Module 5 Lesson 5 – The Life-Cycle-Assessment Methodology

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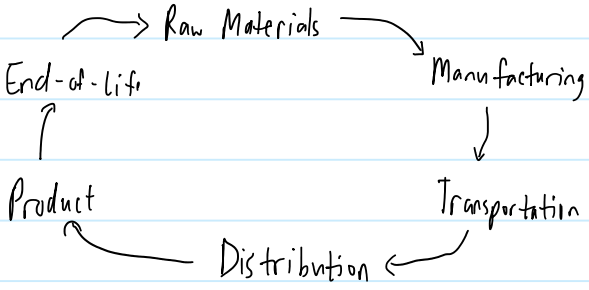
5.5.1 Introduction

- Life Cycle Assessments (LCA)
  - type of material flow analysis based on life-cycle thinking.
  - performed to determine environmental impact of a product, process, or system, over its lifetime
  - performed to understand material inflows & outflows related to a product, process, activity, or system and the influence of these flows on receiving ecosystems



- Formal LCA has 4 steps:
  1) Goal & scope
  2) Definition Inventory
  3) Impact Assessment
  4) Interpretation

5.5.2 Goal & Scope Definition (Phase 1)

- 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 (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?

So, for example, if you are in Moonbeam's coffee shop and want to make a choice between drinking coffee from a paper or a porcelain cup, you might want to search on-line for an LCA which might help you make that decision. You would need to find an LCA where-in the purpose and scope questions are answered as follows:

- **Q: What is the purpose of the LCA?**
- A: *To determine which cup is the least environmentally damaging. (Note that the underlying assumption of LCAs is "human activity is bad for the environment". Work is now underway to modify the LCA process from the perspective of "regenerative sustainability".)*
- **Q: What is the spatial and temporal scope of the LCA?**
- A: *The LCA will focus on the entire life cycle of those paper and porcelain cups used in Moonbeam's coffee shop. (After all, you want to make sure that the total system is optimized, not just a subset of the production system.)*
- **Q: What functional unit will be used in the assessment (i.e. what is the basis of the assessment)?**
- A: It's probably best to look for an LCA where-in the functional unit involves determining the environmental impacts PER UNIT VOLUME HELD BY A SINGLE CONTAINER OVER THE LIFE-TIME OF THAT CONTAINER (not per Litre of coffee, not per weight of coffee cup material) - Think this through! - do you agree?
- **Q: Who is going to use the results of the LCA?**
  - A: *You will use the results (so, because you are an engineering student, the language in the assessment can be fairly technical).*
- **Q: What decisions will be made based on the results of the LCA?**
- A: *The decision will be made to drink your coffee from either the paper or the porcelain cup.*

5.5.3 Inventory Analysis (Phase 2)

- Inflows and outflows are identified and measured
- involves identifying and measuring the materials, energy, water, and pollutant inputs and outputs of each life-cycle stage

5.5.4 Impact Classification (Phase 3)

- Typical list of impact classifications comes from the Eco-Indicator 99 methodology:
  - Fossil Fuels
  - Minerals
  - Land Use
  - Acidification & Eutrophication
  - Ex. toxicity
  - Ozone Layer
  - Radiation
  - Climate Change
  - Respiratory Inorganics
  - Respiratory Organics
  - Carcinogens

5.5.5 Interpretation (Phase 4)

- time to organize previous three steps/phases into a comprehensible package for decision makers
- best performed