

Environmental aspects of energy – introductory remarks

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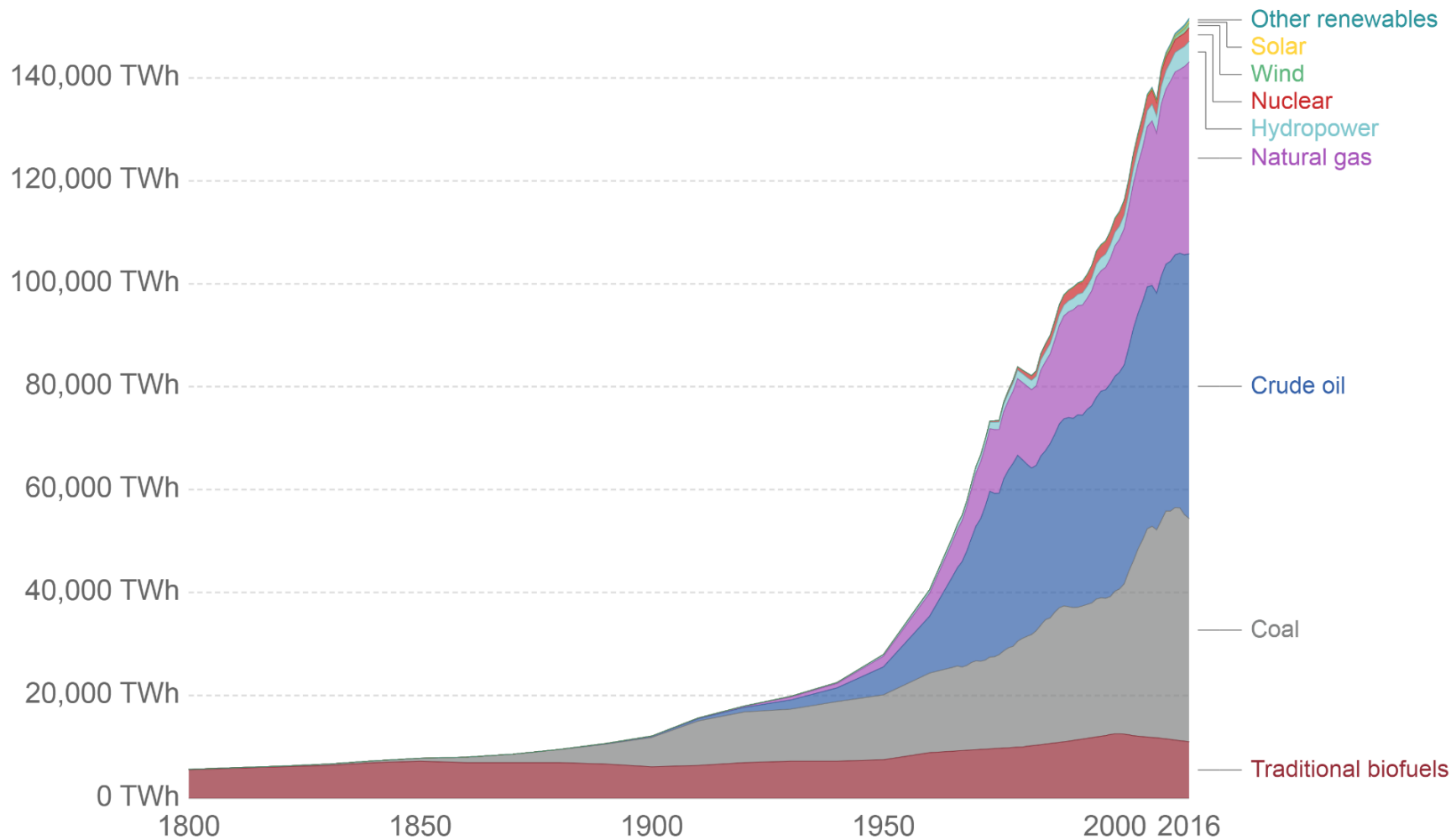
State of the global environment

Five concerning trends:

- 1) Population growth
 - 2) Economic development
 - 3) Decline of life support ecosystems
 - 4) Global atmospheric changes
 - 5) Loss of biodiversity (variety and variability of life)
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- Fossil fuels facilitate these trends.

Global Primary Energy Consumption, World

Global primary energy consumption, measured in terawatt-hours (TWh) per year. Here 'other renewables' are renewable technologies not including solar, wind, hydropower and traditional biofuels.



