Framework for Modeling the Uncertainty of Future Events in Life Cycle Assessment

Objectives

- LCA may provide non-significant result if uncertainty is not included.
- A model framework is proposed to incorporate the uncertainty of future events into LCA.
- Traditional thinking of LCA: 

          ■          
  Scenario 2
  Scenario 3

Rethinking LCA

- Model Framework: Rethinking LCA
  1. Identify events
  2. Determine probability over period
  3. Evaluate impacts
  4. Incorporate into LCA

- Probability of Recession
  Chance of a Recession Occurring When People Begin Replacing Their Devices
  (third year of consideration on, in the U.S.)

- Case Study -- Laptop
  - Carbon footprint of the use phase of laptop is significant.
  - Two events are considered in the case study.
    - Recession
    - Complementary Technology
  - Two scenarios with uncertainty are analyzed.

- Tablet Impact on PC usage
  - As a new complementary technology, surveys suggested that users who own both a tablet and a PC reduce their use time on old PCs for consumption activities. [Morgan Stanley, 2010]

- Case Study Results
  - With the inclusion of uncertain events,
  - Use phase greenhouse gas emissions are up to 40% lower than the benchmark scenario
  - 32% to the overall LCA emissions reported by O’Connell and Stutz (2010) as opposed to their estimates of 47%.

- Conclusion and Future Work
  - A model framework is proposed to incorporate the future uncertainty.
  - The model provides additional information about the possible range of the values that the carbon footprint will likely take.
  - Case study on laptop shows the impacts of including such uncertainty has the potential to alter the LCA result significantly.
  - More and better quality data may be required for better probability estimation of events.
  - Future work: construct a database for identifying events and their probabilities.