Title: Life-LCA: The first case study of the life cycle impacts of a human being

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SUSTAINABLE ENGINEERING

Technische Universität Berlin
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Life-LCA: How to measure my ecological footprint?

DER SPIEGEL Gesellschaft

Einer für alle

Zukunft Ein deutscher Unternehmer will Buße tun für das Kohlendioxid, das er im Laufe seines Lebens in die Atmosphäre geblasen hat. Er will bis zu seinem Todestag eine positive Ökobilanz vorweisen. Ist er ein Spinner, ein naiver Idealist oder ein Vorbild? *Von Uwe Buse*

The New York Times

Carbon Conscious: How One Man Is Shrinking His Footprint

Deutschlandfunk

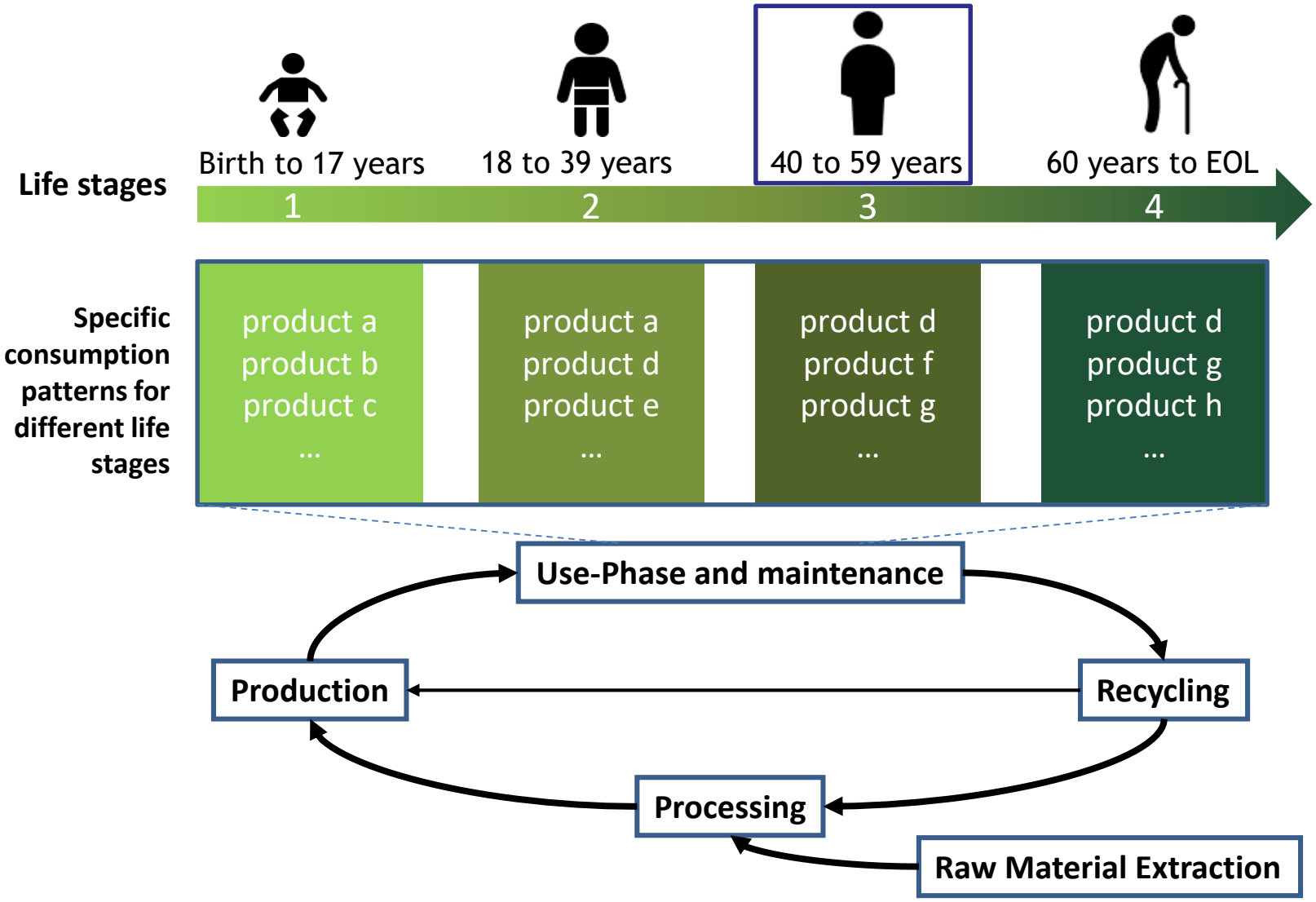
Klimaneutral leben

"Ich möchte keine ökologischen Schulden hinterlassen"