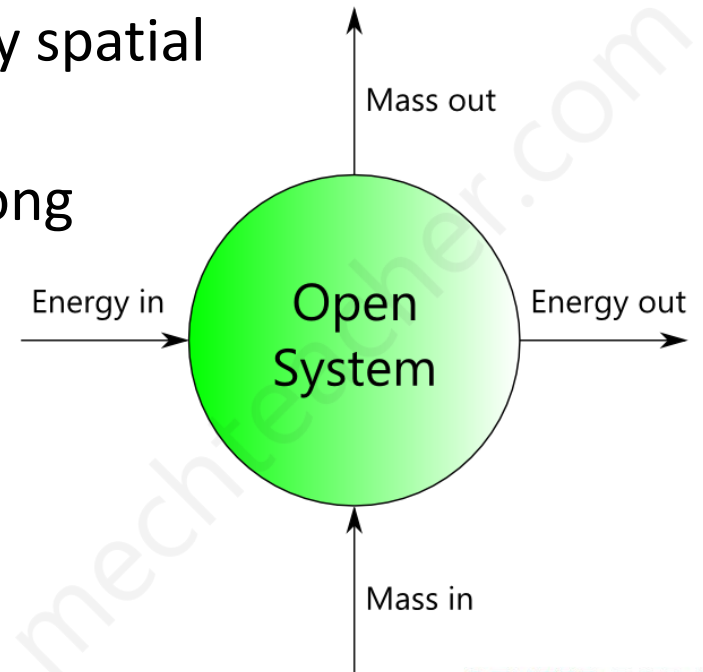
Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

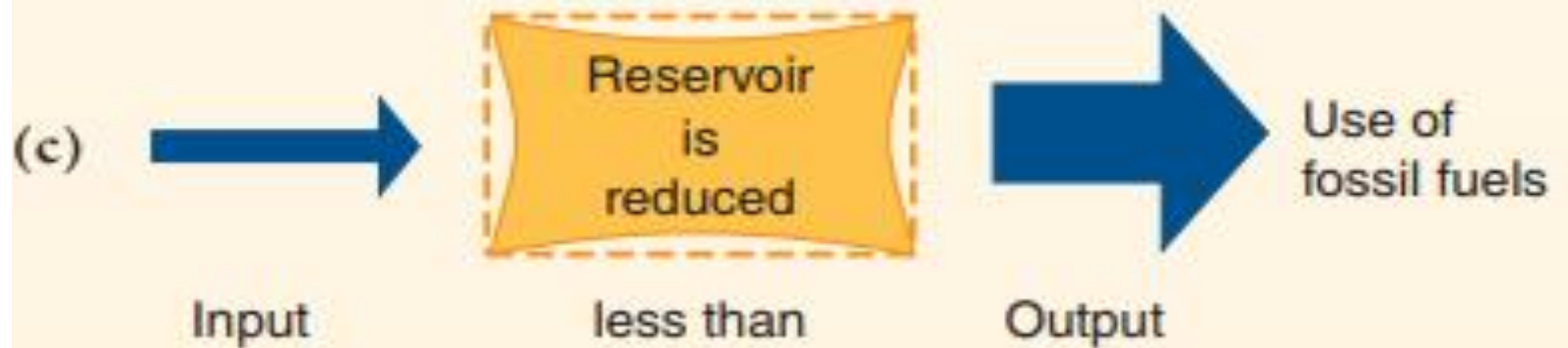
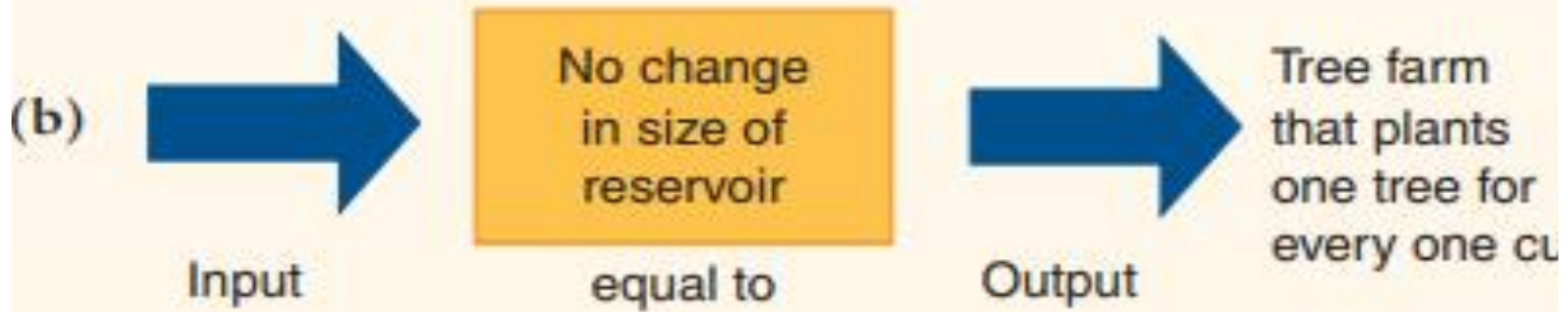
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Requirements of the course

System theory

- Framework to study the (complex) systems.
- Set of components that function together to act as a whole (*The whole is more than a sum of its parts*).
- Separated from the environment by spatial and temporal boundaries.
- Matter or energy is exchanged among components of the system.
- Natural or man-made.
- Open vs. closed systems.
- Earth as a system.







