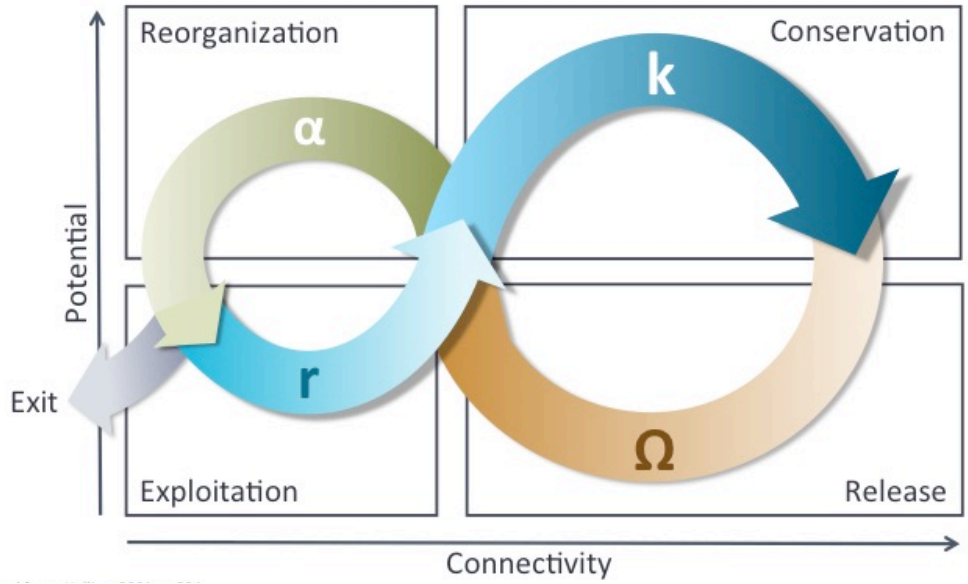
Adaptation and Resilience:

BBAS 413 Complexity Management

The Adaptive Cycle:[1]

Three system properties shape the four phases of the adaptive cycle:

- **Potential:** the range of possibilities open to a system based on its accumulation of capital (skills, resources, processes, functions, niches, etc.).
- **Connectivity:** how tightly parts are linked to one another, and thus how quickly and deeply a change in one part of the system affects other parts.
- **Resilience:** the ability of a system to recover from unexpected shocks (in the diagram below, the background represents low resilience and the foreground high resilience).



	Exploitation (r)	Conservation (K)	Release (Ω)	Reorganization (α)
Potential	Low, increasing	High, climaxing	Low, valleying	Medium, climaxing
Connectivity	Low, increasing	High, increasing	Low, decreasing	Low, decreasing
Resilience	High, climaxing	High, decreasing	Low, increasing	Low, increasing

The exploitation and conservation phases represent a long stable period in which established structures improve their efficiency in extracting resources until increasing specialization and rigidity leave the system vulnerable to unexpected shock. Such shocks unleash a rapid period of 'creative destruction' in which parts of past structures are released and reorganized to create the new broad features of subsequent exploitation and conservation phases. If the parts cannot successfully reorganize, the system dies ('exit').

Panarchy refers to the nested hierarchy of adaptive cycles unfolding at different scales of space and time (for example, a species within an ecosystem within the Earth's socio-ecological regime).

[1] Based on: Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4(5), pp. 390-405.

Resilience:

In its simple definition, resilience is *the ability of a system to recover, or bounce-back, from disruptions.*

In a more technical definition, "Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks."[2]

Principles for More Resilient and Adaptable Organizations:

The following principles can help make organizations more resilient and adaptive. Note that none of them are appropriate at all times or in all situations, and each of them involves costs and trade-offs (particularly with efficiency).

Principle:	Description:	Strategies:
Diversity	Diversity ensures that when a crisis disrupts one way of doing things there are alternatives ways available.	• Maintain a variety of roles, processes, and procedures • Value redundancy in order to preserve alternative options
Experimentation	Experimentation helps find new niches and generates new ways in which to adapt to changing conditions.	• Trying new things • Facilitate safe-fail experiments • Establish innovation labs • Adopt a fail-forward attitude
Decentralization/ Autonomy	Autonomous agents can adapt their activities and relationships to solve problems more nimbly than rigid hierarchies can.	• Foster general skills and learning • Empower team members to make decisions • Enable flexible relationships
Buffering	Buffering creates breaks in connectivity to prevent a crisis from cascading throughout the whole organization.	• Create modularity of functions and sectors • Establish firebreaks • Maintain reserves of crucial stocks
Openness	Openness to the environment and other organizations brings information about changing conditions, new strategies, and possible innovations.	• Foster connections to other organizations • Respect differences
Monitoring (Feedbacks)	Prompt and accessible information about the state of the system helps to evaluate and recalibrate actions.	• Creating feedbacks between actions and effects • Use adaptive management

[2] Walker, B. et al. (2004). Resilience, adaptability and transformability in social-ecological systems, *Ecology and Society*, 9(2).