

Lesson 1 Components of Urban Ecology

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Infrastructure systems

- interconnected and nested systems that exist at different scales and across a wide range of locations
- even without considering the social nature of cities, the interactions between different types of infrastructure systems within the built environment are not always well understood

Urban Societies

- social systems within cities are unique, involve social interactions between strangers
- all these social systems influence peoples' behaviours
- implicit and explicit rules of behaviour exist within all social systems. People's behaviours, in turn, can impact built systems and also bio-physical systems within the urban ecology

Livability

- quality of interactions between people and their urban environment
- encompasses human needs such as food, security, physical health, cultural freedom, a sense of belonging within a community, equity, etc.
- Indicators

<ul style="list-style-type: none">• air quality,• walkability,• working conditions,• cultural activities,	<ul style="list-style-type: none">• sports activities,• volunteerism within the city's communities,• and affordability of housing
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Ecosystem Services in Cities

- Urban environments can support healthy ecosystems which provide all types of ecosystem services
- ex. Bats
 - The barriers caused by light can impact the health of the bat population and thereby limit the bats' ecosystem services which include reducing the mosquito populations

Quiz

Lesson 2 Urban Infrastructure

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Challenges

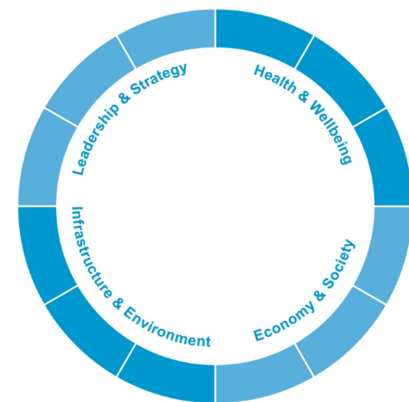
- cities are complex hubs of innovation, exchange of goods and services, as well as places of cultural significance and human well-being
- vulnerable to
 - disease epidemics;
 - criminal activity;
 - loss of housing affordability;
 - natural disasters such as earth quakes;
 - social dysfunction (e.g. rioting).
 - increased airborne particulates due to wild fires;
 - flooding and drought;
 - increases in storm intensity;
 - higher sea level rises leading to salinization (of soil and aquifers) and loss of underground infrastructure;
 - decreases in agricultural productivity due to loss of ecosystem services.

Megacities

- vulnerable to disruptions since located near river deltas or coastlines

Rotterdam

- **Bentemplein Square**
 - provides vibrant social space, AND can act as water catchment
- **Museum Park Garage**
 - provides space for automobiles AND used as underground stormwater reservoir
- **Dakkers Green Rooftops**
 - contributes to stormwater drainage system AND provides vegetables and honey for urban residents



Resilience in Cities

- the capacity of individuals, communities, institutions, businesses, and systems within an urban environment to survive, adapt, and grow no matter what kind of chronic stresses and acute shocks they experience
- need **integrated plan** to address those challenges
- **Resilience Theory**
 - resilient systems have specific qualities, and that for overall resiliency to be achieved, the sub-systems within a city need to possess these qualities.

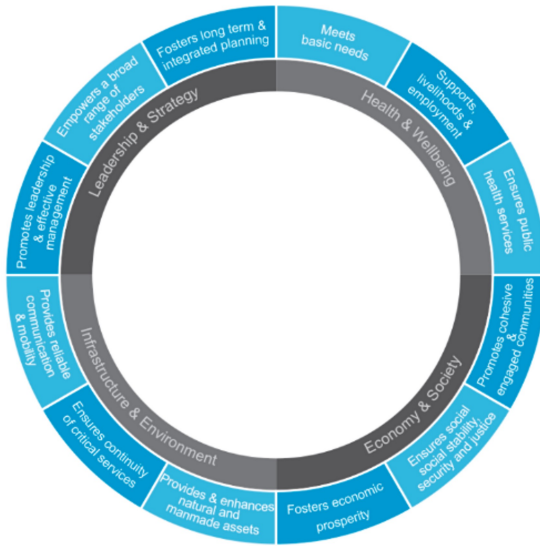
CR Framework (City Resiliency)

