

Designing Sustainable Packaging Step-By-Step

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1. Design Philosophy

Industrial Ecology¹:

- Recognizes that **industrial production is bounded by the ecosphere**
- Looks at a whole system rather than focusing on a single part, in order to better **understand complex interactions** (unintended consequences, delayed effects, etc)
- Models industrial systems after ecological systems, where **wastes of one process serve as the raw material for another** (e.g., circular rather than linear systems)
- **Circular Economy²**: Promotes switch **from “consumer” to “user”** (e.g., products as services, extended producer responsibility)

2. Assessment

Life Cycle Assessment (LCA)

- Tracks the environmental impacts of a products and/or package **throughout its full life cycle**



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- **Quantifies** environmental impacts at each phase (inputs and outputs)
- Evaluates impact on ecological systems using **multiple indicators** (e.g., carbon footprint, water use, land use, non-renewable energy demand, human health impacts, biodiversity/ecosystem impacts)

3. Materials Selection

No “silver bullet” material for packaging:

- **All materials have environmental benefits and challenges**

¹ Credit: Robert Frosch and Nicholas E. Gallopoulos

² Credit: Walter Stahel

- For example, aluminum is highly recyclable but energy intensive, while paper is renewable but carries sourcing risks

LCA Tools:

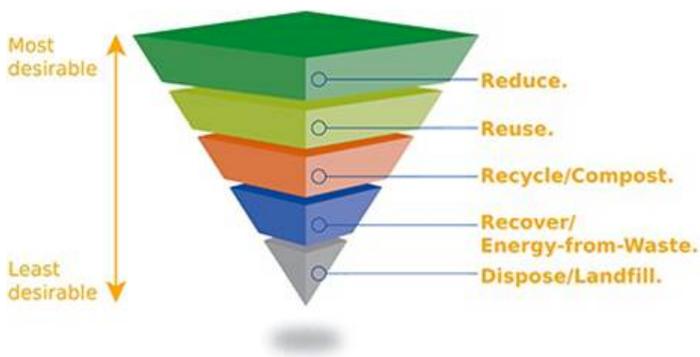
- Allow you to **compare the environmental impact of different materials, formats, design modifications and supplier locations**
- However, LCA tools may not accurately count *all* environmental impacts (e.g., **litter, fiber sourcing**)
- LCA tools also may not include new and **innovative materials**

Innovative Materials:

- When evaluating innovative materials, request **peer-reviewed LCAs**
- Look for plant-based plastics derived from **agricultural by-products**

4. Design for Recovery

The Waste Hierarchy:



Source: U.S. EPA

Design for Recycling (DfR):

- **Fusion of materials** may diminish or prevent recycling
- **Conventional forms** often support recycling
- **Design for recycling guides** available for paper, plastic, glass and metals

5. Communication

Concepts that resonate with consumers

- On-pack sustainability information can **tip the scale** in purchase decisions
- Mainstream shoppers look for **recyclability** first, but also **seek education** on sustainable packaging

Making claims

- **FTC Green Guides** govern specific packaging sustainability claims (e.g., recyclable, compostable, made with renewable materials, made with recycled materials, etc.)