Life Cycle Assessment of Swiss Chocolate

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https://www.esu-services.ch

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Key questions

- What are the differences between different types of chocolate?
- What are the environmental impacts of chocolate consumption?
- What are the most important aspects within the production of chocolate?
- Which potentials exist for the reduction of environmental impacts due to chocolate consumption?

Background

- Projects commissioned by German Aluminium Association (GDA) in cooperation with European Aluminium Foil Association (EAFA), Düsseldorf, Germany
- Büsser S. and Jungbluth N. (2009) LCA of Chocolate Packed in Aluminium Foil Based Packaging. ESU-services Ltd., Switzerland
- https://www.esu-services.ch/projects/packaging/
- Here we present our personal point of view

ESU-services Ltd.

- Founded in 1998 as an ETHZ spin-off
- 3 co-workers
- Long time experience since 1994 with life cycle assessment (LCA)
- Clients from industry, NGO, administration, universities
- Global LCA food database with more than 6‘000 datasets

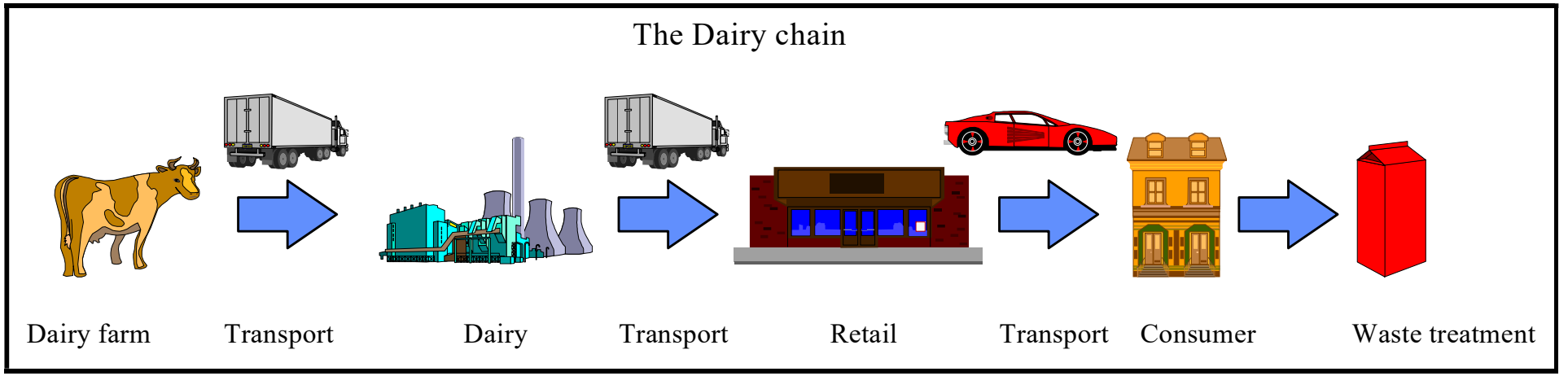
Our services

- Full-scale Life Cycle Assessments (LCA)
- Tiered LCAs
- LCI data acquisition and management (data-on-demand)
- LCA project management
- Ecolabelling concepts
- Literature surveys
- Critical peer reviews
- LCA training & coaching
- Regional SimaPro Centre (LCA software)

Life Cycle Assessment

- Balance of all in- and outputs
- Life cycle from cradle to grave
- Assessment of different environmental impacts (e.g. climate change, eutrophication, summer smog)
- Improvement and comparison of production processes

