Environmental impacts of food consumption and its reduction potentials

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8th international conference on Life Cycle Assessment
in the Agri-Food Sector, “LCA Food 2012”
Saint-Malo, 2. October 2012

Key questions

- What are the total environmental impacts of consumption and how can they be allocated to consumption areas?
- What are the most important aspects within the food consumption area?
- Which potentials exist for the reduction of environmental impacts due to food consumption?

➢ Difficulties and rebound effects for implementation are not considered

Background

- Different projects finances by
  - WWF Switzerland
  - Energieforschung Zurich – ewz-electricity supply Zurich
  - Swiss Federal Office for the Environment, FOEN
- Here we present our personal summary

Life cycle impact assessment

- It is necessary to use a single score method to make this type of assessment and provide clear recommendations (see last years presentation on environmental product information)
- Use of the LCIA method ecological scarcity 2006 (Switzerland)
- Further evaluation of greenhouse gas emissions and energy use for comparison with older studies

Which Life cycle impact assessment

Carbon Footprint, CED:

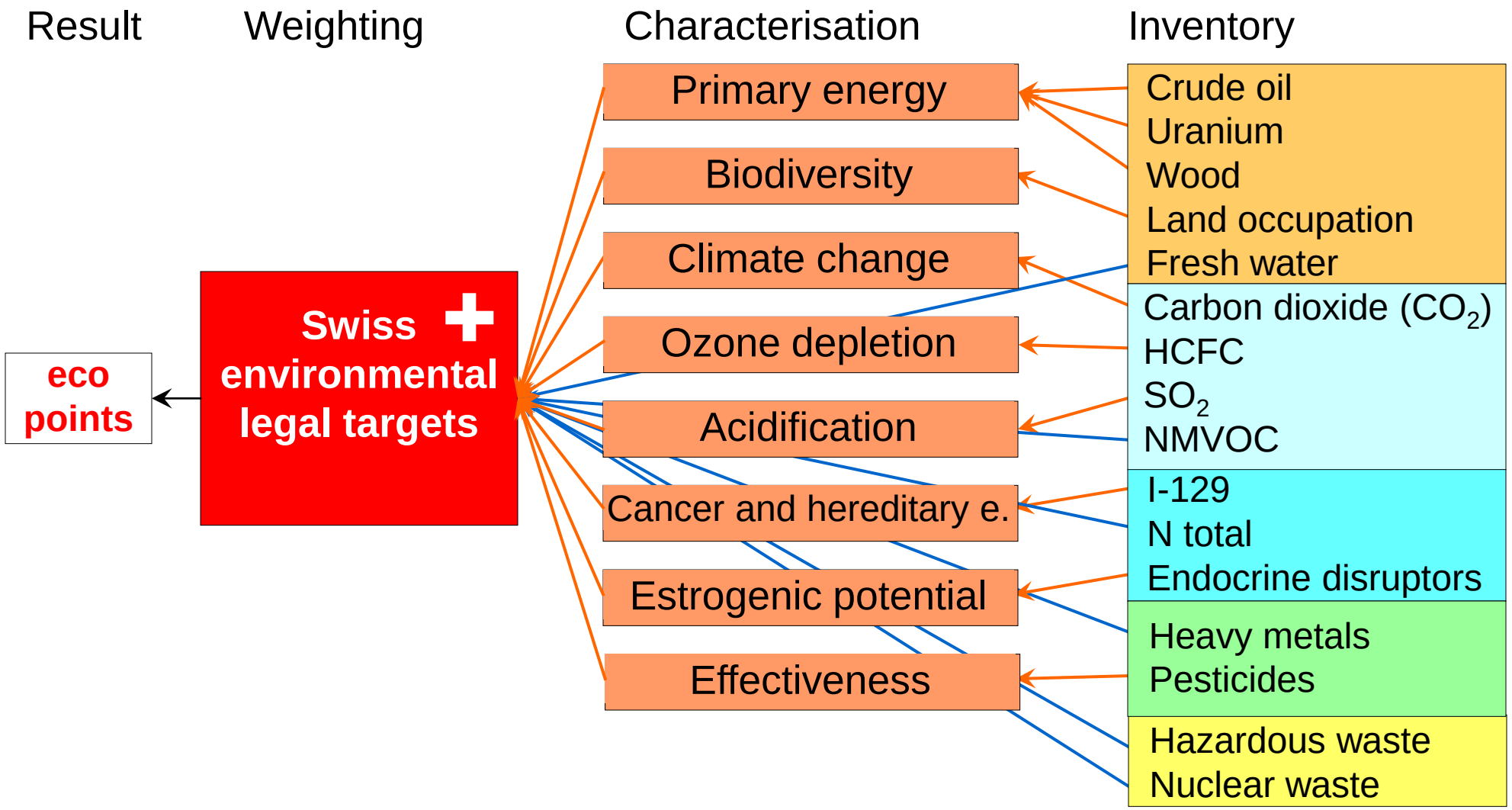
Ecological footprint:

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	∅	∅	∅	∅

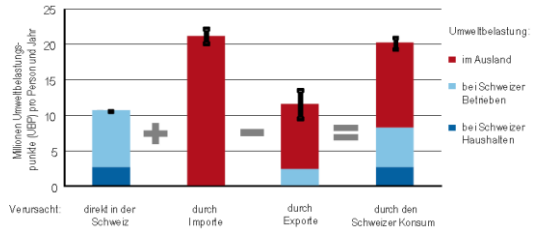
- The three indicators CED, carbon footprint and ecological scarcity are calculated