- Private consumption is responsible for approx. 64% of the global CO_2 emissions
- ca. 50% of these emissions are caused by the richest 10% of the world´s population (Oxfam, 2015)

→ **Increasing environmental awareness by making the individually caused ecological damage measurable, tangible and showing optimization and reduction potential in detail**

Goal and Scope: System boundaries

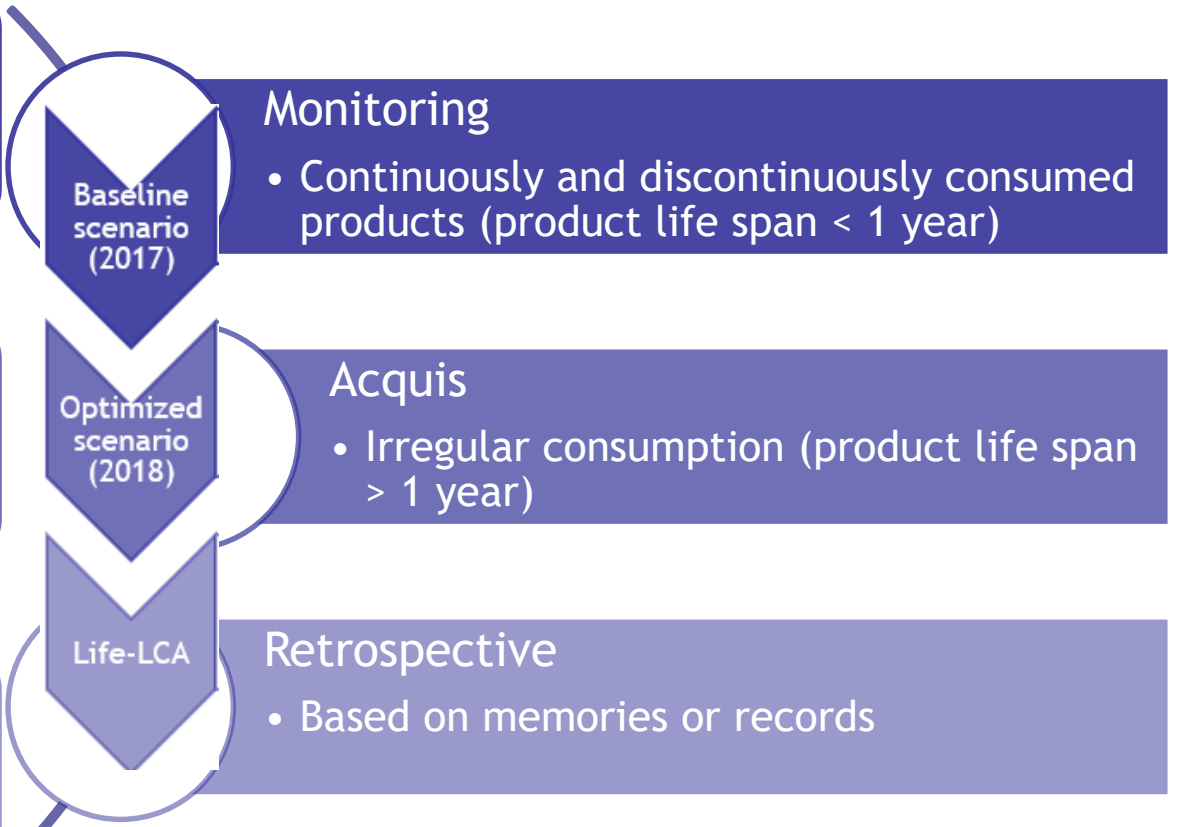