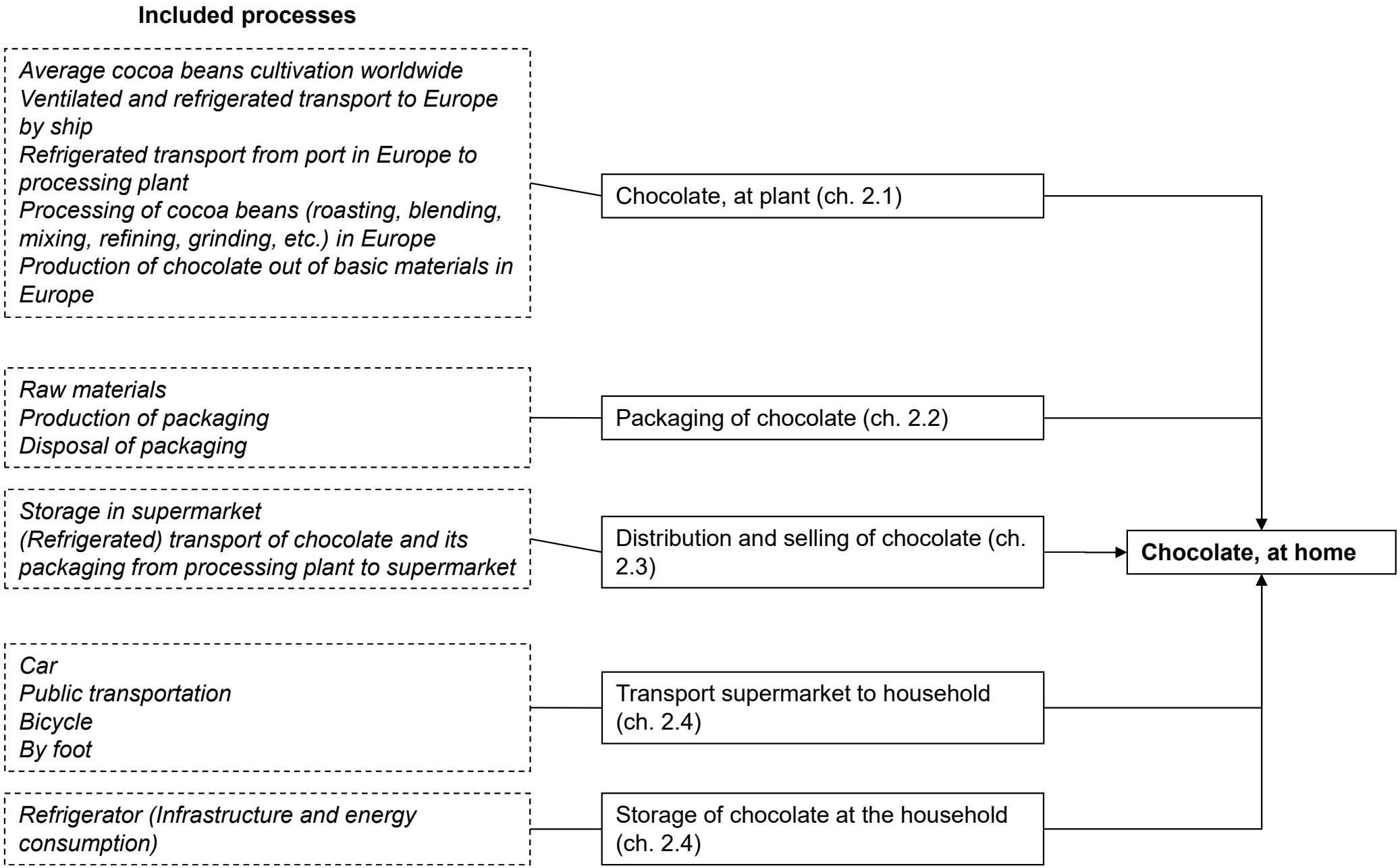
Life Cycle Assessment of Products



- Cradle to grave
- Assessment of emission to air, water and soil as well as resources (water, energy, land)
- International standardisation ISO 14040 ff
- No absolute judgment nor accounting for social and economic aspects

Goal and Scope for this study

- Functional unit: 1 kg of chocolate for consumption in the household
- Packed in aluminium foil and wrapped with paper
- Cocoa data from Ghana
- Consumption in Europe


Included processes
Average cocoa beans cultivation worldwide
Ventilated and refrigerated transport to Europe by ship
Refrigerated transport from port in Europe to processing plant
Processing of cocoa beans (roasting, blending, mixing, refining, grinding, etc.) in Europe
Production of chocolate out of basic materials in Europe
Chocolate, at plant (ch. 2.1)
Raw materials
Production of packaging
Disposal of packaging
Packaging of chocolate (ch. 2.2)
Storage in supermarket
(Refrigerated) transport of chocolate and its packaging from processing plant to supermarket
Distribution and selling of chocolate (ch. 2.3)
Chocolate, at home
Car
Public transportation
Bicycle
By foot
Transport supermarket to household (ch. 2.4)
Refrigerator (Infrastructure and energy consumption)
Storage of chocolate at the household (ch. 2.4)

NJ4

Which Life cycle impact assessment

Carbon Footprint, CED:

Ecological footprint:

Ecological scarcity: Comprehensive, reflects Swiss policy targets, used for assessment of products, companies and for the whole economy

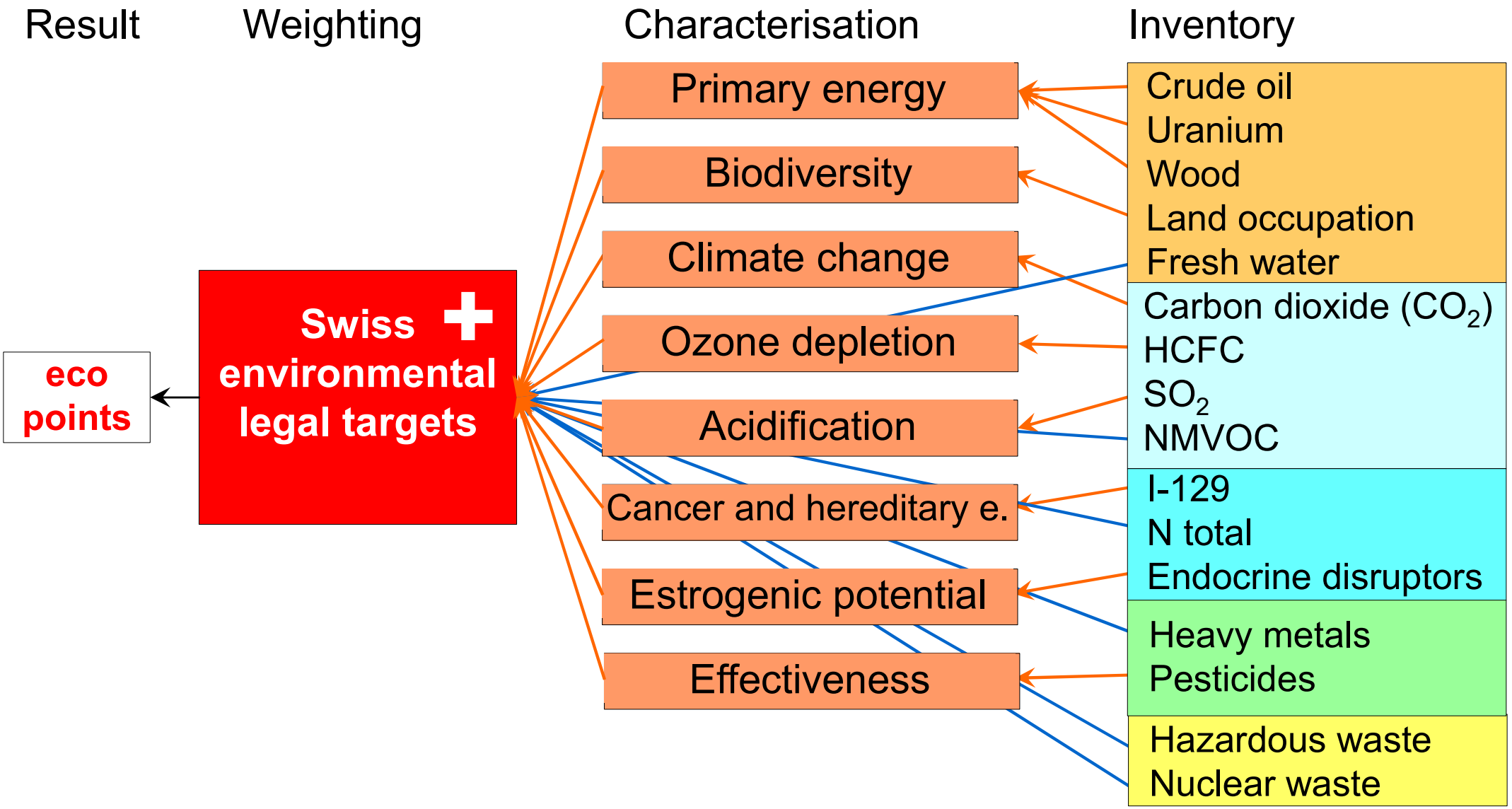
		One environmental issue		Several issues	
	LCIA method:	CED	Carbon footprint	Ecological footprint	Ecological scarcity 2006
	Impact category				
Resources	Energy,non-renew able	√	∅	∅	√
	Energy, renew able	∅	∅	∅	√
	Ore and minerals	∅	∅	∅	√
	Water	∅	∅	∅	√
	Biotic resources	∅	∅	∅	∅
	Land occupation	∅	∅	√	√
	Land-transformation	∅	∅	∅	∅
Emissions	Only CO_2	∅	∅	√	∅
	Climate change incl. CO_2	∅	√	∅	√
	Ozone depletion	∅	∅	∅	√
	Human toxicity	∅	∅	∅	√
	Particulate matter formation	∅	∅	∅	√
	Photochemical ozone formation	∅	∅	∅	√
	Ecotoxicity	∅	∅	∅	√
	Acidification	∅	∅	∅	√
	Eutrophication	∅	∅	∅	√
	Odours	∅	∅	∅	∅
	Noise	∅	∅	∅	∅
	Ionising radiation	∅	∅	∅	√
	Endocrine disruptors	∅	∅	∅	√
Others	Accidents	∅	∅	∅	∅
	Wastes	∅	∅	∅	√
	Littering	∅	∅	∅	∅
	Salinisation	∅	∅	∅	∅
	Erosion	∅	∅	∅	∅