Ecological Scarcity 2006

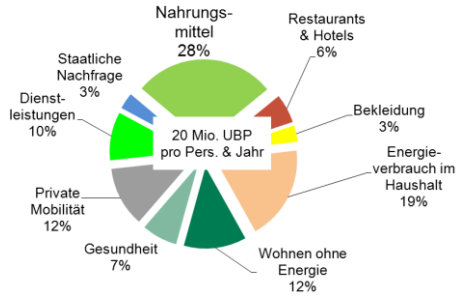


Five main stages for the calculation

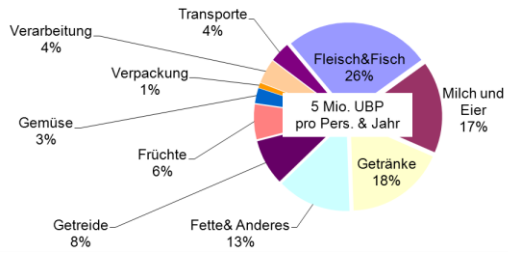
1. Total impacts CH



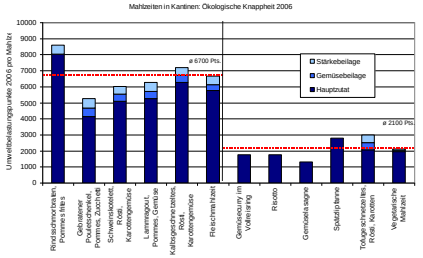
2. Share of consumption areas



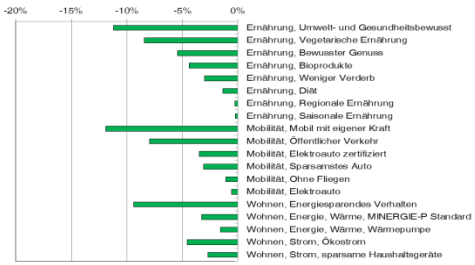
3. Further analysis



4. Reduction potentials

