Module 7 Revisiting Systems

* Define Complexity Science

Study of complex systems

* Describe the findings of Complexity Science (to date) about the properties of complex systems

Tells us properties of complex system:

1. **Complex collective behaviour**:  All complex systems consist of large networks of individual components, each typically following relatively simple rules with no central control or leader.  It is the collective actions of vast numbers of components that give rise to the complex, hard-to-predict, and changing patterns of behaviour that is so fascinating.
2. **Signaling and information processing**:  All complex systems produce and use information and signals from both their internal and external environments.
3. **Adaptation**:  All complex systems adapt - that is, their behaviour changes to improve their chances of survival or success - through learning or evolutionary processes.

* Describe Resiliency Theory

Resilience in a complex system 'protects' its nested group of interacting sub-systems from devastating disturbances. To maintain a resilient system, the system must always be experimenting with the boundaries of what kind of disruption the system can, and cannot, handle.

* Define the Adaptive Cycle and use it to describe a built system

Simple model that broadly describes the behaviour of complex systems

Four phases: Rapid Growth, Conservation, Release/Disturbance, Reorganization

Ex. The bridge preliminary design starts quickly using many human resources (rapid growth). The project moves to slower, detailed design with fewer human resources required (conservation). All of a sudden, steel prices spike and global supply drops (i.e. a distrubrance) and the decision is made to avoid the use of steel (collapse). A new design is started for a concrete bridge (reorganization).

* Describe examples of the application of resiliency in the urban environment