➢ The three indicators CED, carbon footprint and ecological scarcity are calculated

NJ4 Add UBP 2013 (nj)

Niels Jungbluth; 01.04.2014

Ecological Scarcity 2006



NJ5

Anpassen für UBP 2013

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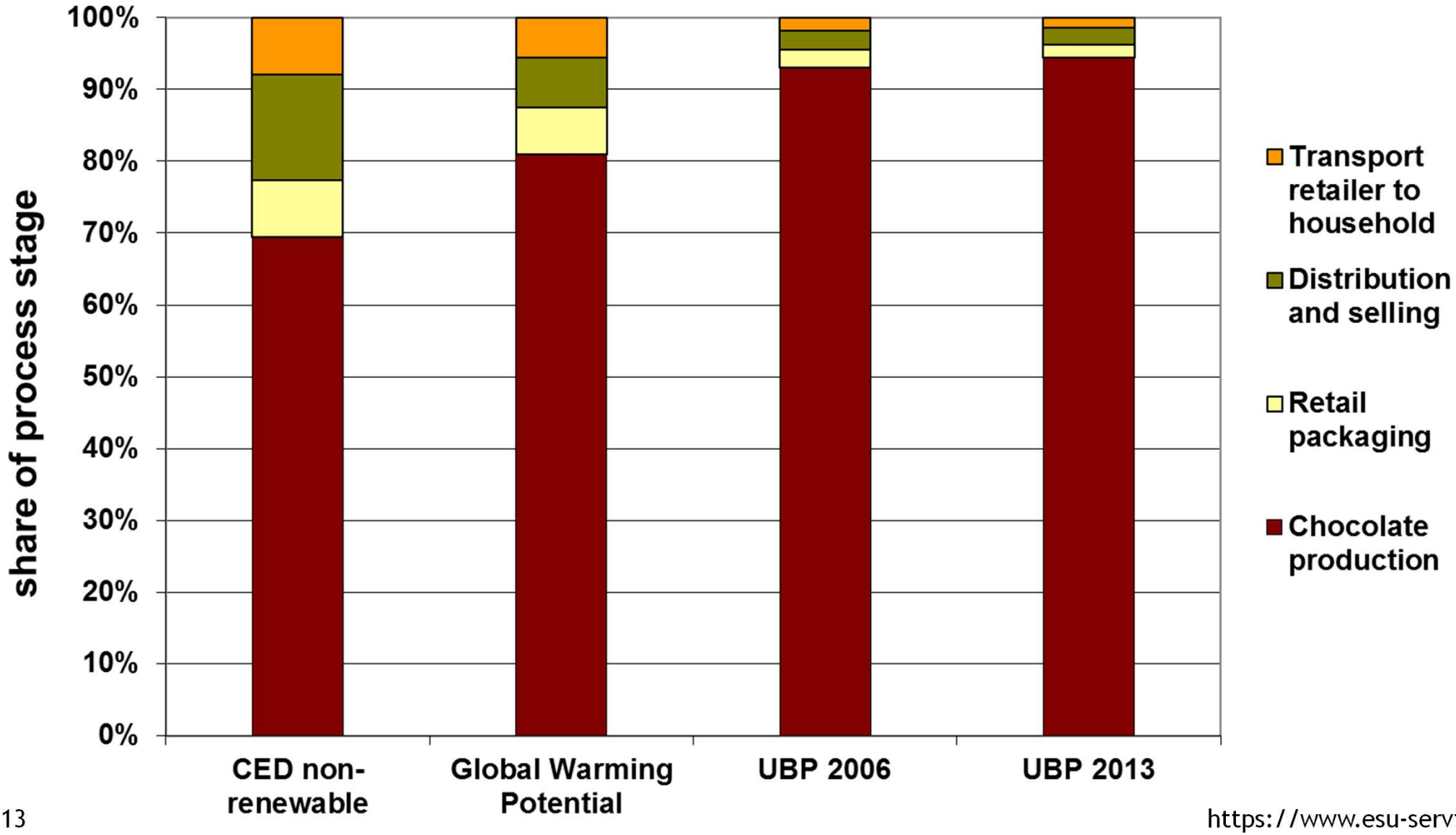
Life cycle impact assessment