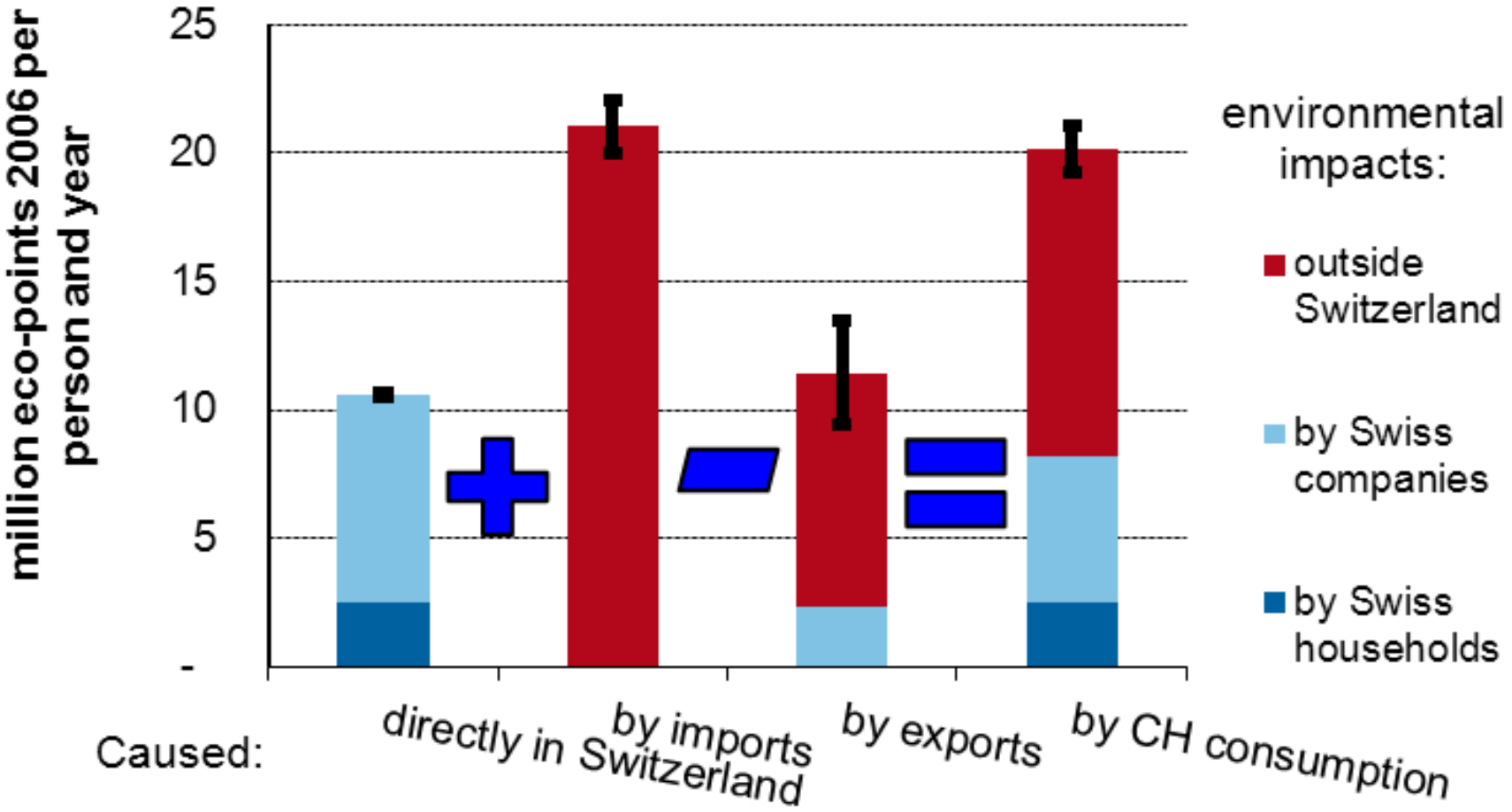


5. Total potentials



1.
TOTAL IMPACTS IN SWITZERLAND
MEAN FIGURES OF SWISS EE-IOA AND SIMPLIFIED “LCA&TRADE STATISTICS” APPROACH

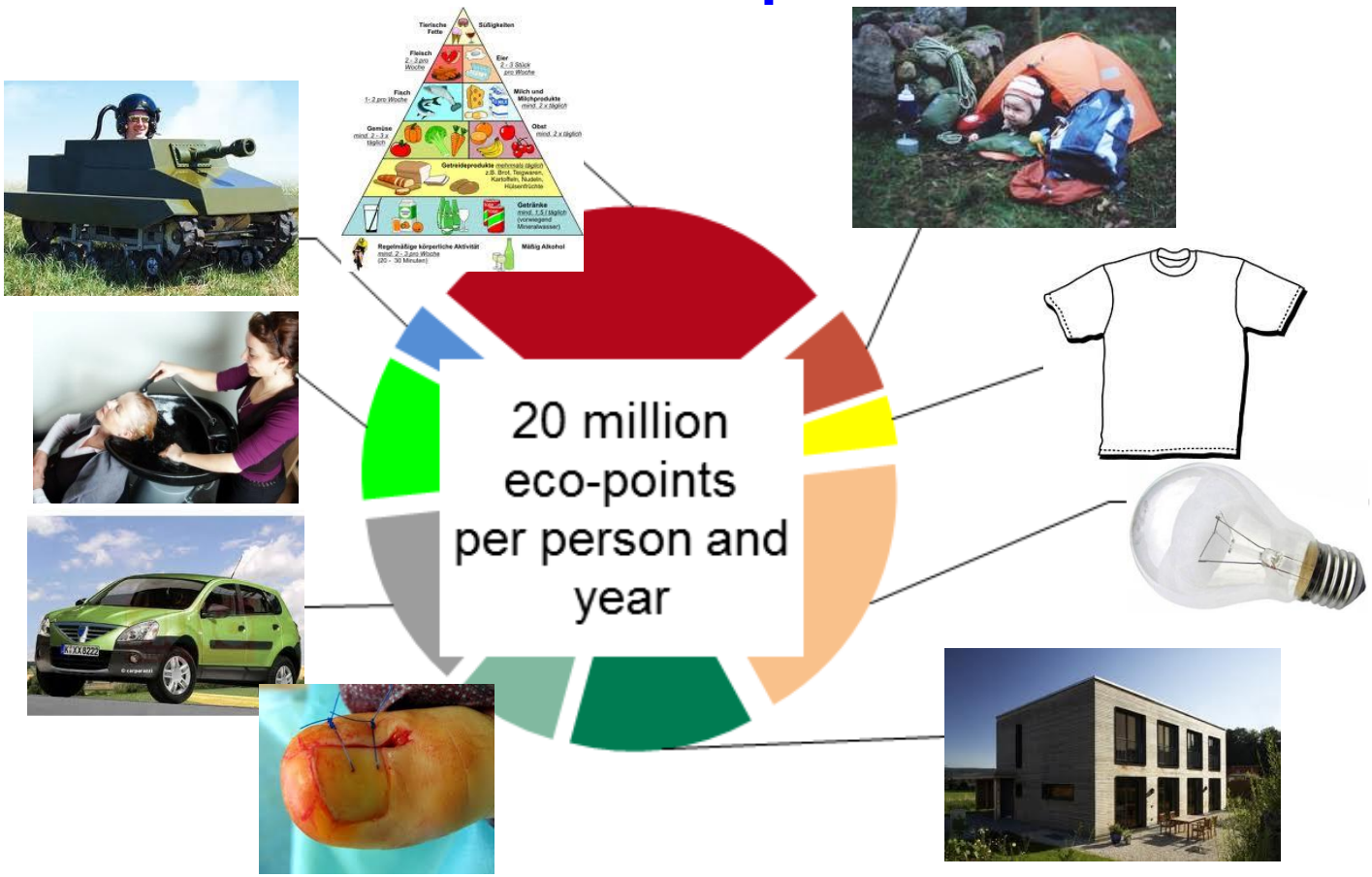
Total balance of Swiss impacts



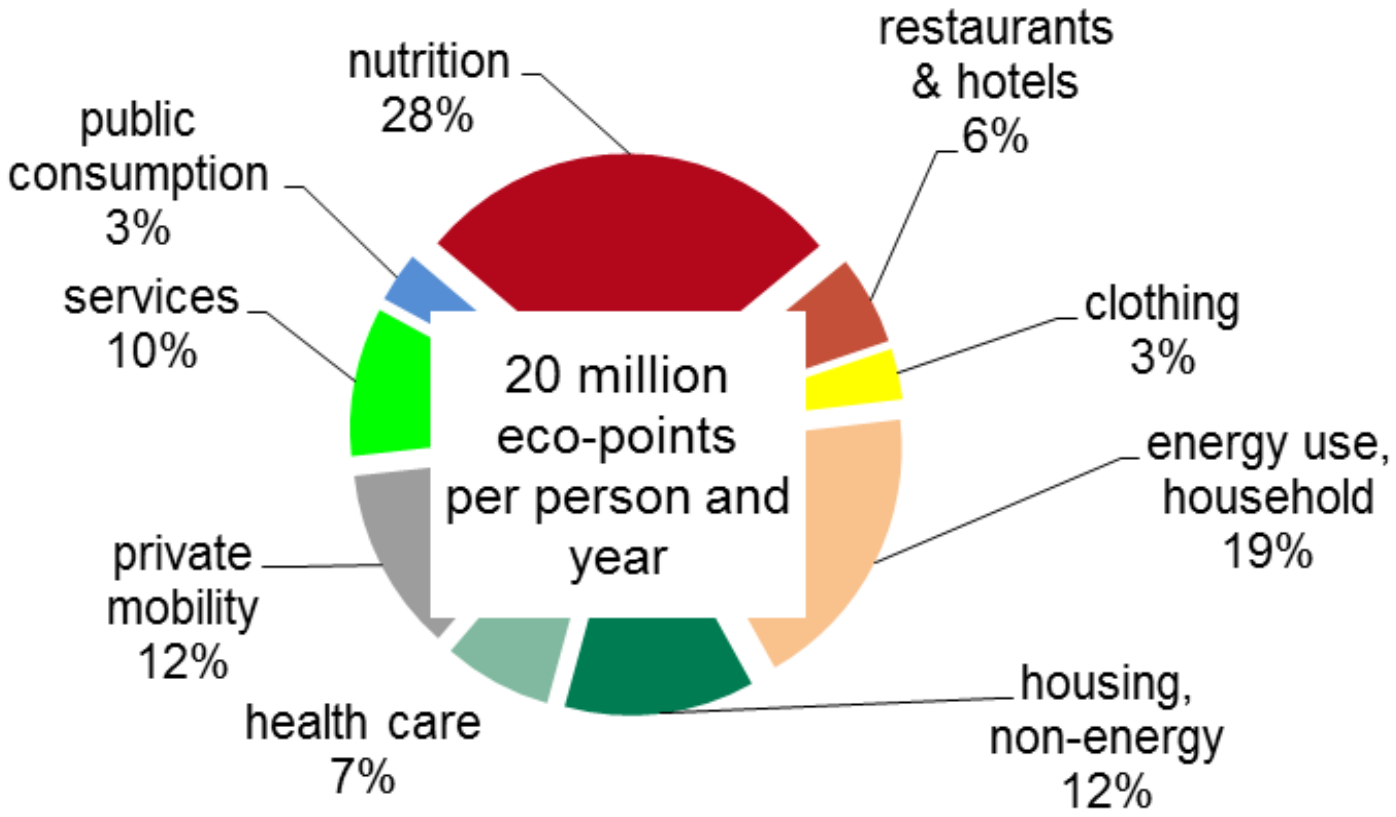
- 20 Million eco-points per year and capita