Human population in large cities (feedbacks)

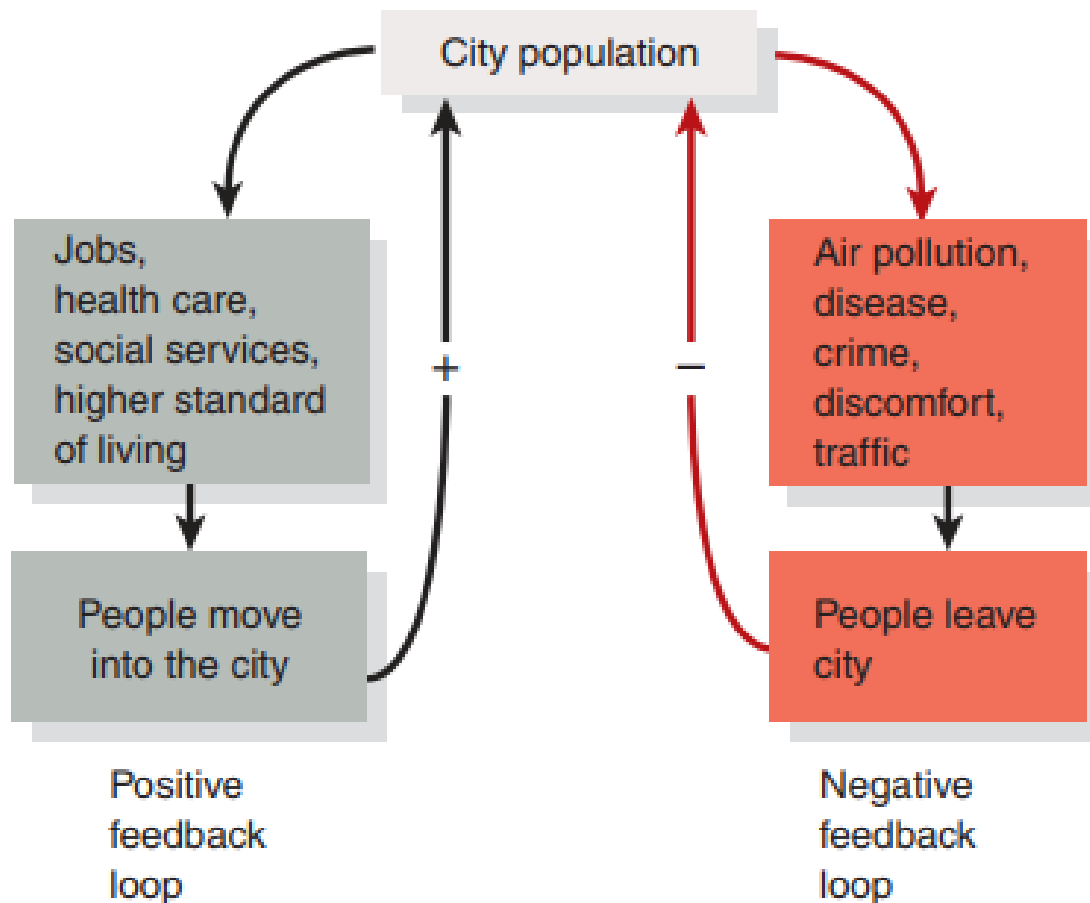
Feedback – when output of the system also serves as an input, leading to changes in the state of the system.

Systems tend to dynamic equilibrium, from time to time disrupted by natural and human-induced disturbances → changes over time.

Positive (amplification) /negative (dampening) feedbacks.

= A feedback loop is a mechanism by which change in a variable results in either an amplification (positive feedback) or a dampening (negative feedback) of that change.

Human population in large cities (feedbacks)





Source: Česká
televize

Sources

- Mechteacher.com: Thermodynamic System and its Types
- Botkin, D.B.; Keller, E.A.: Environmental Science: Earth as a Living Planet.
- Teach the Earth: Complex systems.
<https://serc.carleton.edu/NAGTWorkshops/complexsystems/index.html>