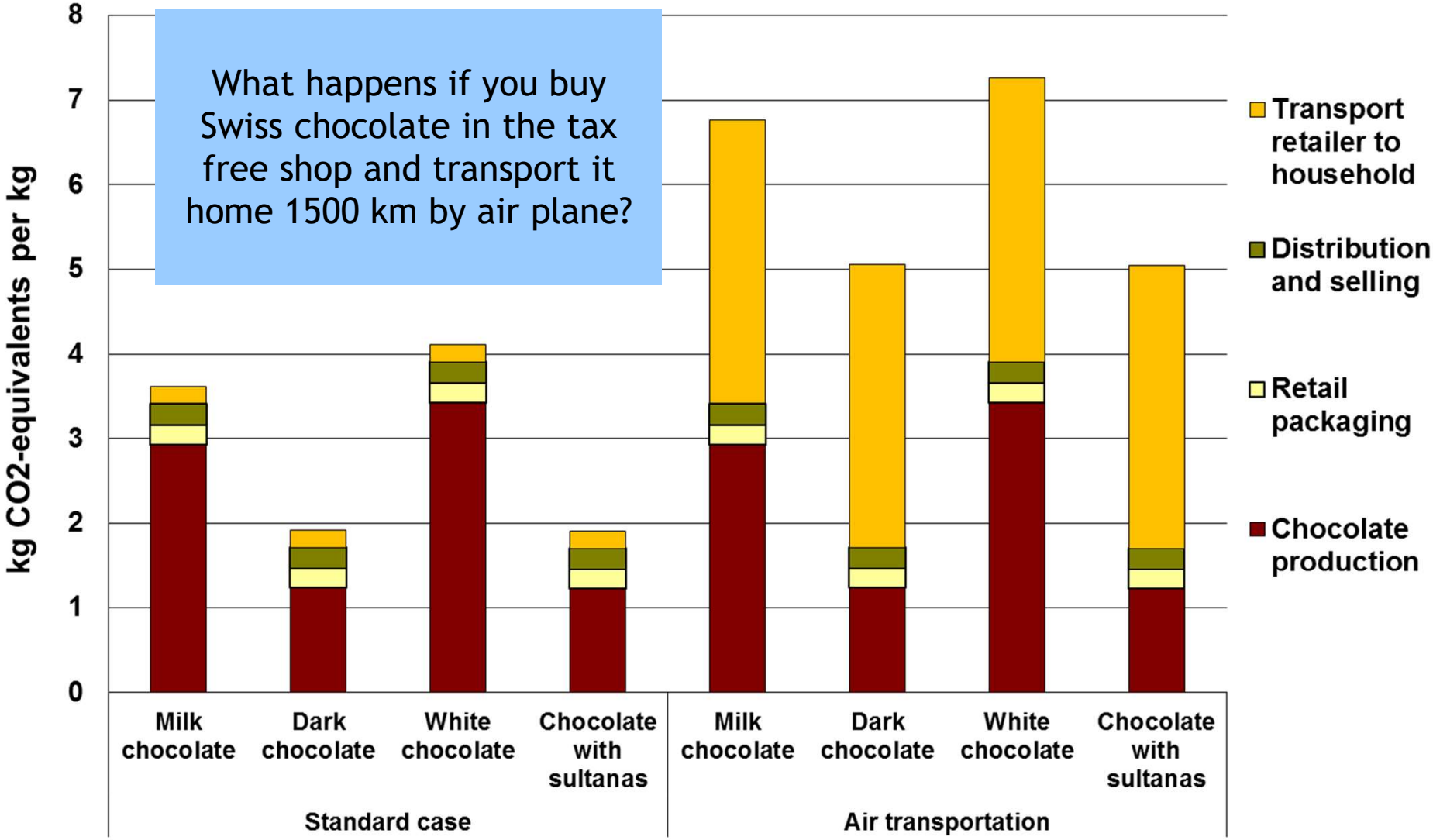
- Evaluation of CML impact categories in original study
- Here use of the LCIA method ecological scarcity 2013 (Switzerland) to simplify the presentation
- Evaluation of greenhouse gas emissions and cumulative energy demand as most common category indicators