2.
SHARE OF CONSUMPTION AREAS
CALCULATION WITH SWISS EE-IOA

Share of consumption areas

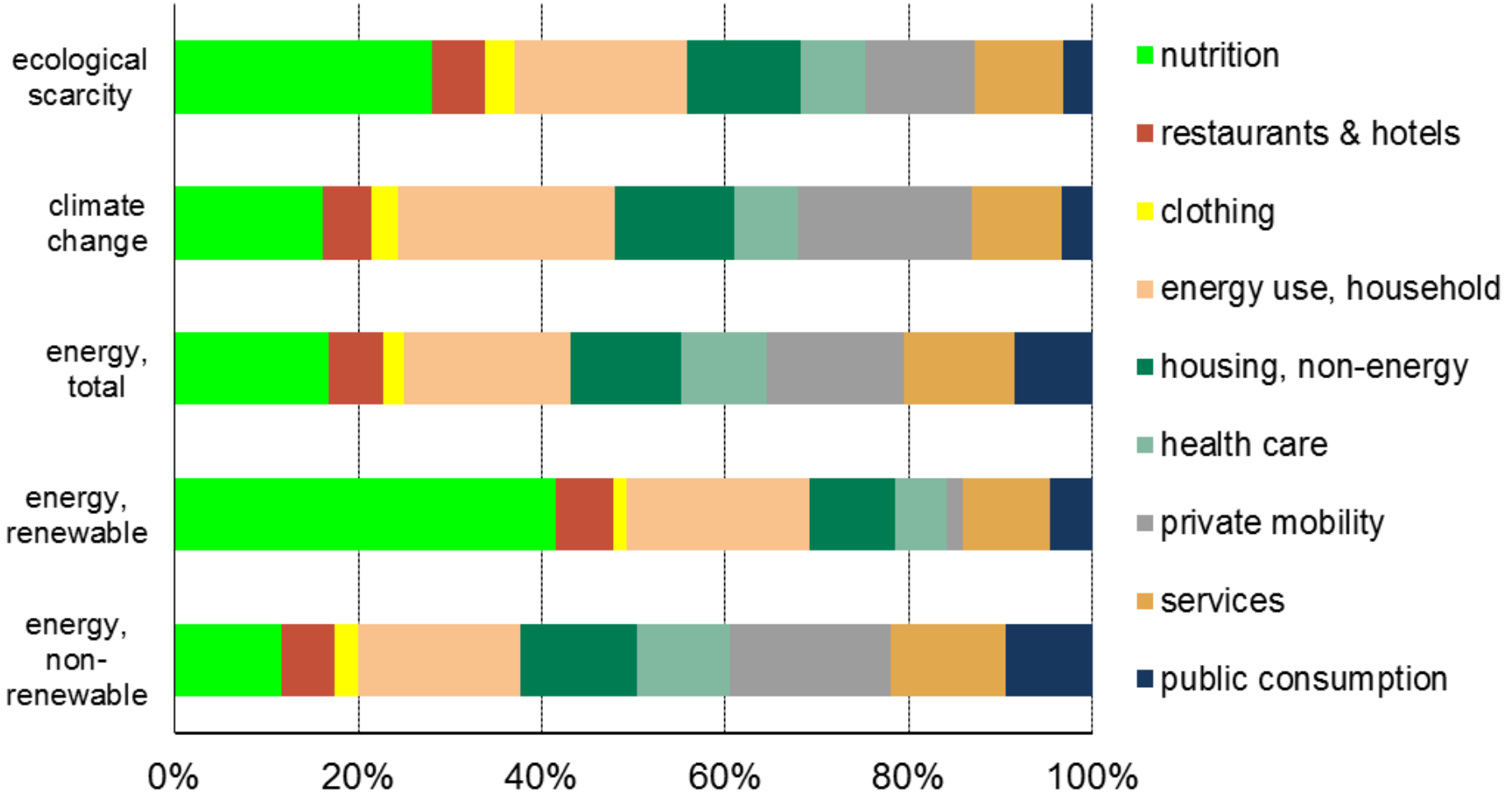


Share of consumption areas



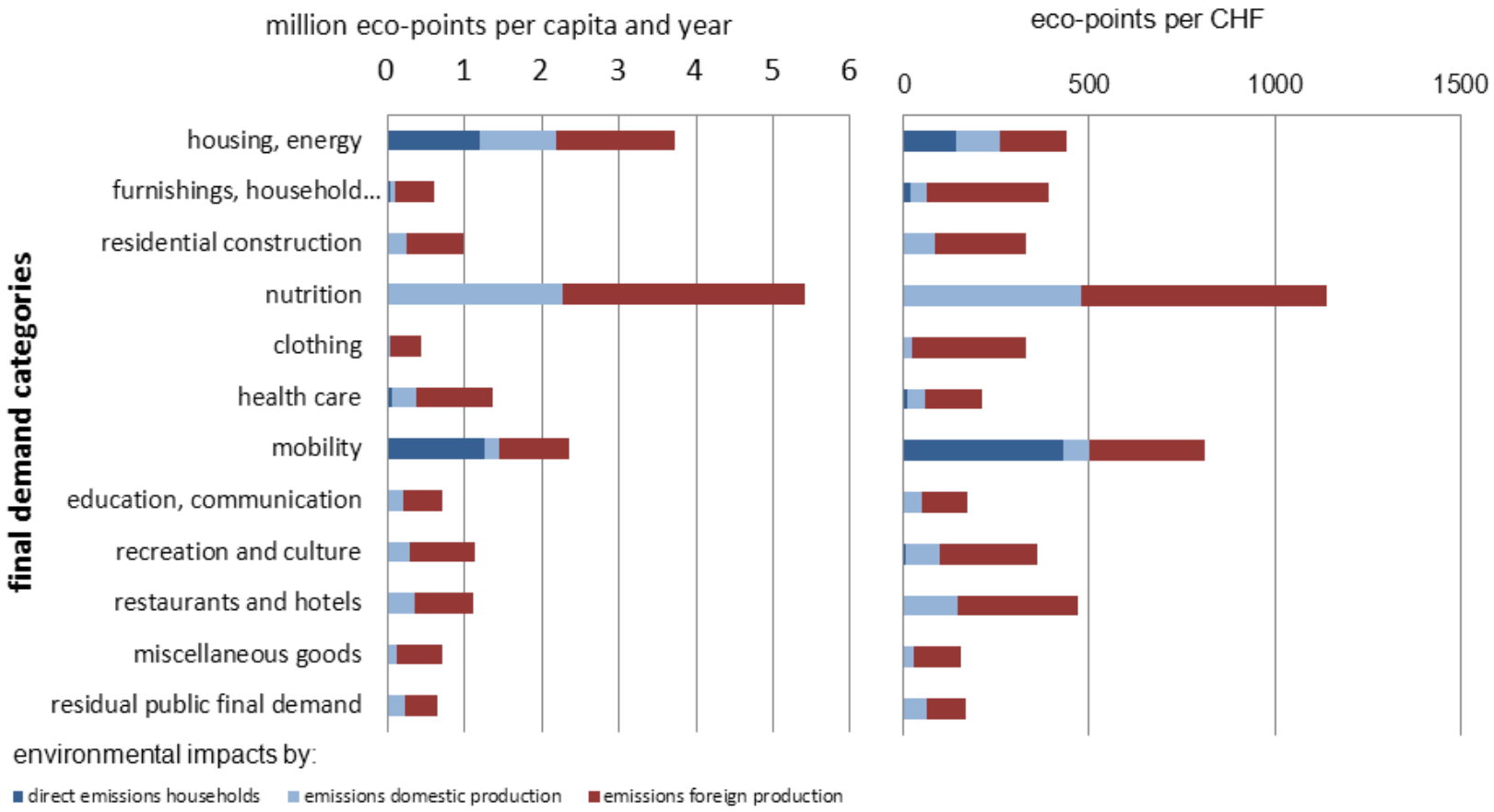
- Nutrition is the most important consumption area with 28%
- Share of restaurants not included in this figure

