# Life Cycle Assessment: A Tool for Making Informed Decisions


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## Abstract

Life Cycle Assessment (LCA) is an innovative tool for assessing the environmental impacts associated with a product's life cycle. This research explores the basic principles of LCA and delves deeper into four product groups: coffee production, expanded polystyrene alternatives, tissue and handkerchief use, and computer replacement. After compiling information from previous LCAs and evaluating each life cycle, we presented our findings to ClimateWise business partners in an effort to educate and engage the community and encourage businesses and individuals to make informed and conscious decisions in daily consumption.


## Methodology

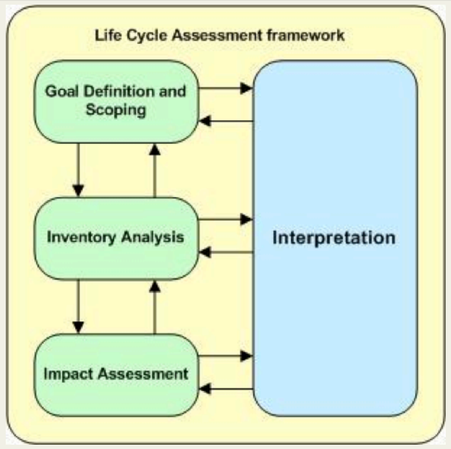


Figure 1: Methodology of Life Cycle Assessment. The different phases are all connected, representing a complex process. Source: EcoSMEs

Standard LCA methodology follows four steps. The main objectives of the goal and scope definition are to define spatial and temporal boundaries of the project as well as relevant life cycle phases. The inventory analysis focuses on quantifying all physical inputs and outputs. Impact assessment aims to define relevant environmental impact categories, and interpretation centers on summarizing the results and making recommendations for future action.

In our own research, we selected four product groups we believe to be prevalent in office settings, evaluated previous LCAs when available, and compiled supplementary information on relevant life cycles. We chose to present our research at a ClimateWise event in an effort to spark interest and conversation around the topic of LCAs.

## Results

### Coffee

- Coffee is nearly everywhere and is a $30-32 billion market worldwide (Specialty Coffee Association of America 2012).
- With 1.6 billion cups consumed per day, the impacts of coffee are substantial through an economic, social, or environmental lens (International Coffee Organization).
- The energy for the production of 1000 kilograms of unroasted coffee beans equates to about three months of the average monthly electricity use per household in the U.S. and it takes 33 cups of water to satisfy the average office drinker (Coltro 2006, EPA 2010, and Recruiters 2012).
- A study comparing instant, drip filter and espresso coffee concluded that instant coffee had the lowest energy consumption and a smaller environmental footprint than both drip filter and espresso coffees.

### Expanded Polystyrene

- Expanded polystyrene, also known as Styrofoam®, provides exceptional insulation and protection at a reasonable cost, making it popular as a key component in packaging, coffee cups, and more.
- Expanded polystyrene has been blamed for harmful health complications, including diminished nervous system function and cancer, and it has been linked to the release of dozens of harmful chemicals into the environment.
- Ecovative Design developed an alternative product (Mushroom® Packaging) that uses agricultural by-products, poses no known health risks, is 100% compostable, and performs at the same quality as expanded polystyrene.
- A formal LCA is not yet available, but consumers can limit use of expanded polystyrene, recycle when available, and explore alternative product choices.

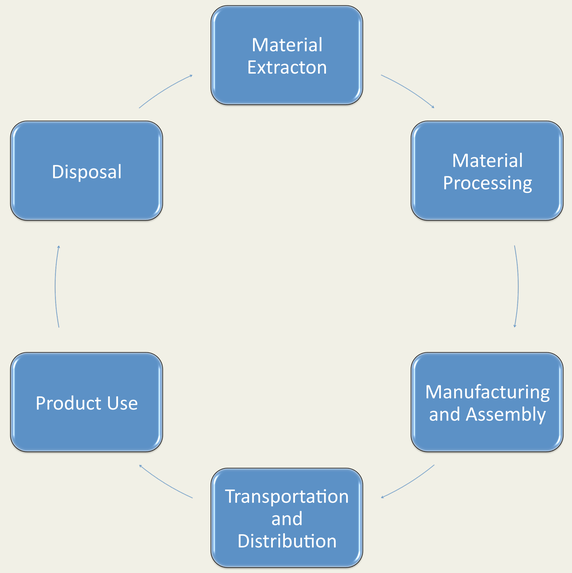


Figure 2: Diagram illustrating the different phases of a life cycle assessment. Although this model shows it as a cycle, this is the ideal and currently most systems run as a linear model.

### Tissues and Handkerchiefs

- Consumers are questioning the environmental impacts of disposable facial tissues.
- Cotton handkerchiefs, a predecessor to Kleenex®, are regaining popularity as a reusable alternative
- End-of-life impacts for both products make up a very small percentage of the total environmental impacts.
- The resource-intensive production of a cotton handkerchief may negate the environmental benefits of choosing a reusable product (Ecosystem Analytics, Inc. 2012).
- The choice between particular brands may ultimately be more impactful on the environment than the choice between tissues and handkerchiefs.

### Computers

- It is much more beneficial to use computers to their end-of-life due to the environmental impacts and energy required during raw material extraction, processing, and manufacturing of new computers.
- Reusing and recycling computers can lessen the environmental impacts of computers. Reuse means reselling or donating in order to ensure a 2nd lifespan of computers is realized before final disposal.
- Recycling computers at the end-of-life is crucial to salvage materials necessary for the production of new computers.
- Using power management strategies can reduce watt usage and increase the lifespan of computers.

## Conclusion

While an LCA is typically treated as a detailed and complex tool for evaluating a product's life cycle, it should not be limited to this type of use. Through sharing this research with ClimateWise business partners, it became quickly apparent that LCAs could be extremely valuable as a more general tool for changing consumer mindsets and a simple reminder that environmental burdens are often more complex than initially assumed. After presenting a summary of this research to ClimateWise business partners, audience members began suggesting other products to consider in the scheme of LCA as well as ways in which to educate and engage the greater community. Future work in this field should attempt to expand upon individual product LCAs as well as community outreach and education to encourage manufacturers and consumers to think more deeply about their daily choices and the potentially surprising environmental impacts of those choices.

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