Impacts per process stage



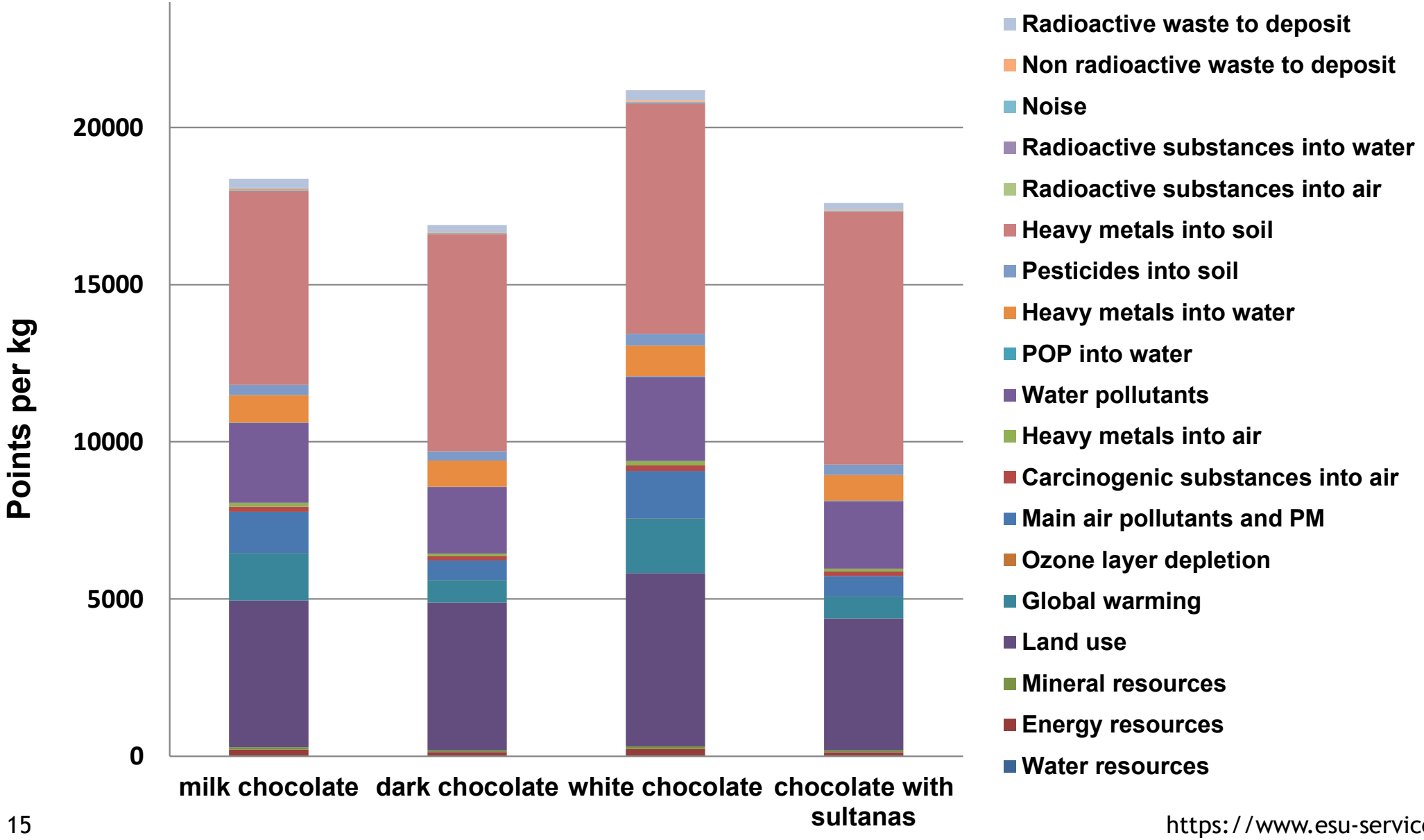
GWP: Comparison of different chocolates

What happens if you buy Swiss chocolate in the tax free shop and transport it home 1500 km by air plane?



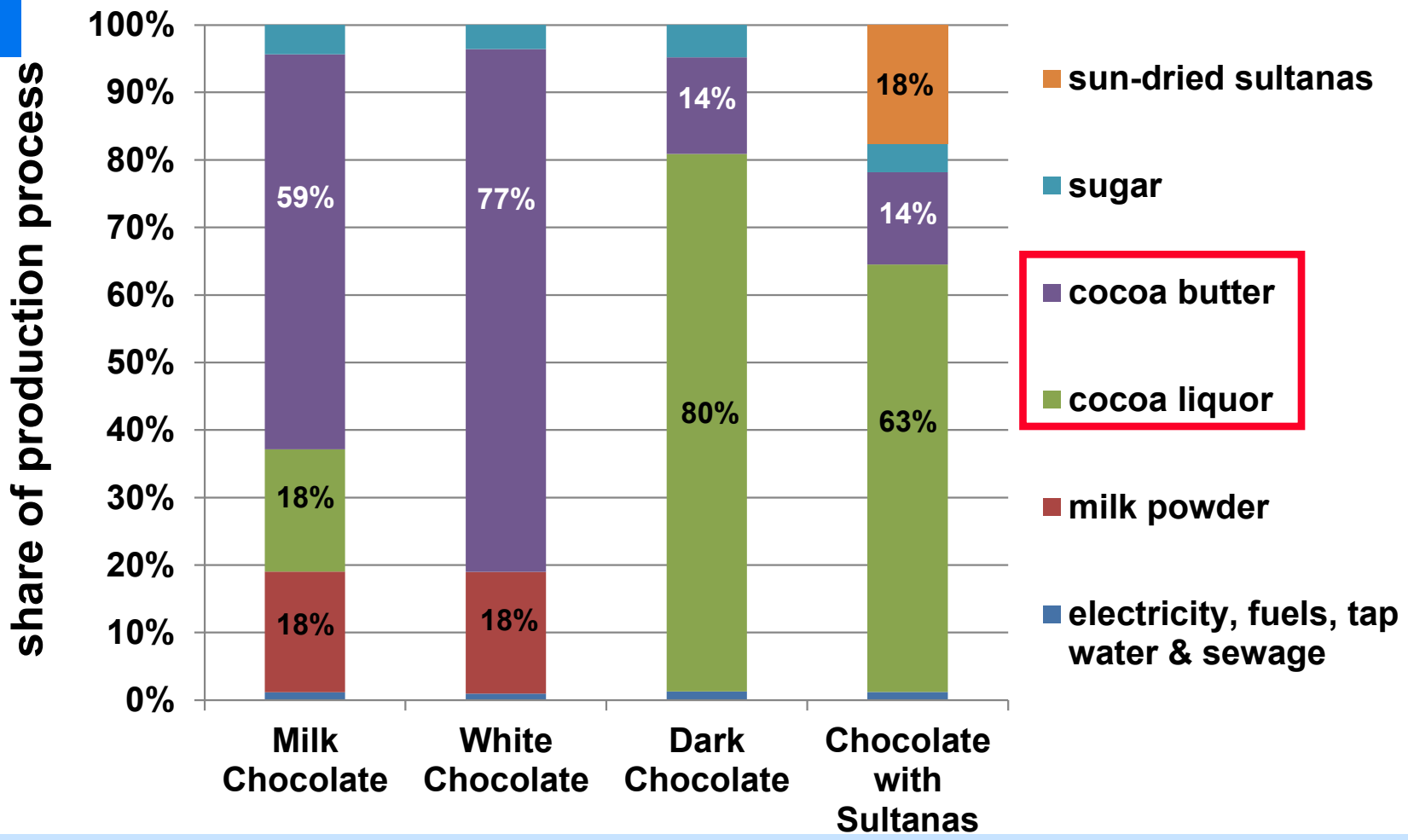
- Buy in tax free and 1500 km flying home can add considerable impacts