- **Health and wellbeing**
 - Everyone living and working in city has access to what they need to survive
 - Meets Basic Needs
 - Supports Livelihoods and Employment
 - Ensures public health services
- **Economy and society**
 - The social and financial systems that enable urban populations to live peacefully, and act collectively
- **Leadership and Strategy**
 - Processes that promote effective leadership, inclusive decision-making, empowered

stakeholders, integrated planning

- **Infrastructure and Environment**

- The human-made and natural systems that provide critical services, protect, and connect urban assets enabling the flow of goods, services, and knowledge.



Resiliency at Different Scales

- for very large systems to be resilient, the subsystems of which the large system is made, must also be resilient

Quiz

- **four qualities of a resilient infrastructure system?**
 - Reflective (i.e. learning from past experiences)
 - Robust
 - Flexible
 - Integrated (For engineered systems, this is critical and there are growing examples of this - for example, integrated waste water management is a growing field.)
 - Resourceful
 - Redundant
 - Inclusive

Lesson 3 Resiliency in Urban System Design

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The Ecosystem Approach to Resilient Design

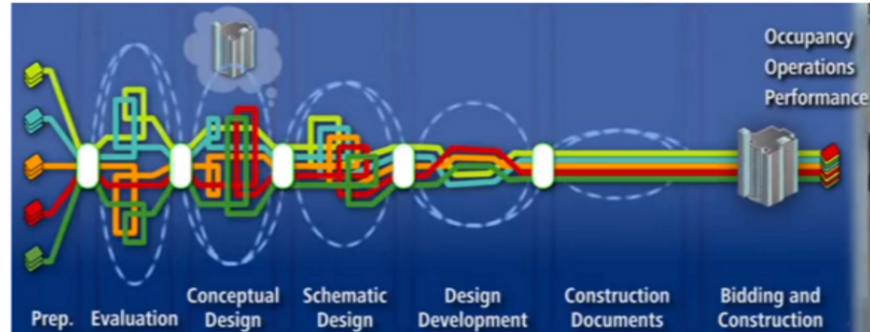
- The ecosystem approach to infrastructure design involves consideration of the context of the design (e.g. the bio-physical context, the political context, cultural context, economic context and so on)
- short and long term impacts of the design
- direct and indirect impacts of the design
- awareness of the systems in which the infrastructure is embedded (including the ecological, geographic, climatic systems, and the different levels of social and economic systems)
- considerations of the entire life cycle of the infrastructure
- influence the goals of the infrastructure design.

Lesson 4 Green Buildings

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IDP

- **Integrative Design Process**
 - o highly collaborative and interactive design process that focuses on resource efficiency by employing systems thinking to derive multiple benefits from single expenditures.
- 7 stages
 - o Design Preparation
 - o Evaluation
 - o Conceptual Design
 - o Schematic Design
 - o Design Development
 - o Construction Documents
 - o Bidding and Construction
- eighth stage is often added, namely:
 - o Occupancy, Operations, and Performance (sometimes called "Post-Occupancy")



IDP Design Goals

- Energy
 - o energy use reduction, energy generation
- Water
 - o water use reduction
- Material
 - o use of recycled and locally produced materials
- Site
 - o optimal use of buildign site
- Indoor quality
 - o optimal indoor quality for occupants
- **People in IDP**
 - o Core Project Team Members
 - Client
 - Project manager
 - Engineer, etc.
 - o Additional Members
 - Ecologist
 - Marketing expert
 - Occupants, etc.
- Design Charette
 - o intensive planning session, designers and stakeholders of the project, collaborate to create an overarching vision for the project
 - o Design charettes are called when the project is particularly large.

LEED

- address conundrum, client know if building really is high performance
- Leadership in environmental and energy design certification process
- credit system where any project can be assessed to have a specific number of credits in each of several design categories

LBC

- green certification process applied to buildings
- Living building Challenge

- Criteria
 - Materials
 - Health
 - Beauty
 - Equity
- certified the Van Dusen Gardens gift shop