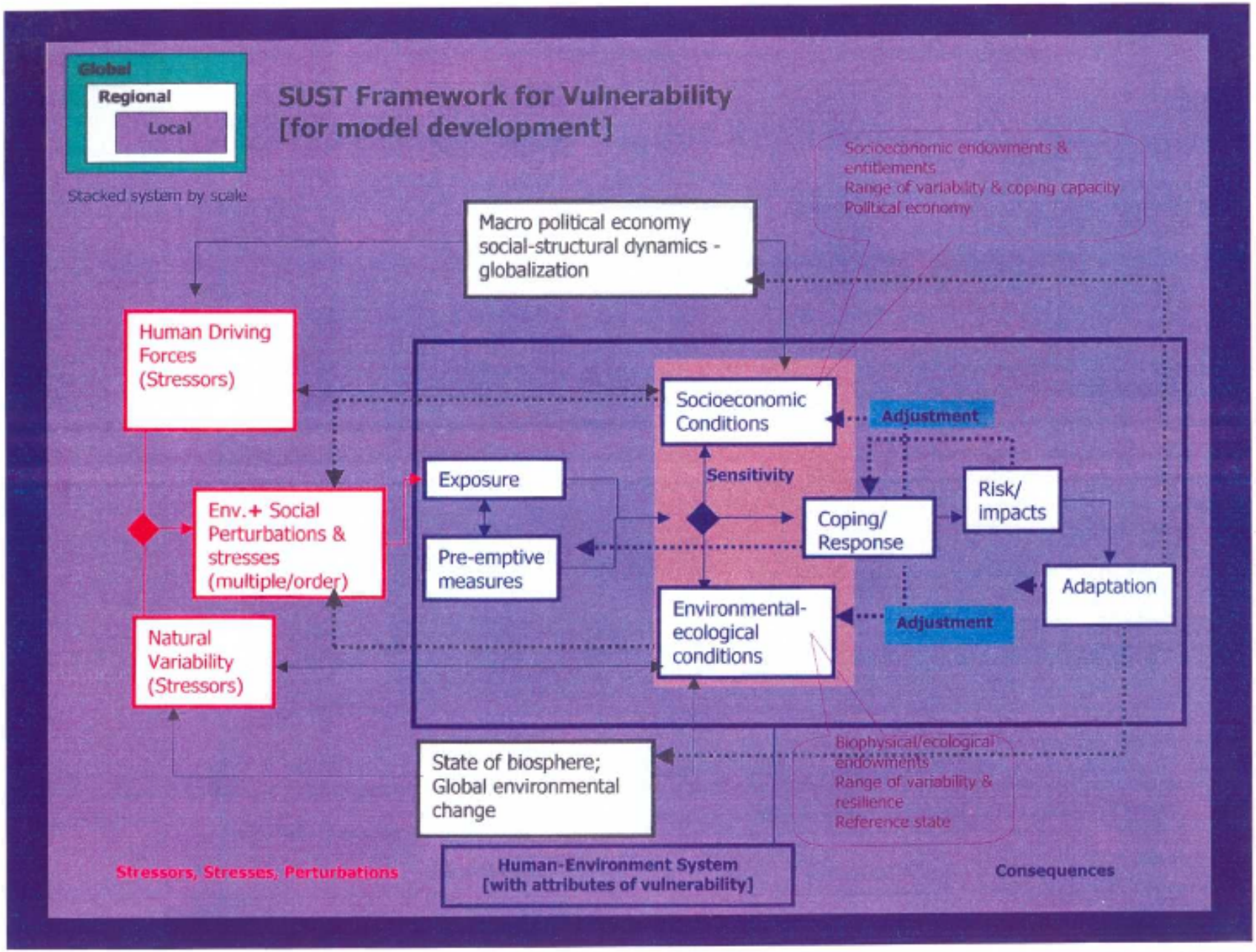
- ecosystems sensitive and with low resiliency to environmental change
- human societies with high socioeconomic vulnerability
- dependency on global markets or distant political authority

4. Non-linear and discontinuous environmental change holds a high potential for confounding diagnosis and delaying societal responses.

5. Criticality involves situations in which emerging environmental degradation threatens to overwhelm natural buffering systems, leading to a loss of life support capacity.