UBP2013: Comparison of different chocolates



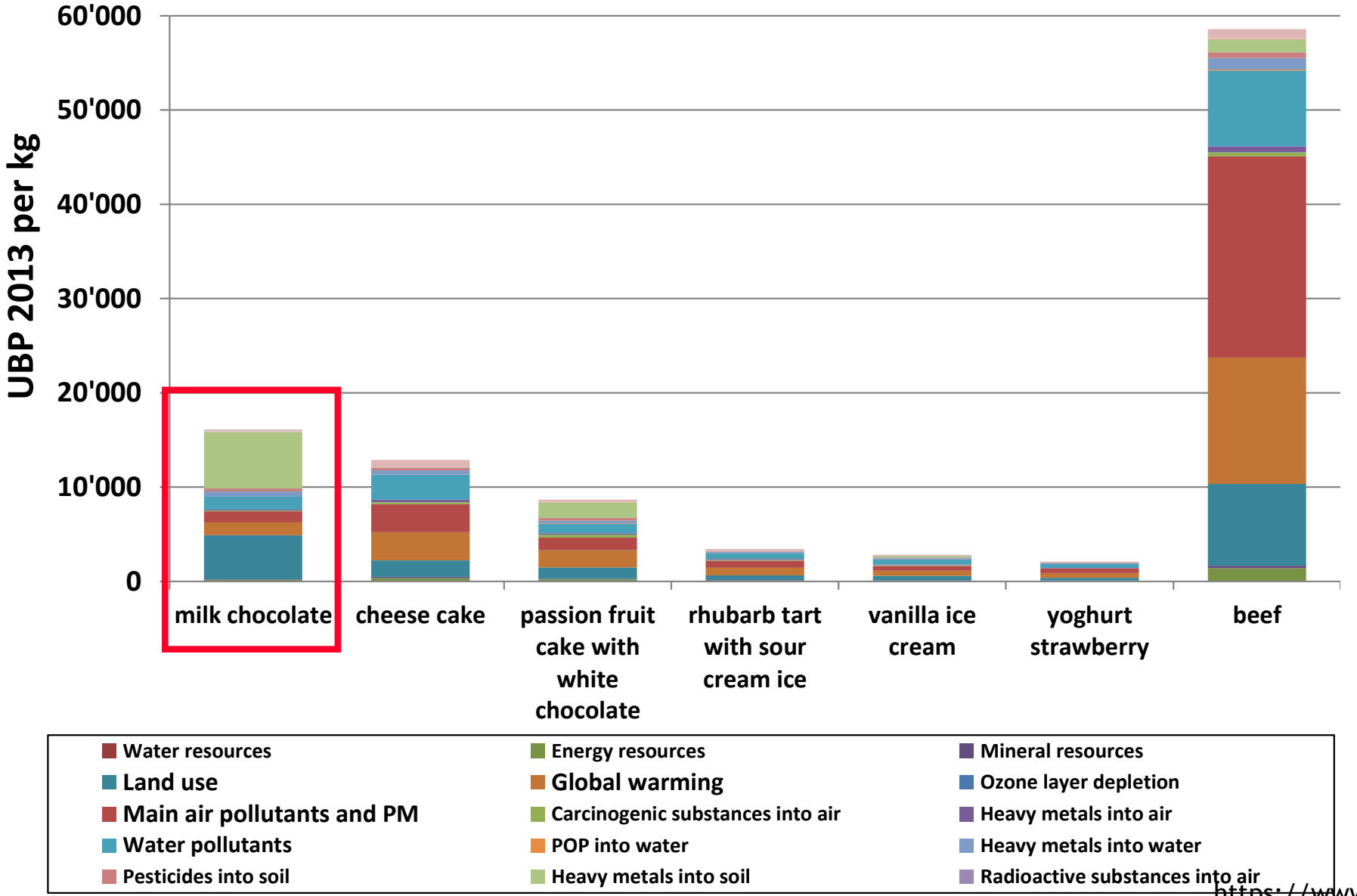
Shares in chocolate production

UBP 2013

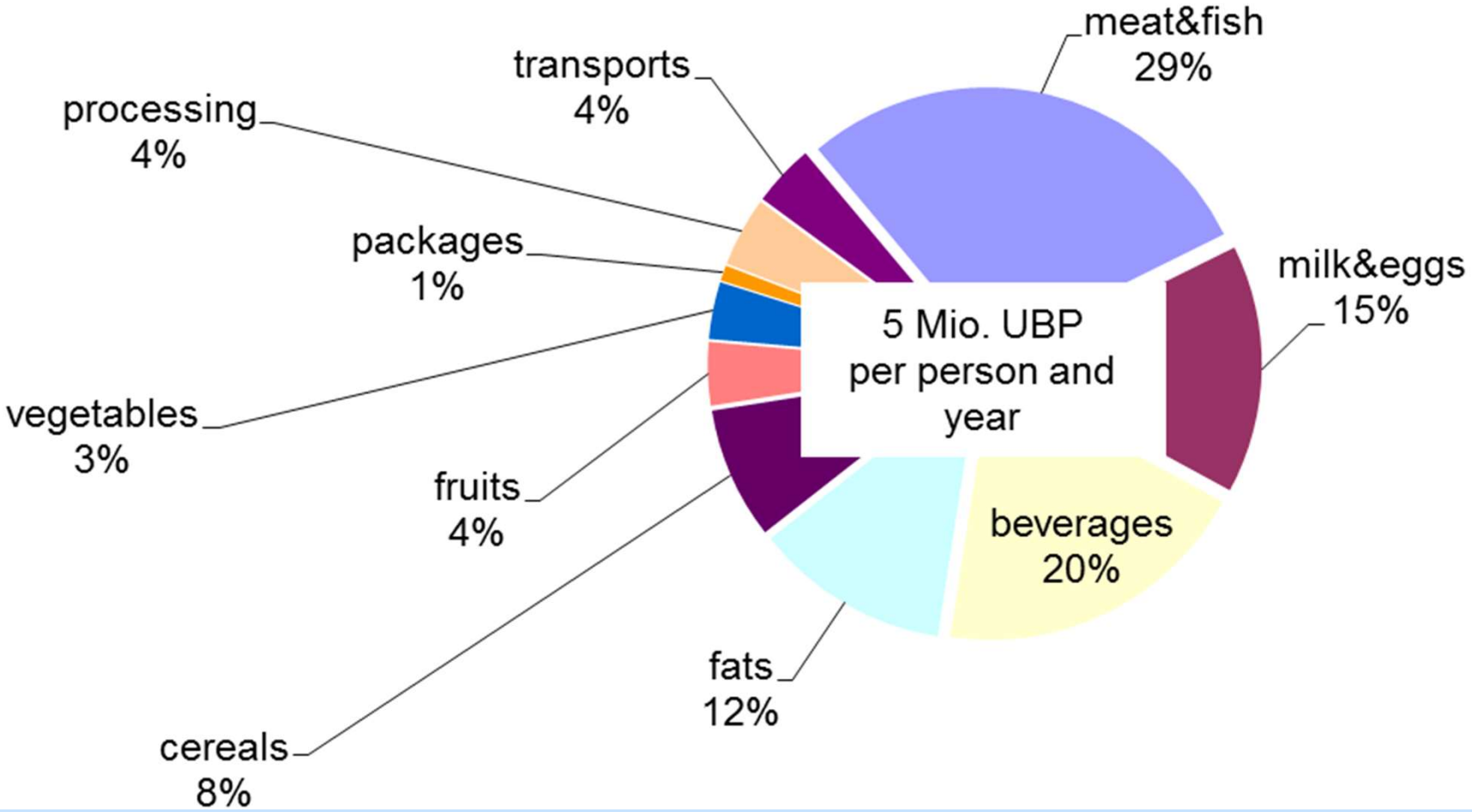


- Land use and heavy metals into soil due to agricultural production of coca beans as main environmental impact factors

Chocolate and other food products



Chocolate related to total Swiss food consumption impacts



- Milk chocolate consumption of 12.3 kg per year and Swiss causes about 3.5% of total impacts due to food consumption

Summary

- Environmental impacts of chocolate are dominated by the agricultural production of cocoa beans and milk
- Packaging and distribution is of minor importance
- Dark chocolate has the lowest impacts