Goal and scope - System boundaries and data collection

Baseline scenario (2017)
- 2 month monitoring period
- Identifying hotspots

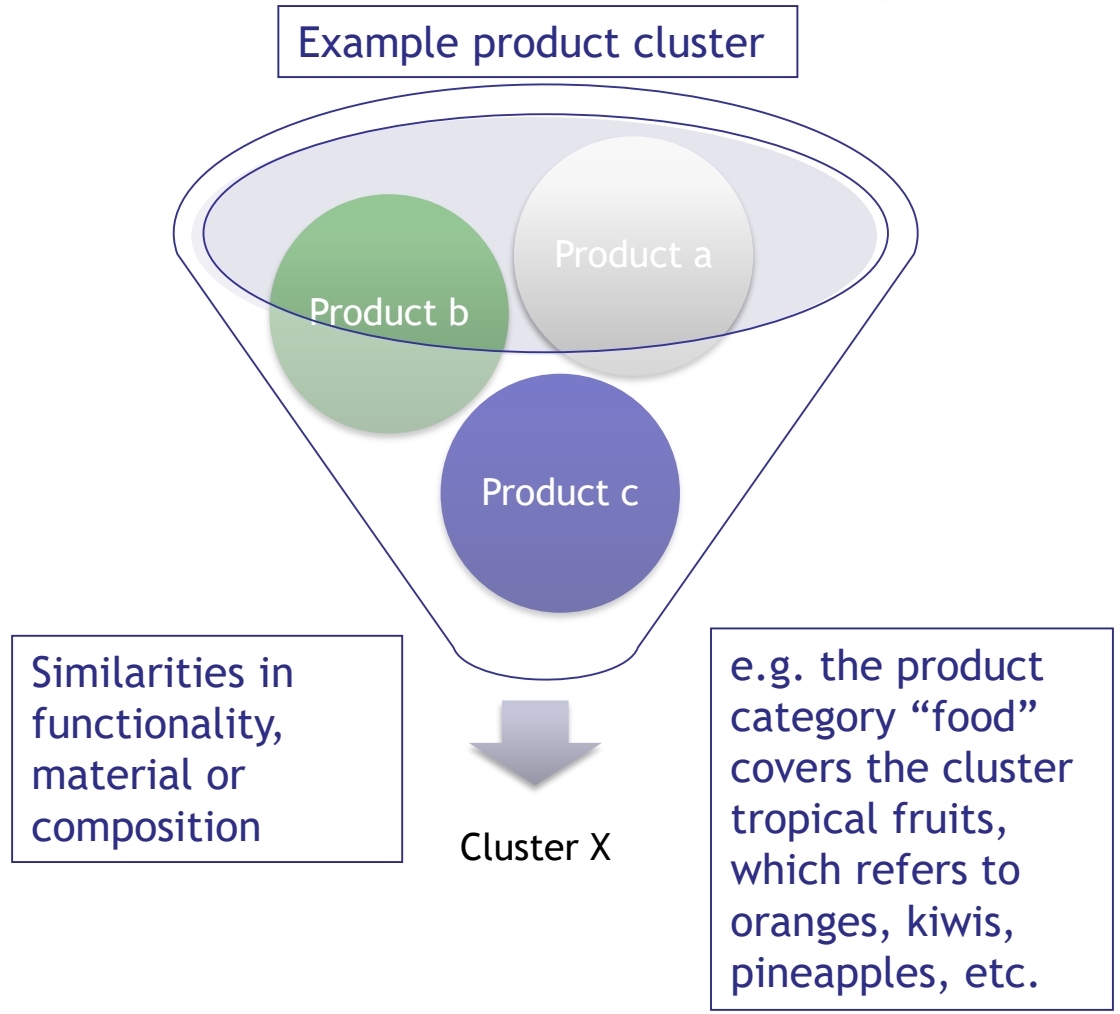
Optimized scenario (2018)
- Measures catalogue for sustainable consumption
- 2 month monitoring period
- Reduction potential

Life-LCA
- From birth until his current life year
- Retrospective
- High uncertainties in early childhood and youth stage

