

Anthropogenic Effects

- Three insights:
 - Engineering decisions are not independent of the surrounding natural and human systems.
 - The traditional approach to engineering must be challenged; we must understand the interactions and invent a system approach (technical-hard vs. non-technical-soft)
 - Engineering decisions affect the quality of life of humans and natural systems.
- The built environment is a significant problem. Large percentages of materials, fuels, and natural resources are being used producing large quantities of waste.
- Definition of health: a state of complete physical, mental, and social well-being; not just the absence of disease or infirmity—World Health Organization.
- How does our built environment lead to an unhealthy environment?
 - Land-use decisions to air quality and respiratory health. Ex: Very important since death from pollution from cars is greater than death from automobile accidents.
 - The built environment discourages physical activity. It is typically made for mobility by cars, not for pedestrians or bicycle traffic. Ex of how the built environment could help if done to promote walkability: when Atlanta was developed for the Olympics it provided more safe methods of pedestrian/bicycle travel thus increasing the number of people exercising and decreasing emissions by cars.
 - Need to improve the built environment to increase accessibility of elderly, disabled.
 - There is a great impact of uncontrolled growth and sanitation, disease. Development can lead to ground water contamination, floods, can change the historical hydrograph.
- What should the definition of the “engineer of the future” be to turn things around?
 - “The engineer of the future will apply scientific analysis and holistic synthesis to develop sustainable solutions that integrate social, environmental, cultural, and economic systems.”
- Aldo Leopold:
 - “Engineer and the public believe a constructed mechanism is preferable to a natural one. The conservationist believes the contrary.”
 - The engineer has respect for the mechanical wisdom, but disrespect for ecological wisdom.
 - Land ethic: a thing that is right when it tends to preserve integrity, stability, beauty of the biotic community.
- Non-natural systems vs. Natural systems. You cannot use the same tools to understand each!
 - Non-natural systems: Cartesian, Predictable, Closed Systems
 - Natural: Non-Cartesian, Diverse, Open Systems
- How does a concrete dam affect the environment?

- Atmosphere
 - Microclimate change upstream/downstream
 - Pollution from water-sports in reservoir
 - Clean energy production
 - Pollution from energy generation
- Geosphere
 - Hydrologic fracturing from subterranean pressures
 - Dries riverbed
 - Reduces sediment deposit for banks/riverine habitat
 - Less forestation
 - Lack of downstream flood deposits
- Hydrosphere
 - Increase in evaporation
 - Changes in hydraulic cycle
 - Controls and causes flooding
 - Hydration
 - Silt and salt increase
 - Change in the natural cause of water affecting species
- Biosphere
 - Migration route (habitat change)
 - Creates energy
 - Changes nutrient flow downstream
 - Less biodiversity
 - Fish population declines – affects people who count on them
 - Increase in the temperature of water that changes habitat