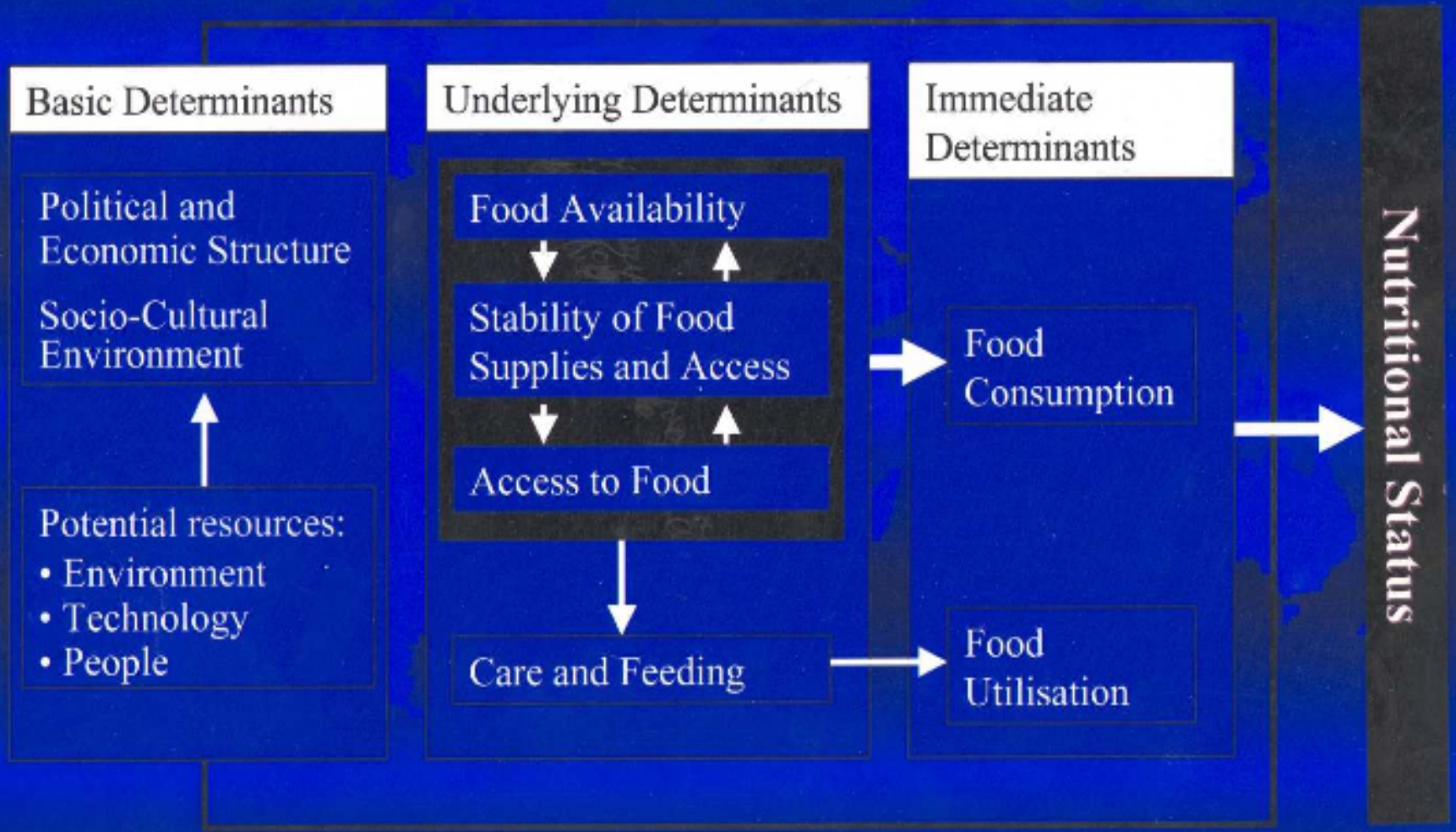
6. Much of the drawn-down of nature represented by current human pressures on the environment will be borne by future generations.