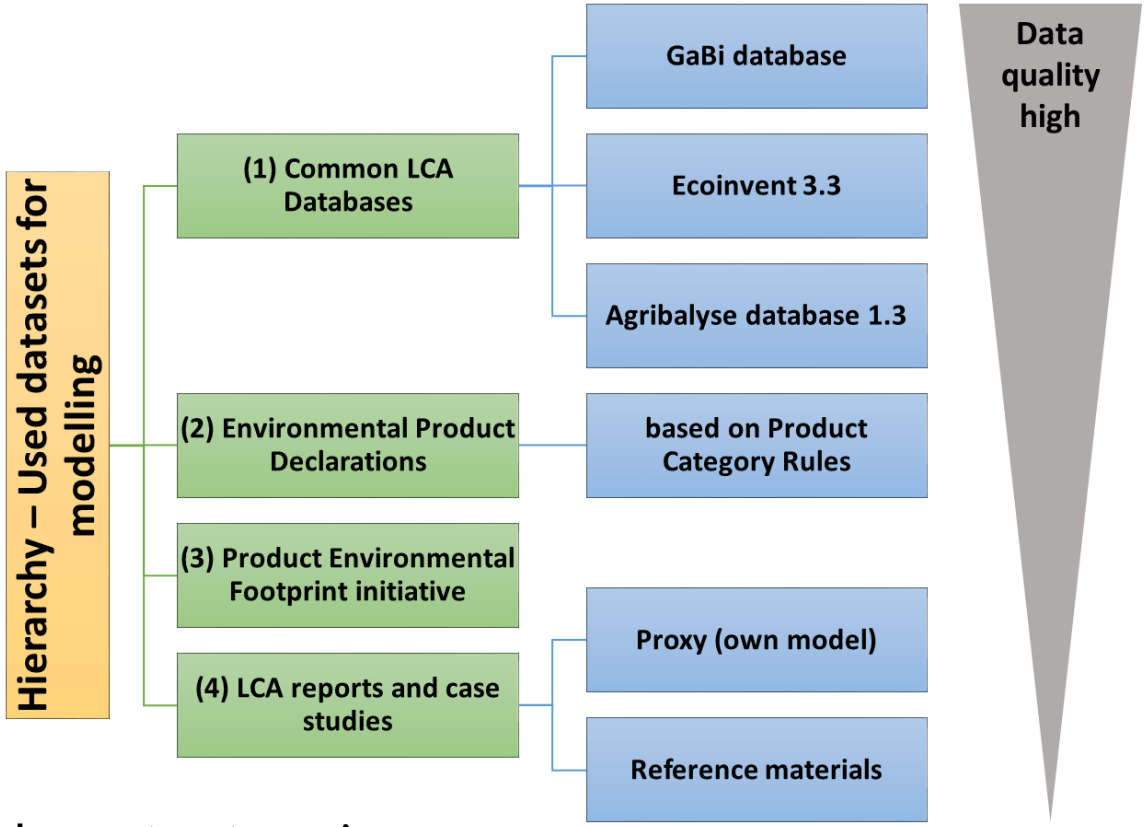


Goal and Scope – Product clusters

Product category	Clusters (n)
clothes and jewelry	23
cosmetics, hygiene and cleaning	17
electronics	15
energy and water	6
food	41
health and medical equipment	5
hobbies, leisure and pet	29
house	16
living, household and home office	49
transport	12



Goal and Scope – data calculation and allocation



Impact categories:

- Global Warming Potential (GWP)
- Acidification Potential (EP)
- Eutrophication potential (EP)
- Photochemical Ozone Creation Potential (POCP)

