EPFL – LCA projects proposals 2025

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1. Topic - clothes (t-shirts) -> see appendix

- **Guided analysis**
  - Two types of t-shirts should be compared: **cotton and synthetic**.
  - Environmental impacts of **t-shirts**: including production, use and end-of-life
  - The washing machine and the washing powder should be considered.
  - The use phase should be evaluated in several countries.
  - Severak end-of-life are considered.

Context

You are helping a consumer association to generate public information on clothes based on data for t-shirts from two brands. Brand A manufactures cotton t-shirts. Brand B manufactures synthetic t-shirts. Applying the knowledge you learned during the class, you decide to assess both t-shirts from an environmental perspective and look for possible relevant solutions for impact reduction.

Objectives

Perform a comparative Life Cycle Assessment according to the approach learned in class.

Provide a report of your assessment. The report should contain:

- Objectives of the study and recipients,
- Function, Functional Unit, Reference flows,
- Key parameters,
- System and system boundaries,
- Evaluation of the impacts with multiple indicators (EF 3.1)
- The answers to the 19 questions,
- A documentation of your approach and assumptions,
- An analysis,
- A conclusion.

Note: Document your assumptions. They have to be realistic. A lack of information cannot be a pretext to avoid any part of the analysis unless there is a clear justification for it.

Questions

Assuming that t-shirt are dried outdoors:

1. What is the best t-shirt from an environmental point of view and why?
2. Which step of the life cycle is inducing the most impacts and why?
3. Is electricity production during incineration important in terms of avoided impacts?
4. How large is the influence of the washing temperature?
5. Do you think the impact indicators considered are sufficient to take into account all the environmental impacts of a t-shirt? What is missing?

Extrapolation to other countries

6. What are the impacts for someone living in France? Are your conclusions still valid?
7. What are the impacts for someone living in Poland? Are your conclusions still valid?

What happens during wintertime if t-shirt are dried in a machine:

8. What is the impact of this behaviour assuming:
    a. The same machine can wash and dry?
    b. A specific dryer is needed?
9. Are the conclusions of questions 1-8 still valid in this case?

What happens if biogenic carbon emissions are also considered

10. What are the results from questions 1 to 8?
11. Are the results and conclusions of questions 1-8 still valid?

You decide to change your washing machine for an A +++ machine?

12. What is the annual direct decrease in the impact?
13. How long does it take so that your new machine is more advantageous, in terms of environmental impacts, than the old one (considering direct and indirect impacts)?

What are the potential solutions for reducing the impacts of these t-shirts?

14. What would be the impacts if all materials were recycled?
15. What would be the impacts if you go to a laundry shop instead of using your own machine?
16. What would be the impacts if the t-shirts were sent to Nigeria at the end of their life?
17. What are the other key solutions to reduce the environmental impact of wearing a t-shirt? How do you evaluate them wrt to their social acceptance, technical feasibility and environmental performance?

Results in context (other extrapolations are possible)

18. Extrapolating these results to your complete wardrobe, how large are your impacts?
19. How do these impacts compare to the impacts of the clothes from an average Swiss citizen?

Data

Brand A

Cotton t-shirts are produced in India. 90% of the deliveries to Switzerland are by boat until the Havre and the rest of the trip is by truck to Geneva. 10% of the t-shirts are however directly sent by plane to Geneva, in order to increase flexibility in stocks management.

Brand B

Synthetic t-shirts are produced in China. All deliveries to Switzerland are by boat until the Havre and the rest of the trip is by truck.

Washing machine

Textile quantity per wash: 8 kilos. Machine life: 1000 cycles

1. Carcass Steel: 22 kg Polypropylene: 18 kg Aluminium: 1.7 kg 2. Stabilization block Cement: 19 kilos 3. Drum Stainless steel: 4.5 kg	4. Door Steel: 3.5 kilos Glass: 2.7 kilos 5. Pipes and electronics PE: 1 kilos Copper: 1.6 kilos Printed circuit: 0.7 kilos 6. Packaging Cardboard: 2.5 kg Plastic: 1.8 kg

Washing temperature, water and electricity consumption (per wash)

Temperature (°C)	Water (L)	Electricity (kWh)
40	72	0.9
60	63	1.2
95	77	2.3

Additional information

80 ml of laundry powder is used per wash.
Electricity for drying is estimated to be 1.8x the electricity for washing (at 40°C).

End of life

Clothes are incinerated. The washing machine is partly landfilled and partly incinerated.