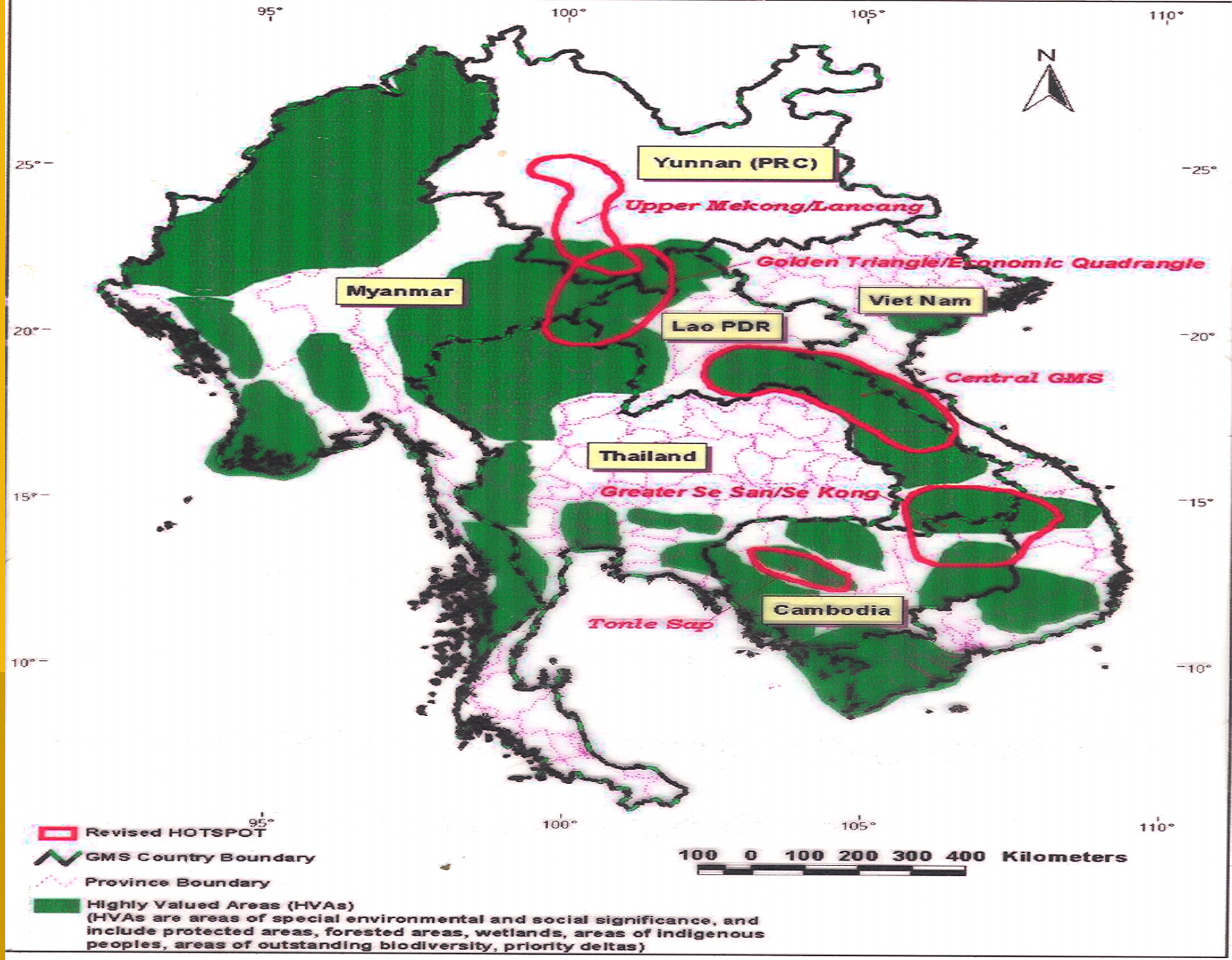




What is food security, insecurity and vulnerability ?