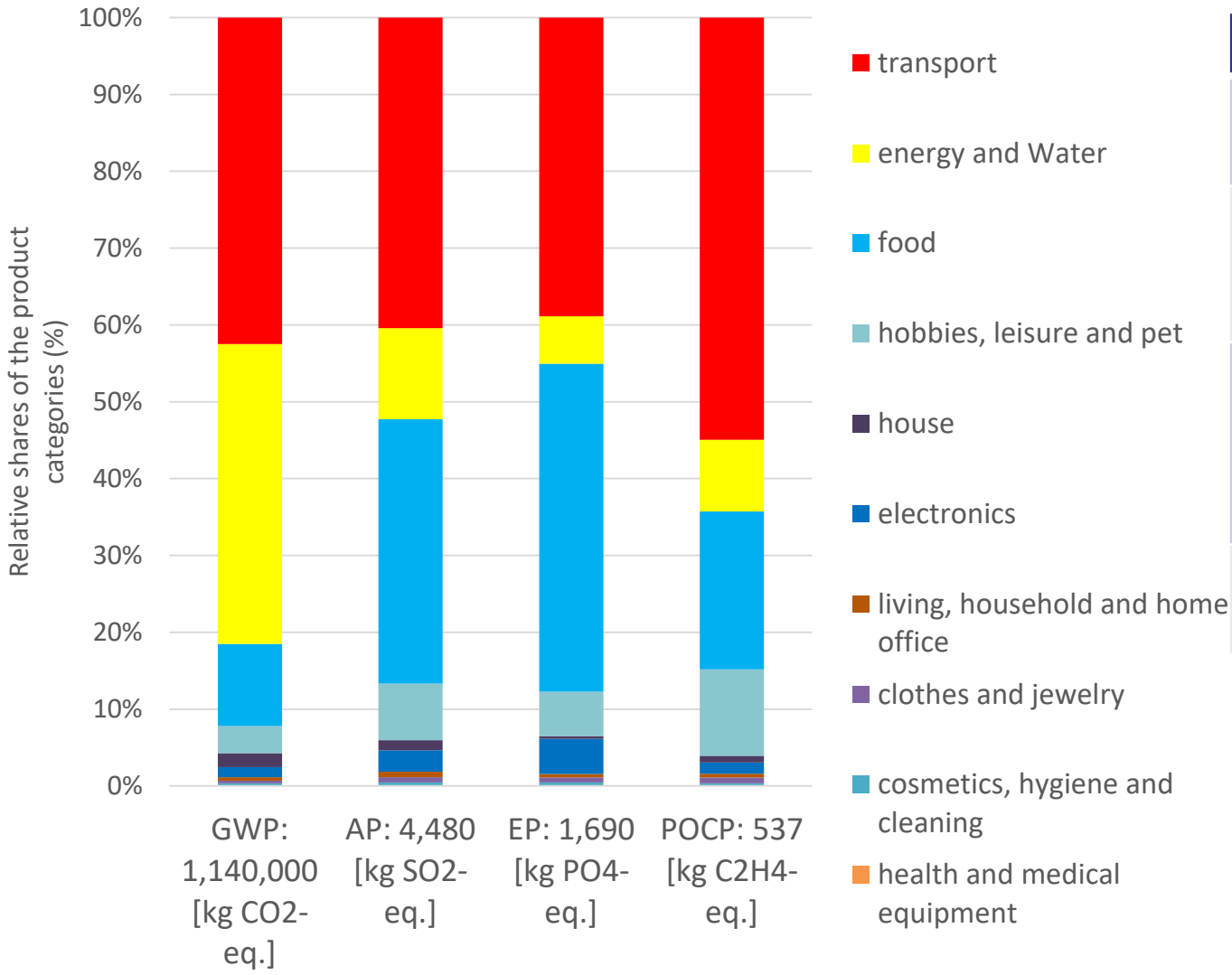
Included

- Direct impacts at work and business trips
- Total allocation of his childhood and pets to himself
- Estimated product use ratio

Excluded

- Old adulthood stage and death
- Financial investments
- Goods received as inheritance
- Prenatal phase and birth
- Indirect impacts due to work-related decisions
- Transports from birth to 18 years

Results - Life-LCA: birth to current life year



Product category	Main contributor
Transport	9 cars over 30 years Business flights
Food	Diary products Meat Coffee
Energy and Water	1986-2014 oil for heating and conventional electricity
Hobbies leisure and pet	Pets (mainly his current dog)

average yearly impact of around 23.3 t CO2-eq., which is more than twice of the average German (UBA 2019)

Results – Baseline scenario (BS) vs. Optimized scenario (OS)

Product category	GWP [kg CO_2-eq.] (baseline scenario)	GWP [kg CO_2-eq.] (optimized scenario)	Difference [%]
transport	18,628	3,484	-81
food	2,560	738	-71
hobbies, leisure and pet	921	469	-49
clothes and jewelry	96	70	-28
cosmetics, hygiene and cleaning	88	70	-20
energy and water	4,214	3,418	-19
house	641	641	0
electronics	374	381	+2
health and medical equipment	0,6	0,75	+20
living, household and home office	95	230	+59
SUM	≈ 27,600	≈ 9,500	-66

Measures for optimization
- Disbanding flights
- Almost vegan diet
- New dog feed
- Face to Face Meetings
- Replacing heating system

BS vs. OS: Reduction in between 59-66% for all impact categories

GWP :
Baseline scenario: Transport, energy and food have a total share of roughly 90%

GWP:
OS vs. BS: 20% lower than the average German (per year).

Conclusion and remaining challenges

- First insights how to practically apply a LCA approach on a human being
- Performance tracking, revealing of reduction potentials, and the identification of possible trade-offs were possible
- Better identification of the analyzed person with its caused impacts
  - led to significant positive changes in the study object`s consumption pattern

Remaining challenges

- High data uncertainties for the childhood and youth stage
- More case studies of persons with different backgrounds, ages or lifestyles necessary
- Improvement of data quality
- Future studies should also consider additional impact categories

Thanks for your attention!

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