Different indicators and share of final consumption areas



- Energy and GHG indicators underestimate the contribution of nutrition

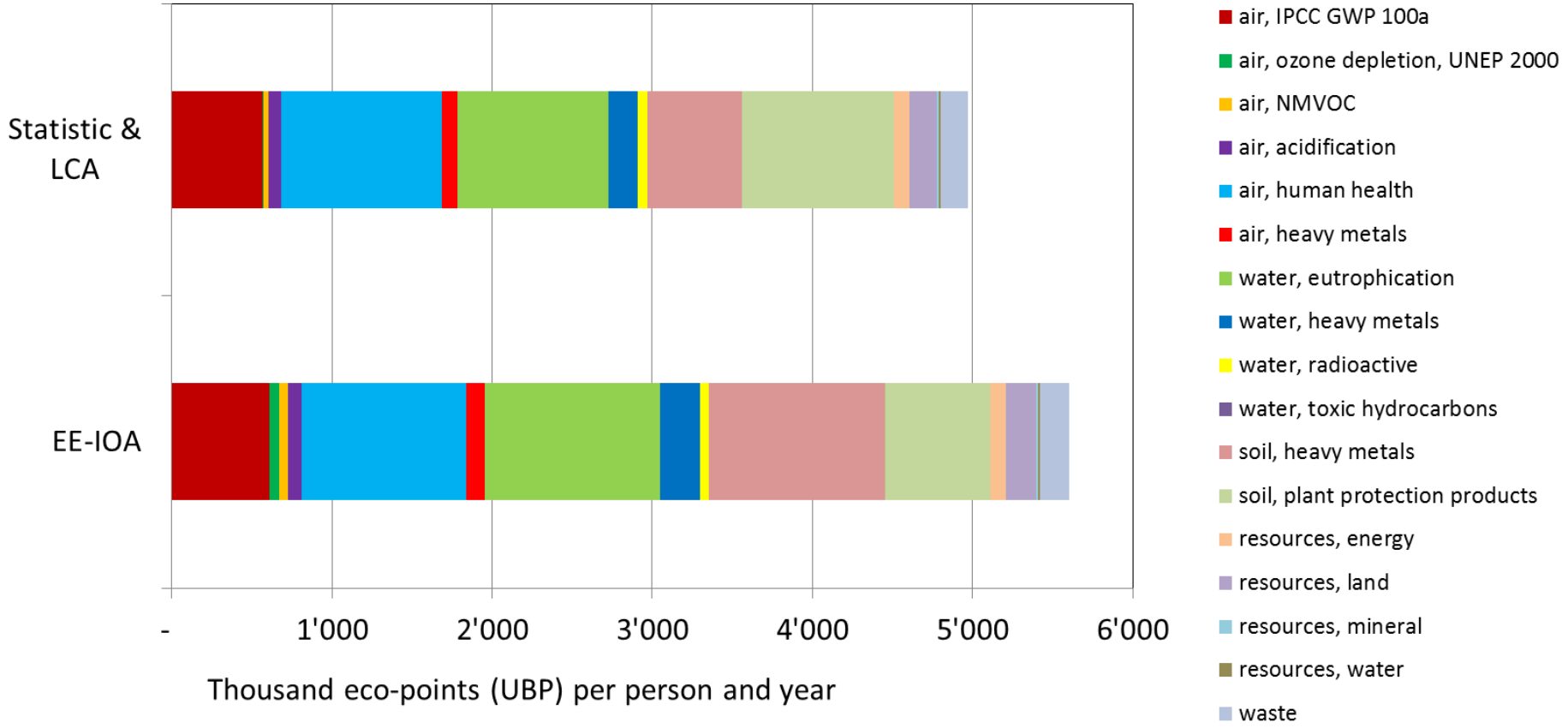
Consumption perspective



- Nutrition and mobility most intensive per money spent
- 40% of the environmental impacts due to nutrition occur abroad

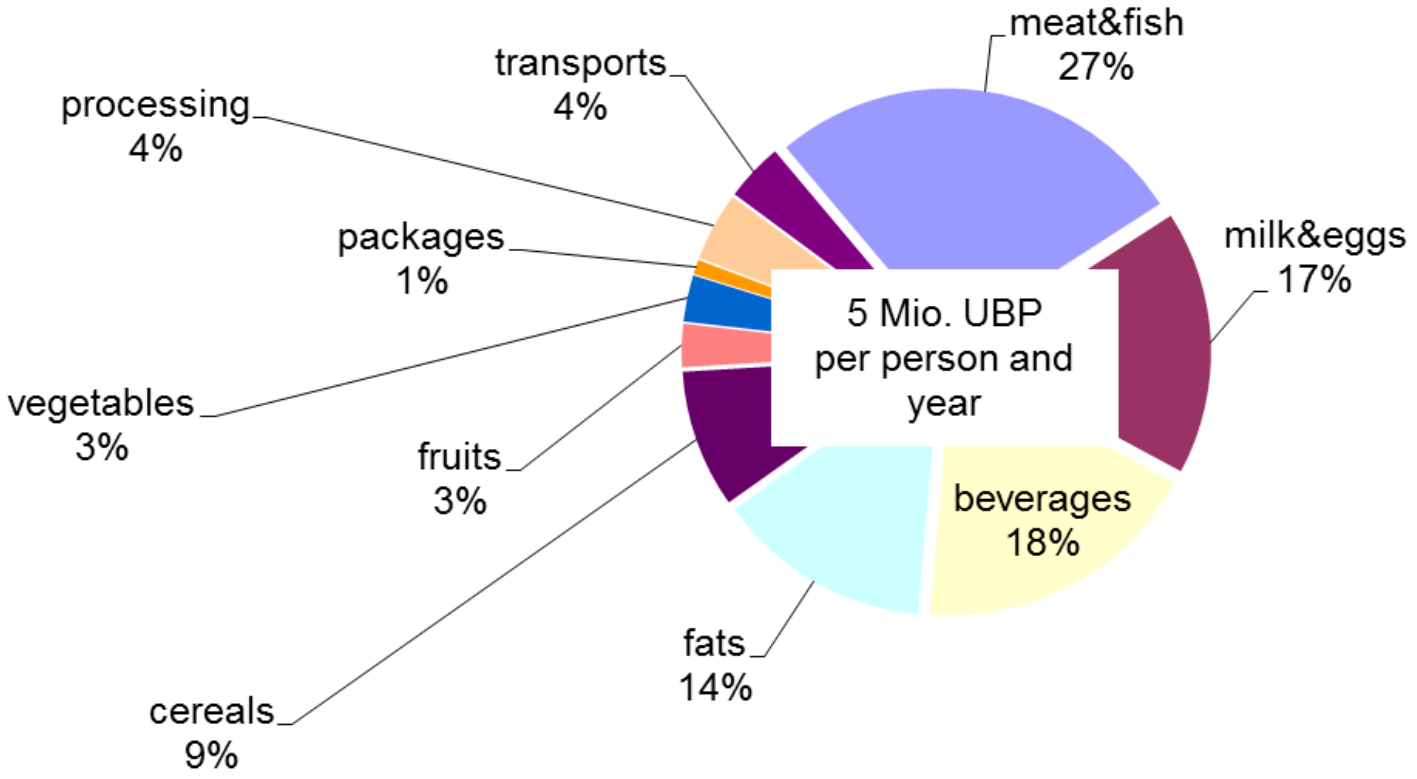
3.
FURTHER ANALYSIS OF CONSUMPTION AREAS
TOP-DOWN AND BOTTOM-UP
ASSESSMENT WITH LCA AND COMPARISON WITH EE-IOA

