

Life Cycle Assessment:

Discussion on full-scale and simplified assessments to support the product development process

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ADVANCES IN CLEANER PRODUCTION

USP



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Summary

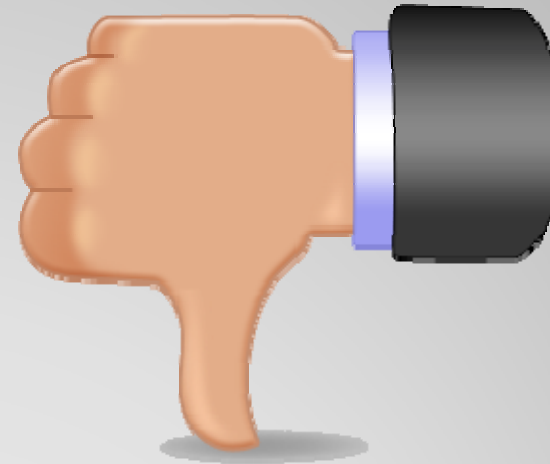
- Context
- Goal
- Life Cycle Assessment (LCA)
- Simplified approaches (S-LCA)
- Methodology
- Ecodesign methods and tools = S-LCA
- Final Remarks

Context

Products



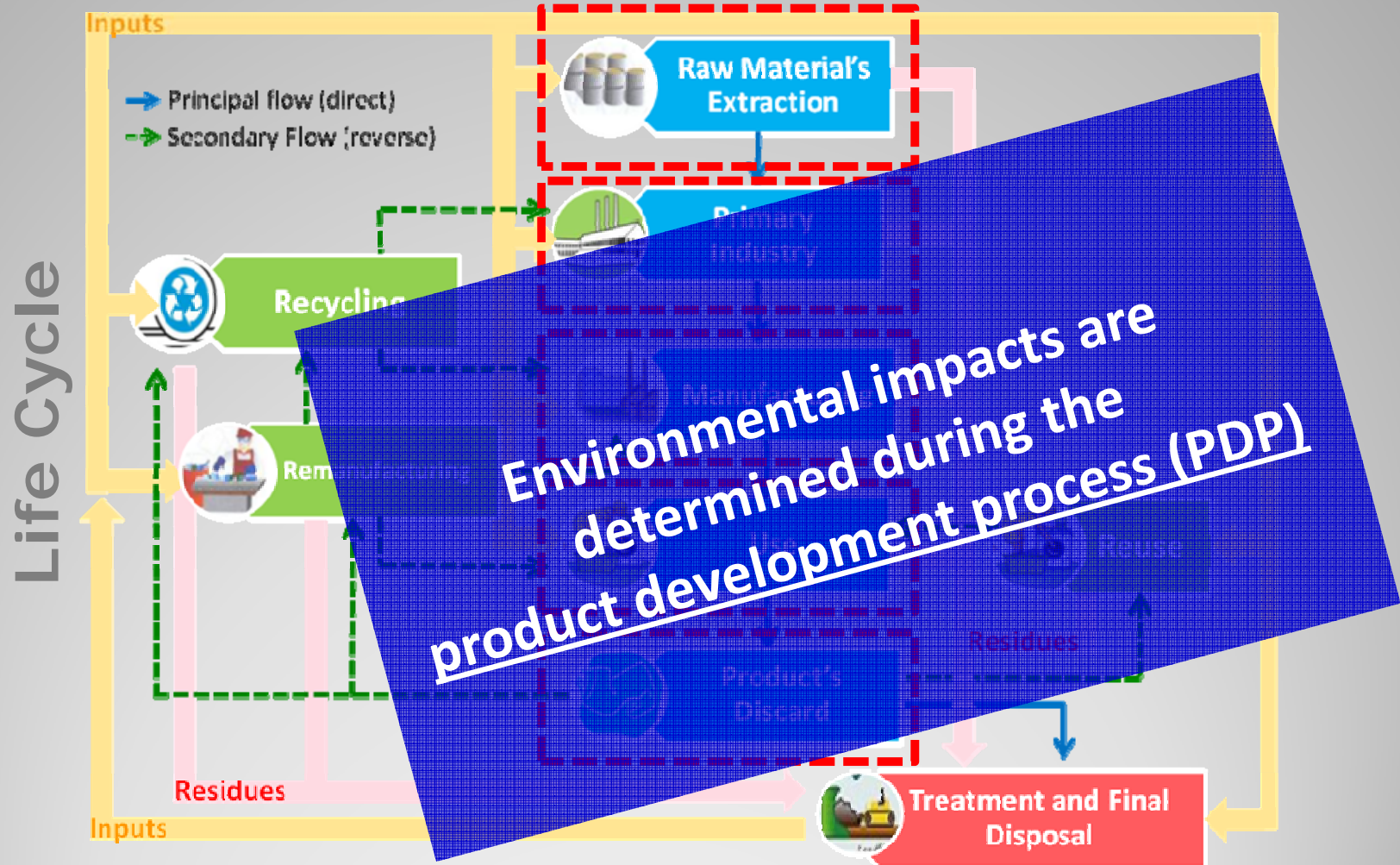
Wealth of our society
Quality of life we all enjoy