- Tax free chocolate transported by airplane can cause considerably higher impacts
- Chocolate is a product with comparable high impact

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Thanks for financial contributions:
German Aluminium Association (GDA) in cooperation with European Aluminium Foil Association (EAFA), Düsseldorf, Germany

Further information about the project
https://www.esu-services.ch/projects/packaging/

ESU data-on-demand for
food production and consumption
https://www.esu-services.ch/data/data-on-demand/

- The relevance of single decisions has to be taken into account

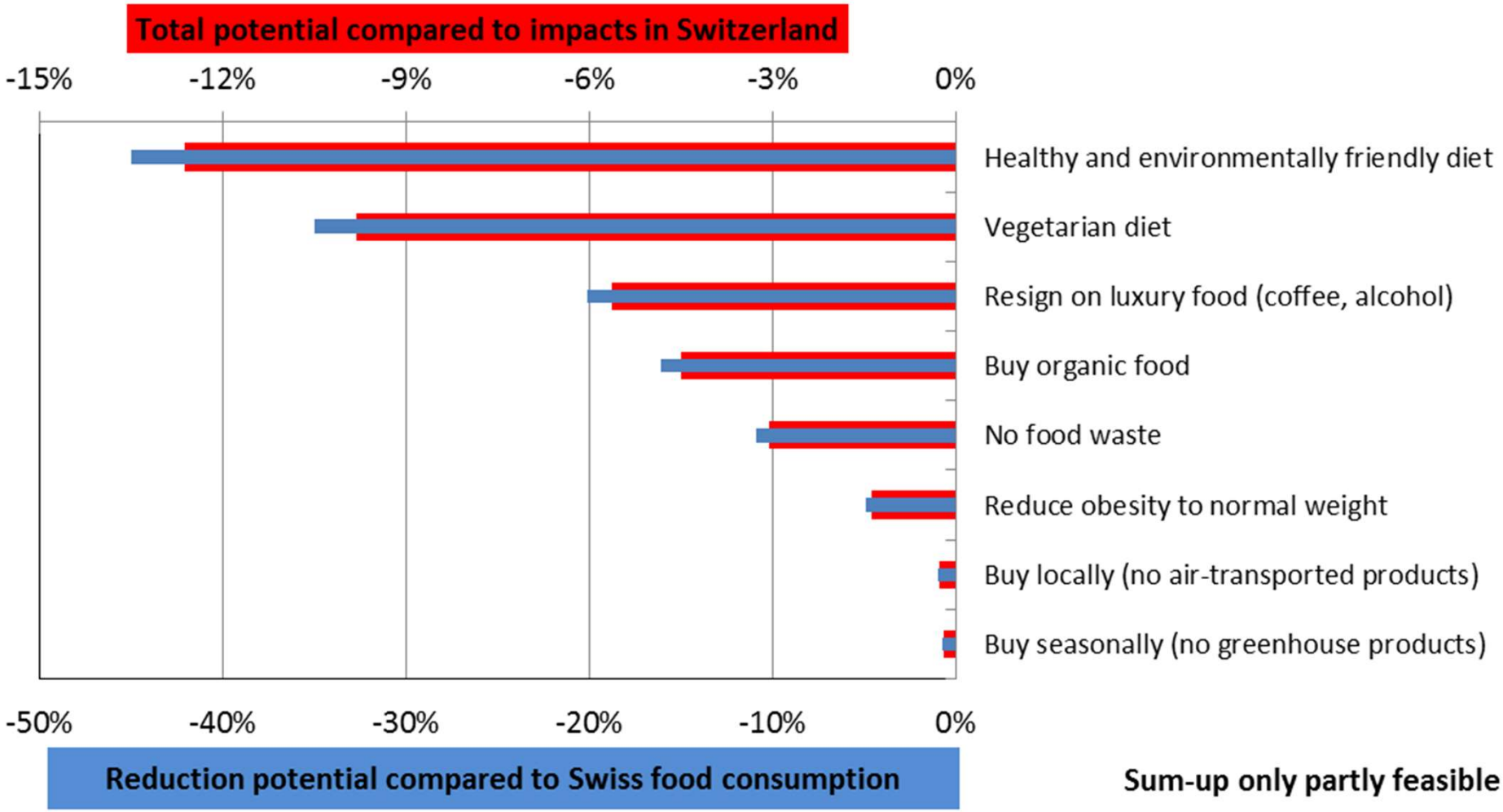
NJ11 Neue Idee für Abschlussfoto?