Environmental impacts of food purchases



- Top-Down and bottom-up come to comparable results
- Further analysis of consumption areas based on LCA and statistics

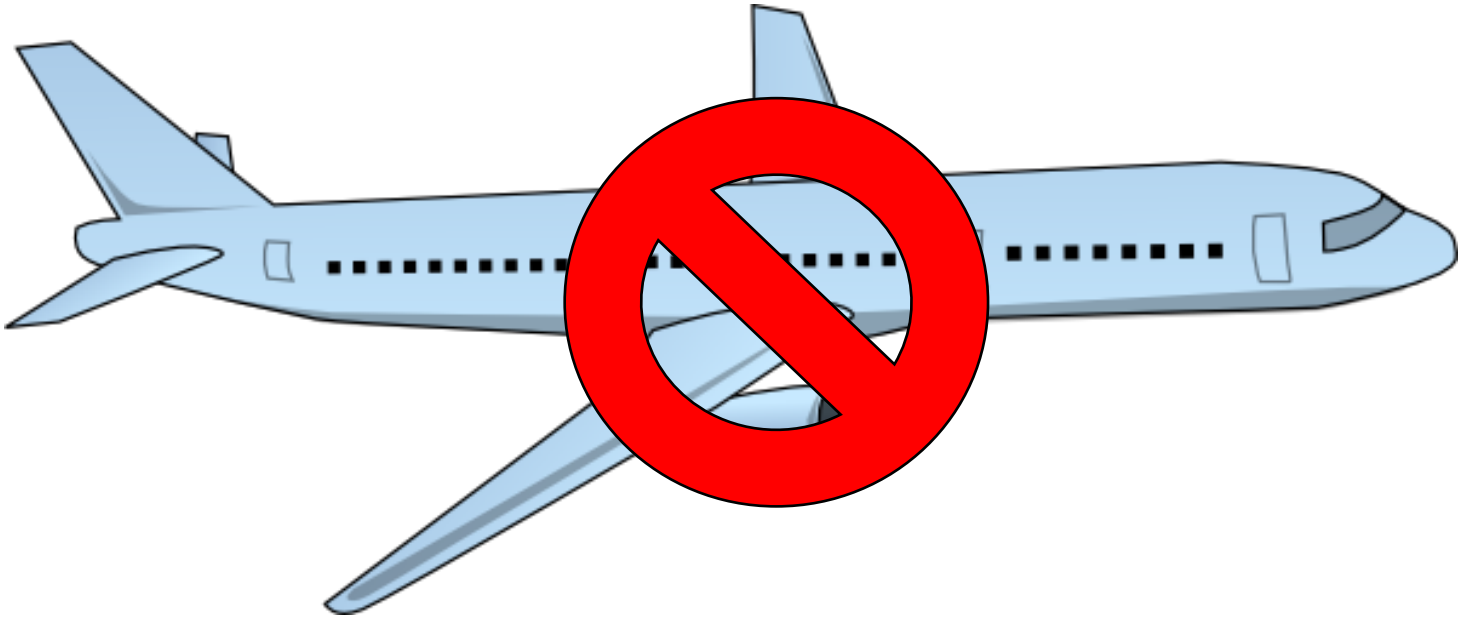
Product groups within nutrition



- Meat and animal products cause 44% of total impacts
- Wine, coffee and beer are important for beverages

4.
REDUCTION POTENTIALS
ANALYSIS OF EIGHT SINGLE CHANGES IN FOOD CONSUMPTION

Buy locally

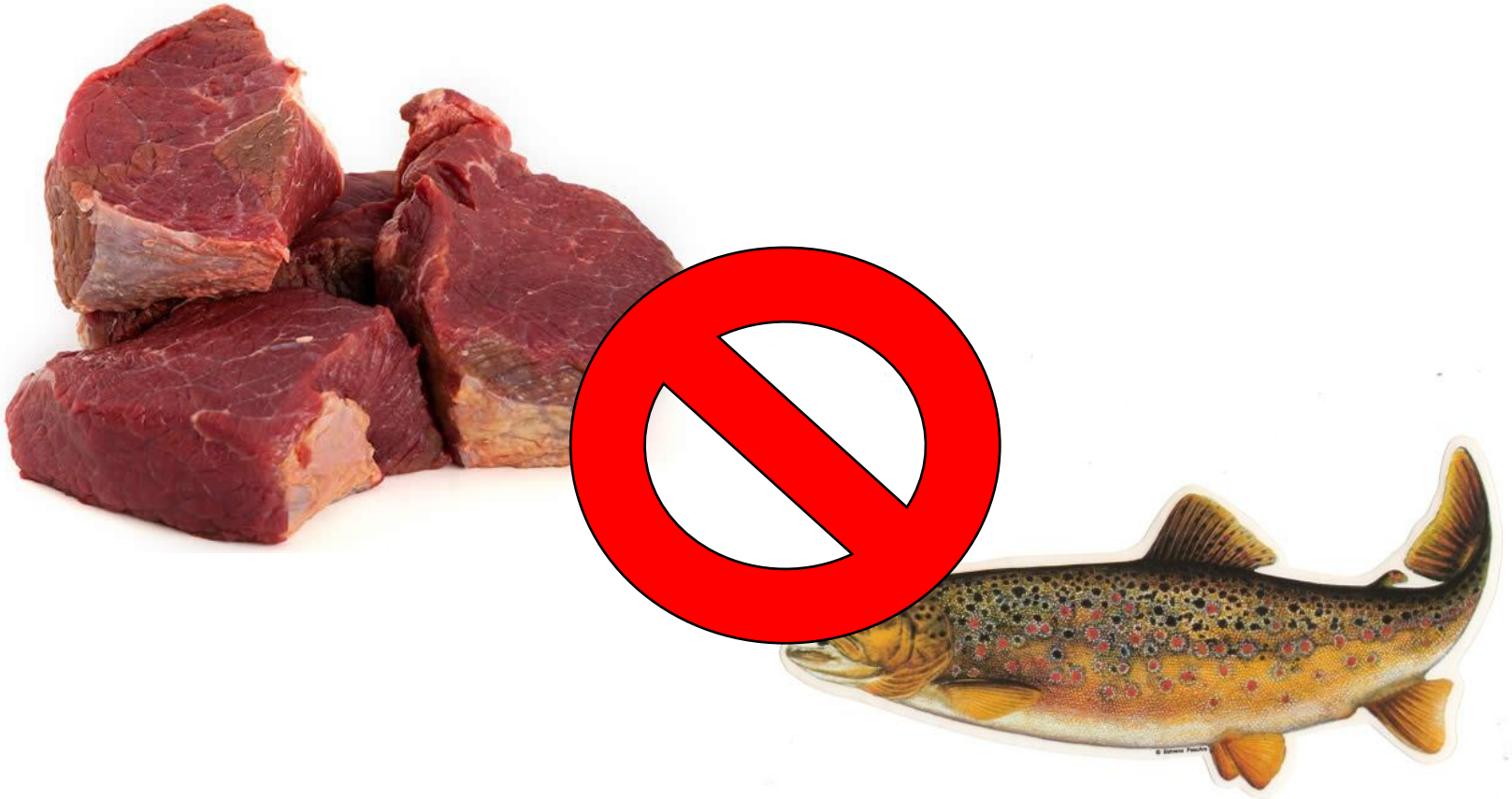


- Switzerland imports 50% of food: No full self-supply possible
- Only NO airplane transports of food are modelled

