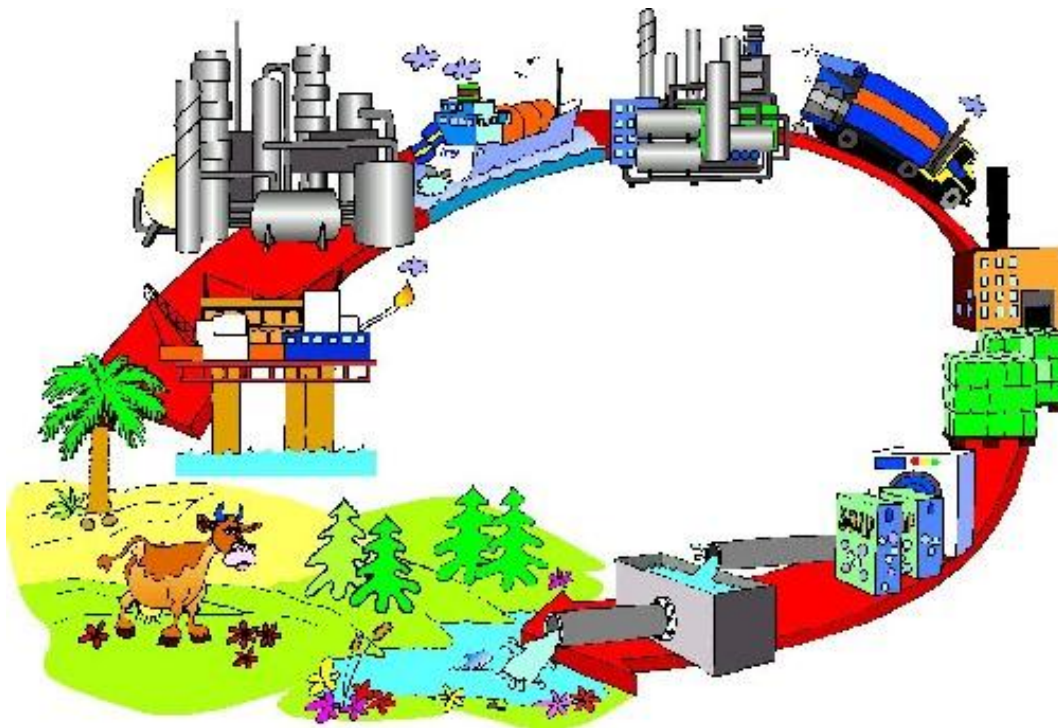


Environmental Life Cycle Assessment

PSE 476/WPS 576/WPS 595-005

(Topic 3: Philosophy of LCA)



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Topic 3: Philosophy of LCA

The Environment and Ecosystems

Environment: all of the physical chemical, an biological factors and processes that determine the growth and survival of an organism or community of organisms

Ecology: study of the abundance and distribution of organisms in relation to their environment

- The earth has sustained living organisms for >3.8 million yr
- Humans have had the greatest effect on the environment

Ecosystem: is the combination of a community of organisms and its physical and chemical environment, functioning as an integrated ecological unit, taken in a specific area.

- Example: lakes, forest, earth
- include **biota**, living organisms
- include **abiotic**, nonliving things

Ecosystem Services

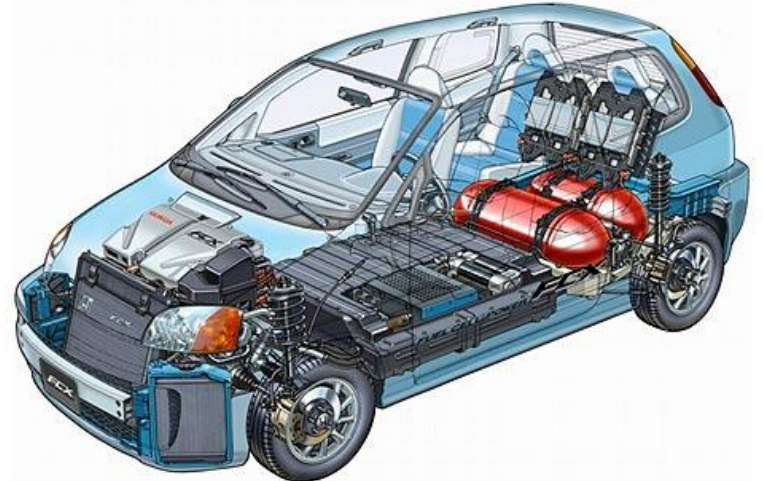
- **Ecosystem services:** the resources and services provided to humans supplied by ecosystems
 - **Provisioning:** food, water, air
 - **Regulating:** climate, flow of water, absorption of pollution
 - **Cultural:** spiritual and recreational benefits
 - **Supporting:** nutrient cycles, soil formation, pollination...
- No doubt, humans are a special organism with high and fast demand of ecosystem services: *stress on ecosystems*