Niels Jungbluth; 01.04.2014

5.
TOTAL POTENTIALS
ANALYSIS FOR THE PRESENT SITUATION IN SWITZERLAND

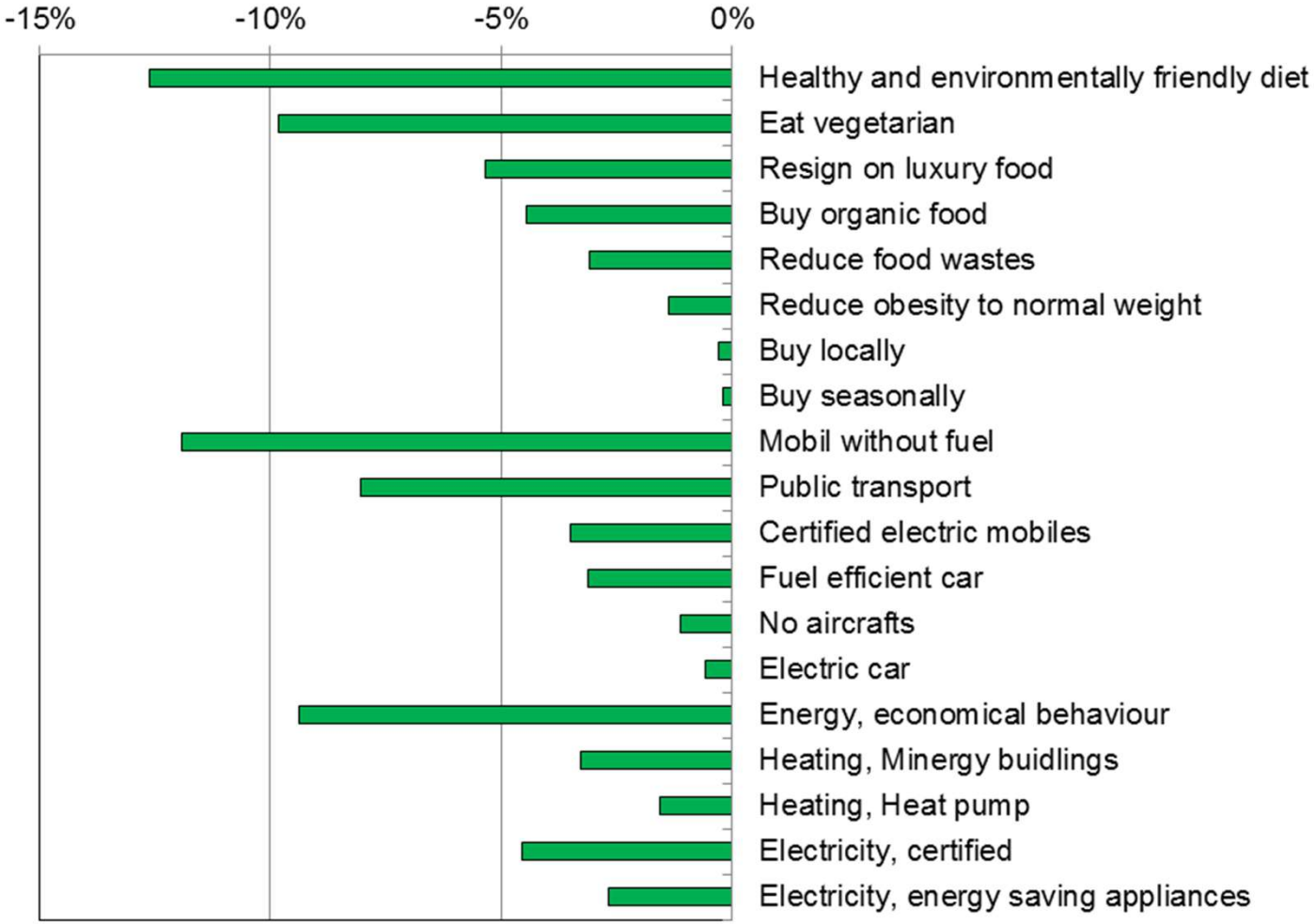
Total potential for reduction of impacts

Multiplying Reduction Potential and Share of Consumption Area



- Most relevant is a reduction of animal products
- Buying local/seasonal low potential because only vegetables and fruits affected

Summary of total potentials



- Vegetarian diet and substantial reduction of mobility demands have highest potentials
- Sum-up only partly possible