Conceptual causality framework





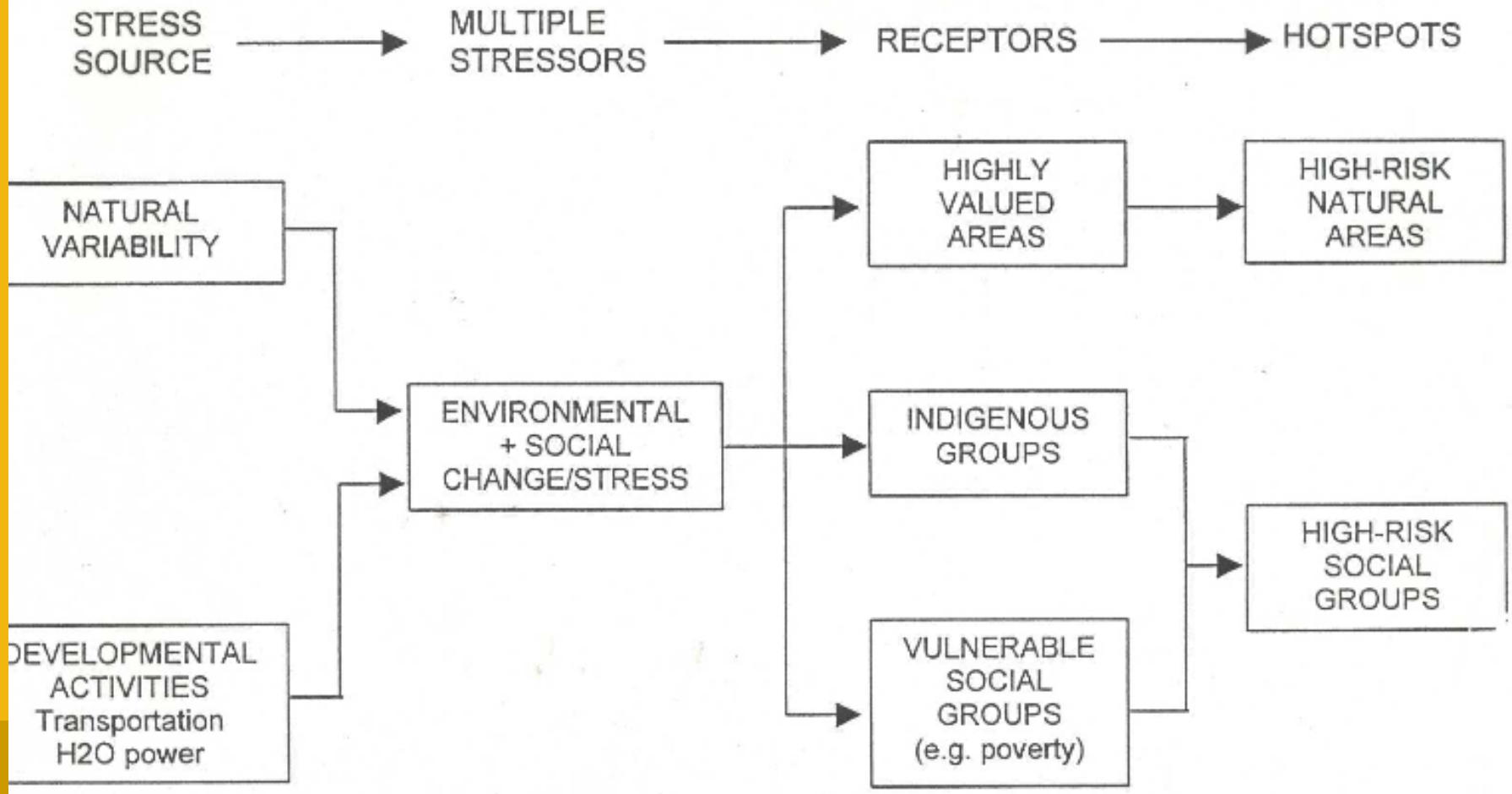


Figure 1: A Simple Model for Analyzing High-Risk Regions and Groups (Hotspots)

Principles Drawn from Local Social-Ecological Systems for Building Resilience

- Using management practices based on local ecological knowledge
- Designing management systems that 'flow with nature'.
- Developing local ecological knowledge for understanding cycles of natural and unpredictable events
- Enhancing social mechanisms for building resilience.
- Promoting conditions for self-organization and institutional learning.
- Re-discovering adaptive management.
- Developing values consistent with resilient and sustainable social-ecological systems.

Challenges

- Integrated analysis
- Collaborative research and capability building
- Alternative regional futures
- Protecting the most vulnerable
- Bridging science and policy: Engagement
- Linking the region with global processes
- Developmental pathways
- Adaptive management

The IPAT Formulation
(Holdren and Ehrlich)

I = P x A x T *where*

I = Environmental change

P = Population (base resource needs)

A = Affluence (per capital consumption)

T = Technology (effficiency of resource production system)