Buy seasonally

- No fruits and vegetables from heated greenhouses

Eat vegetarian



➢No meat and fish products

Organic food products

- The whole food basket from organic production
- No heated greenhouses and air-transports
- Extra import-transports because of lower yields

Resign on luxury food

➢ No consumption of coffee, alcohol and chocolate

Food waste

- Consumers do not waste food

Reduce obesity to normal weight

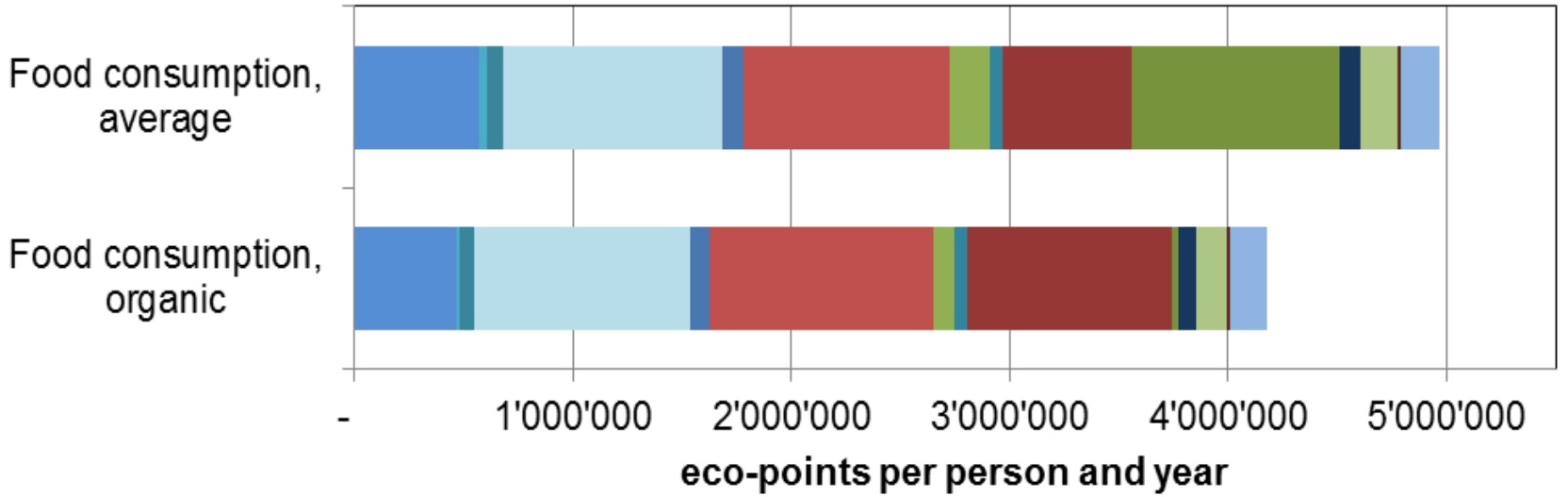
- About 37% of Swiss population is overweighed
- Recommended diet for everyone

Healthy and environmentally friendly diet

- Combine different changes like reduced meat and luxury product consumption, seasonal and local

4.
REDUCTION POTENTIALS
LITERATURE REVIEW AND OWN CALCULATIONS

Organic products



- air, IPCC GWP 100a
- air, ozone depletion, UNEP 2000
- air, NMVOC
- air, acidification
- air, human health
- air, heavy metals
- water, eutrophication
- water, heavy metals
- water, radioactive
- water, toxic hydrocarbons
- soil, heavy metals
- soil, plant protection products
- resources, energy
- resources, land
- resources, mineral
- resources, water use
- waste

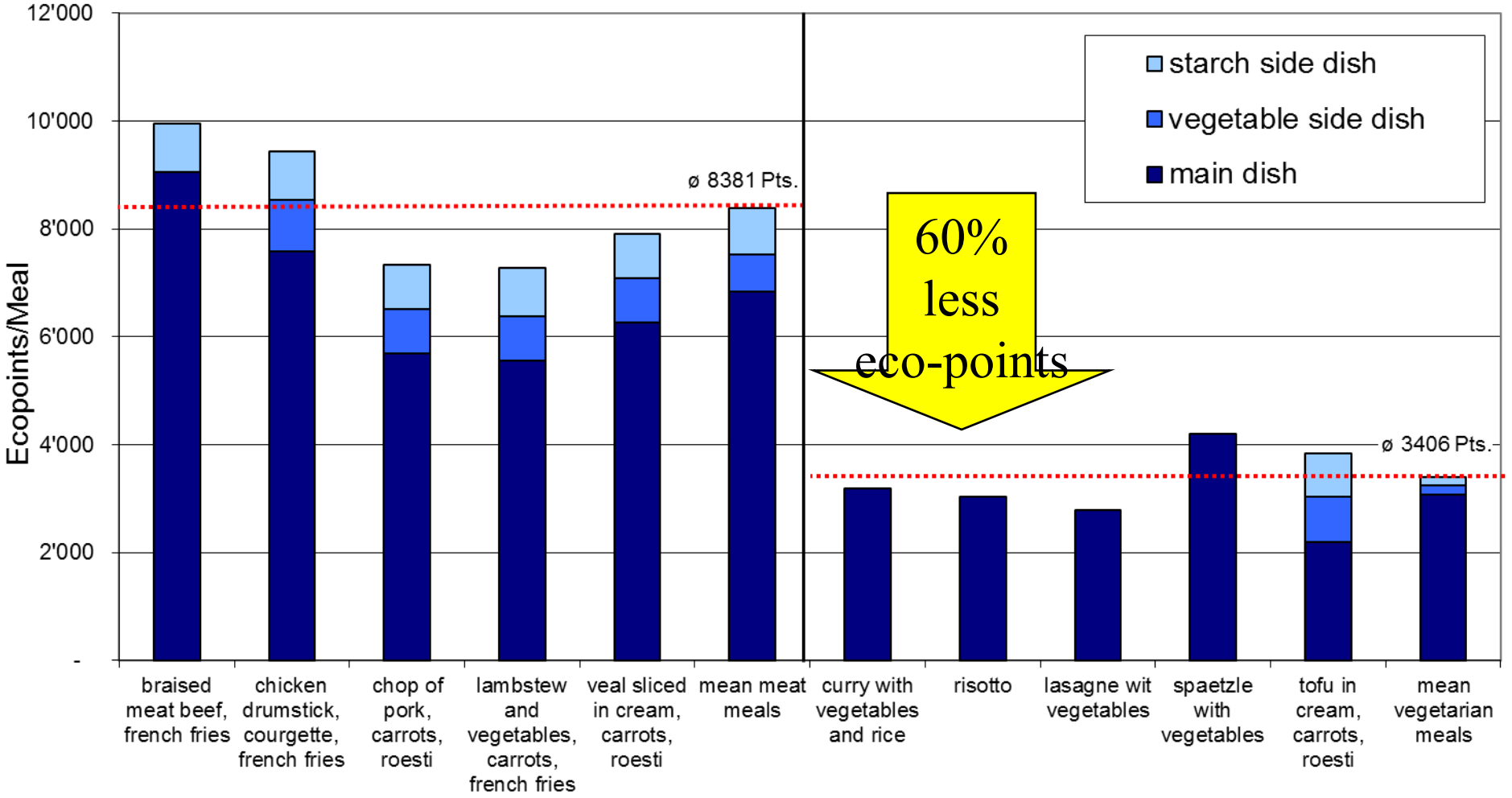
➢ Reduction potential about 16% if only organic food is bought