The rising consumption of products is responsible for most of the pollution and depletion of resources that our society causes


(Comission of the European Communities, 2001)

Products can affect the environment:



Ecodesign

Systematic introduction of environmental concerns into the PDP, without compromising other essential criteria, such as quality and performance.



Higher
environmental
performance

Life Cycle
Thinking

Life Cycle
Assessment
(LCA)

Life Cycle Assessment (LCA)

Technique to assess the aspects and impacts of a product system considering its life cycle.

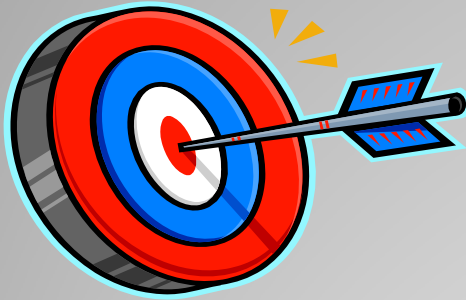


- Life Cycle Thinking into PDP
- Quantification of environmental impacts
- Internationally accepted (ISO)



- Complex
- Time and cost consuming
 - Highly quantitative
- Lack of environmental competencies on staff

Goal



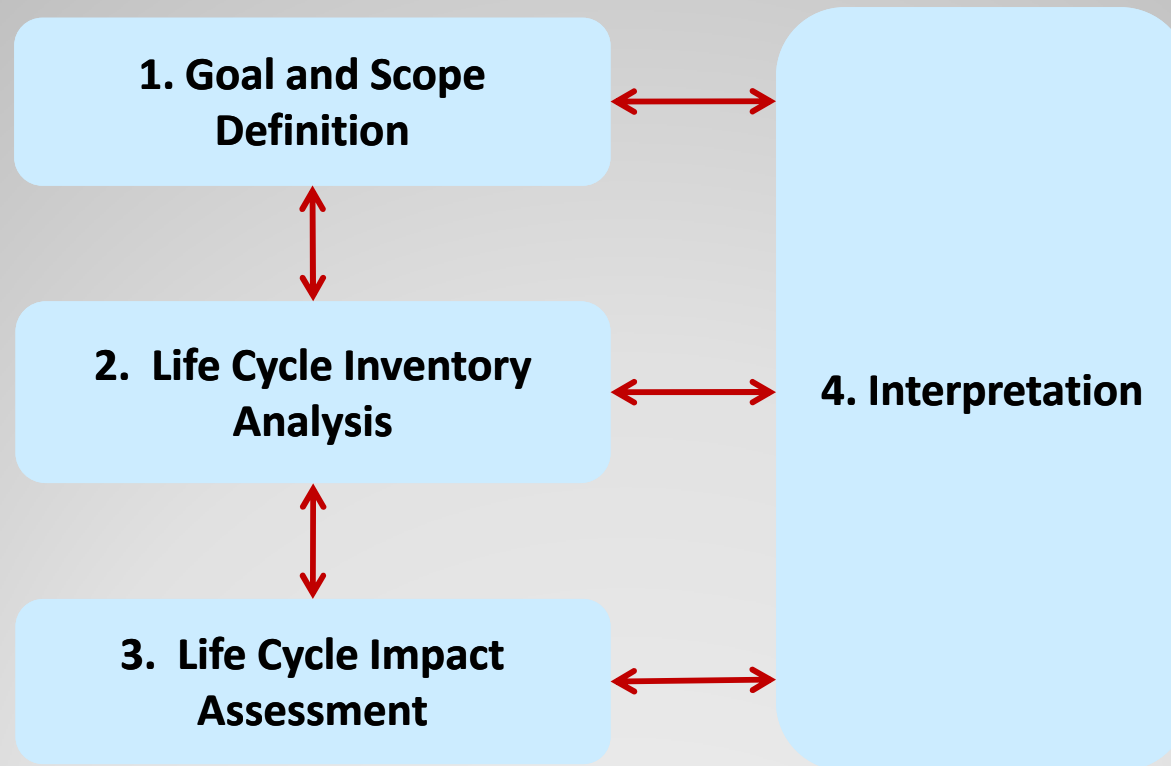
Considering:

- ✓ Need of adopting a systemic view of the environmental impacts in the first stages of PDP;
- ✓ Unavailability of quantitative and detailed data on initial phases;
- ✓ Complexity and slowness of full-scale LCA studies
- ✓ Lack of technical expertise of the designers to apply LCA

To discuss the use of full and simplified LCA in the context of product development process and present an overview of simplified LCA

Full-scale LCA

ISO 14040 and 14044 – four main phases



Simplified / Streamlined LCA (S-LCA)

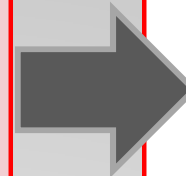
Tool for identifying environmental 'hot spots' and highlighting key opportunities for effecting environmental improvements.

Goal: to provide essentially *the same results* as a full (detailed) LCA – covering the whole life cycle, but in a *superficial way* (e.g. using qualitative and/or quantitative generic data), followed by a *simplified assessment*, thus reducing significantly the *expenses and time expended*.

“It is recognized that where quantification is not possible (for reasons of time or cost, for example), qualitative aspects can - and should - be taken into account (GUINÉE, 2001)”

Methodology

Systematic Literature Review
Identification and classification
of ecodesign methods and tools -
Pigosso, 2010



560 studies
Papers, books, thesis
and dissertations



**19 Ecodesign
methods and tools =
S-LCA**



**105 Ecodesign
methods and tools**

19 Ecodesign methods and tools = S-LCA

Ecodesign Method

- Name
- Reference

Summary

- Brief description

Assessment Criteria

- Impact categories considered

Approach

- Qualitative
- Semi-quantitative
- Quantitative

19 Ecodesign methods and tools = S-LCA

Example

Ecodesign Method

- *Philips Fast Five Awareness* (Byggeth & Hochschorner, 2006)

Summary

- The tool is used to judge and compare different product concepts towards a reference product.

Assessment Criteria

- energy
- recyclability
- hazardous waste content
- durability/repairability
- alternative ways to provide service

Approach

- Qualitative

19 Ecodesign methods and tools = S-LCA

Example

Ecodesign Method

- *MET Matrix* (Brezet et al., 2001)

Summary

- Purpose: to find the most important environmental problems during the life cycle of a product, which can be used to define different strategies for improvement. The environmental problems should be classified into the categories.

Assessment Criteria

- Materials (M)
- Energy use (E)
- Toxic emissions (T)

Approach

- Qualitative or Quantitative

MET Matrix

Example

MET-matrix		Materials	Energy	Toxic substances
		Input/ output	Input/ output	Output
Production and delivery of materials and components				
Production				
Distribution				
Use	Operational			
	Maintenance			
End of Life	Collecting			
	Disposal			

Final Remarks

- ✓ Designing products with **better environmental performance** is a necessary action for industries to ensure competitive and environmental advantages.
- ✓ However, the systematic incorporation of environmental considerations during product development process (**ecodesign**) is not an easy task, especially in the early stages, in which there is a **lack of information** about the product (but the **degrees of freedom** to take actions for improvements are greater).
- ✓ LCA is a technique developed to study the environmental influence of a product system. But, in some cases, as for complex products, the application of full LCA is hampered by several factors, including **lack of data and other resources**. **Time** is also a factor that prevents the application of LCA during the first stages of the product development process (PDP).

Final Remarks

- ✓ In order to overcome the difficulties, it was developed a large amount of ecodesign methods and tools to support the simplified assessment of the life cycle environmental impacts (S-LCA) – **19 presented**.
- ✓ A **survey on the effective use** of these methods and tools by industry should be conducted in future works.
- ✓ **Databases development**, especially for Brazil, is of great value to facilitate and **promote LCA** performance for decision-making purposes concerning products.
- ✓ Extreme improvements towards sustainable products can be explored by the **incorporation of services** in the economy, and, in this sense, broadening the application of S-LCA to Product-Service Systems is a tendency to be researched.

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Thank you!