Ecosystem Stability

- **Dynamic homeostasis:** how systems adjust to minimize variations from normal values
- **Feedback:** *ability to adjust based on changes in the system*
 - **Negative feedback:**
 - **Positive Feedback:**
- *Change in ecosystems is inevitable and essential*
- *Will human stress cause change that is not sustainable?*
- *Will positive feedback events occur so that future generations will not be able to live like the current generation?*
- *How can we find thresholds of change?*

Balance between ecosystem service consumption and Sustainability

- ***Blind automechanic example:***
 - *Automobile consists of thousands of parts*
 - *Auto's main service is to:*
 - *What if you were asked to remove parts sequentially and had excellent knowledge about how a car works?*
 - *What if you were asked to remove parts sequentially but had no knowledge about how a car works?*



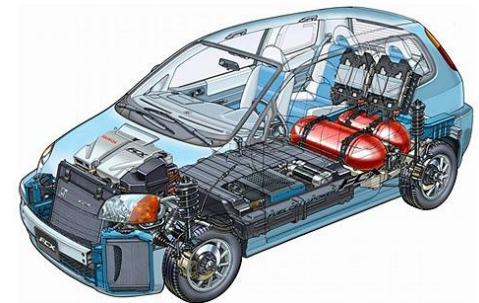
- ***Uncertainty: there are things that we don't know about ecosystems***
 - *Ignorance*
 - *Complexity*

- ***Scientists try to reduce uncertainty using hypotheses and the scientific method***

Systems Thinking

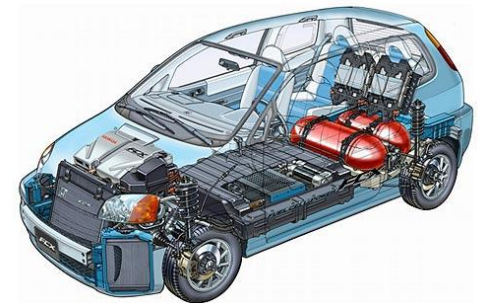
- **Systems thinking** is the process of understanding how things influence one another within a whole.
 - In nature, examples include ecosystems in which various elements such as air, water, movement, plants, and animals work together to survive or perish.
 - In organizations, systems consist of people, structures, and processes that work together to make an organization healthy or unhealthy.
- an approach to problem solving, by viewing "problems" as parts of an overall system, rather than reacting to specific part, outcomes or events and potentially contributing to further development of unintended consequences.

- Systems Thinking:
- Parts Thinking:



Systems Thinking

- Life cycle analysis is best approached as a systems thinking activity
- **Issue:** Over focus on global warming. Unintended consequences.
- **Issue:** Carbon markets. Proof of additionality.
 - Additionality: an activity that would not be done if there were no considerations for climate change.

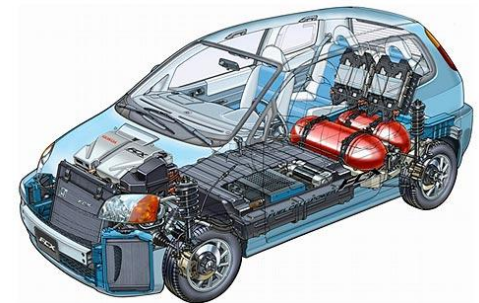


Uses of LCA's:

Application	Requirement on Methodology
Decision making, choices between alternative actions	Reflections of consequences of actions, fairness to all alternatives, inclusion of reasonable alternatives
Market communication	Fairness, possibility to compare results to other options, clarity
Purchasing decisions	Results presented on a high level of aggregation, simplicity, fairness to all options
Decisions on national, state, or local level, government policies	Data representing all regions of the national, state, or local area
Internal use to improve a product	Site specific data, to a detail such that individual changes can be understood

Choices in LCA

- Quality of data
- Boundaries
- Allocation
- Best case / worst case



Ethics in LCA

- The American Center for Life Cycle Assessment supports adherence to this code of ethics regarding LCAs. All members of the American Center for Life Cycle Assessment therefore make the following commitments:
- To make maximum use of national and international standards, particularly the ISO 14040 series standards, and U.S. federal FTC guidelines for claims when conducting an LCA;
- To avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
- To be honest and realistic in stating claims or estimates based on available data;
- To the greatest extent consistent with retaining confidential business information, to disclose data and estimates in a full and transparent manner;
- To clearly distinguish between professional extrapolations and value judgments when developing, performing and using life cycle assessments;

Ethics in LCA

- The American Center for Life Cycle Assessment supports adherence to this code of ethics regarding LCAs. All members of the American Center for Life Cycle Assessment therefore make the following commitments:
- To improve the understanding among LCA professionals, the general public and decision-makers of Life Cycle Assessment, its appropriate application, and potential consequences;
- To maintain and improve one's technical competence and to undertake tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
- To seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
- To treat fairly all persons regardless of such factors as race, religion, gender and sexual orientation, disability, age, or national origin; and
- To assist colleagues and co-workers in their professional development and to support them in following this code of ethics.



Summary

- Ecology
- Ecosystems
- Dynamic homeostasis
- Negative feedback
- Positive feedback
- Systems thinking
- Sources of Uncertainty
- Piece thinking
- Ethics in LCA