



Evaluating Sustainability: A View Informed by Complex Adaptive Systems

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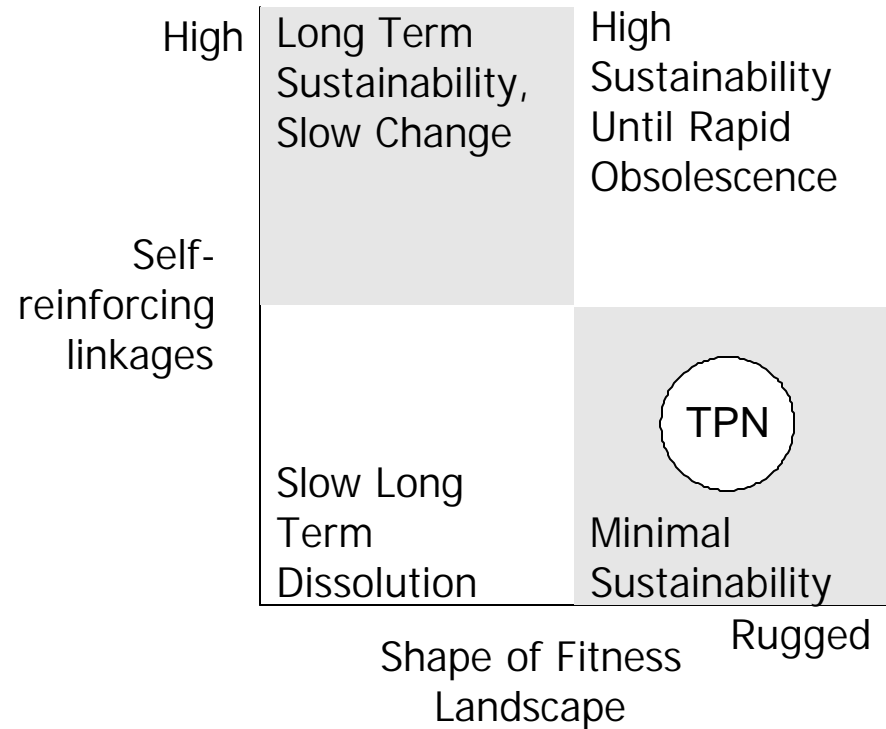
Complex Adaptive Systems

- ✍ Set of constructs dealing with causes & dynamics of system behavior.
- ✍ This is not a tutorial on CAS, but to convey a flavor some important concepts include:
 - ✍ Emergence
 - ✍ Fitness landscape
 - ✍ Basins of attraction
 - ✍ Sensitive dependence on initial conditions
 - ✍ Self organization
 - ✍ NK models
 - ✍ Autonomous agents
 - ✍ Stability/chaos, border regions
- ✍ Critical elements of CAS
 - ✍ Have formal definitions
 - ✍ Are best understood using modeling and simulation
 - ✍ But also have heuristic value
- ✍ Goal of this presentation is to provide a glimpse into how these ideas can help understand sustainability

Example 1: Cross Linkages and Fitness Landscapes

- ✍ Linkages: mutually supports favor incremental over radical change.
 - ✍ E.g. Internal combustion engine: highway system, housing patterns, fossil fuel availability, proven low cost technology, self interest of automobile manufacturers and dealers, availability of parts and repair.

- ✍ Fitness landscapes: Contour map on which an “organism” (aka innovation, program) evolves



- ✍ Placing the TPN: Landscape Axis
 - ✍ Funding gone = radical change in fitness landscape
 - ✍ Survival requires jumping a steep valley from one fitness peak to another. Incremental change won't help.
- ✍ Placing the TPN: Linkage Axis
 - ✍ TPNs have few established reinforcing linkages with other systems.

Example 2: Self-Organization and Adaptability

✍ Self-organization: Property of systems that describes change independent of central control. Function of degree of control and internal complexity

✍ Depending on environment, self organization may be adaptive

✍ Placing the TPN: Landscape Axis

- ✍ Funding gone = radical change in fitness landscape
- ✍ Survival requires jumping a steep valley from one fitness peak to another. Incremental change won't help.

✍ Placing the TPN: Self Organization Axis

- ✍ TPNs are small organizations with few people and few internal sub-groups

