

Lesson 1 Material Resources & Productivity

December 4, 2019 9:22 PM

Intro

- Supply chain = sequence of activities leading to the delivery of a product/service to an end user

Decoupling Material Consumption

- Dematerialization requires
 - o government policies need to support dematerialization, ex. fees for the use of resources, and setting minimum warranty periods
 - o New business models need to include improved efficiency of production
 - o Greater consumer awareness of role we can play

Lesson 2 Biomimicry in Engineering design

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Biomimicry

- develop products that contribute to sustainable supply chain

Biomimicry and design



- 4 stages: scoping, discovering, creating, evaluating
- substages:
 - o defining context of problem
 - o identifying function that design will perform
 - o integrating life's principles into the scope of design

Design inspired by nature

- Coloured Fabrics and Without chemical dyes
 - o as chemical dyes require pigments from nature and can be toxic, Teijin fibers limited created blue coloured fabric without the use of chemical dyes, by creating a fabric of varying fibre thickness, inspired from the Morpho butterfly wings

Lesson 3 Industrial Ecology

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Intro

- IE Industrial ecology = idea of thinking about a factory as an industrial organism, and thinking of a set of factories as an industrial ecosystem
- ex. Kalundborg successful industrial ecosystem
 - o world's first industrial symbiosis. Cooperation between companies in symbiosis provide mutual benefits both economical and environmental. The residue from one company becomes a resource in another. It allows for resource saving and recycling.
 - o world's first well-functioning example of industrial ecology
 - o companies buy and sell waste from each other in a closed cycle of industrial production
 - o by-products are traded, steam, ash, gas, heat, sludge, and others that can be physically transported from one company to another.

Lesson 4 Circular Economy & Construction Waste

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Circular Economy

- focus on eliminating waste from resource and material processing
- minimizing inputs of new, raw materials
- adopting renewable energy as a means of supporting human activities
- mimic biological cycles when we create technical cycles.

Recycling of Construction materials

- Pine Beetle wood
- Masonry
- Unfired bricks
- Metals
- By product Carbon dioxide

Lesson 5 Life Cycle Assessment Methodology

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Intro

- determine the environmental impact of a product over the lifetime
- understand material inflows and outflows
- functional unit
 - o ex. between paper and ceramic coffee cup
 - o unit volume held by a single container over the life-time of the container
 - o unit area of paper over life-time of paper

Formal LCAs

1. Goal and Scope (most critical step)
 - What is the purpose of the LCA?
 - What is the spatial and temporal scope of the LCA?
 - What are the functional units to be assessed (i.e. what is the basis of the assessment)?
 - Who is going to use the results of the LCA?
 - What decisions will be made based on the results of the LCA?
2. Definition Inventory
 - identifying and measuring the materials, energy, water and pollutant inputs and outputs of each life-cycle-stage
3. Impact Assessment
 - each flow identified in inventory categorized into one of several types of impacts
 - ex. fossil fuels, minerals, radiation
4. Interpretation
 - organize goal and scope, results of inventory analysis and impact assessment steps
 - best performed during each of 3 first steps of LCA