Reduction potential – organic products

Organic products	reduction potential	total potential	Land	Source	Estimation
Consumption area	**nutrition**				
Total environmental impacts	**-15.9%**	**-4.5%**	**CH**	**Own calculation**	**Organic production, no heated greenhouses and no air transported goods**
Primary energy demand	**-6.2%**	**-1.0%**	**CH**	**Own calculation**	**Organic production, no heated greenhouses and no air transported goods**
	-33.0%		AT	Fazeni 2011	100% organic production in AT
	-4.0%		CH	Faist 2000	Additional impacts of transports are estimated with 1%, but not included
	-1.7%		CH	Jungbluth 2003	100% organic, extra transports
	-20% - 56%		CH	Mäder et al. 2002	
Carbon footprint	**-18.2%**	**-2.9%**	**CH**	**Own calculation**	**Organic production, no heated greenhouses and no air transported goods**
	-33.0%		AT	Fazeni 2011	100% organic production in AT
	-10% bis -30%		DE	Grießhammer 2010	Organic vegetables
	-6.0%		CH	Jungbluth 2003	100% organic, extra transports

- 15.9% less environmental impacts (reduction potential)
- Total potential = Reduction potential * Share of consumption area
- 4.5% total potential for reductions

Vegetarian canteen meals



- Vegetarian meals reduce the environmental impacts considerable

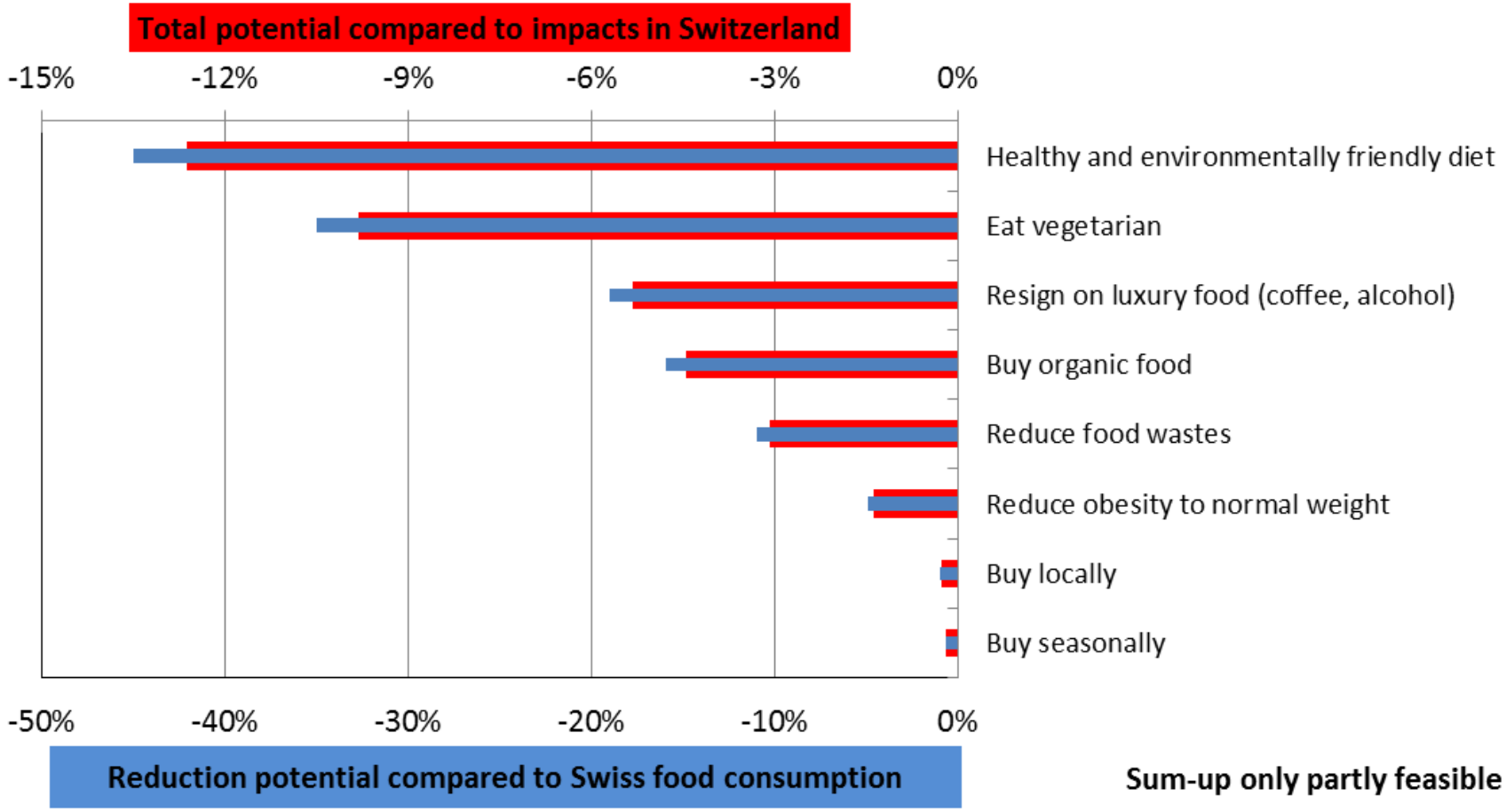
Reduction potential – Vegetarian diet

Vegetarische Ernährung	Reduktionspotenzial	Gesamtpotenzial	Region	Quelle	Annahmen
Konsumbereich	**Ernährung**				
Umweltbelastung, CH	**-35.0%**	**-9.8%**	**CH**	**Schätzung**	**Verzicht auf Fleisch**
	-44.0%		CH	Diese Studie	Verzicht auf tierische Produkte
	-58.7%		CH	Leuenberger 2009	Vegi-Mahlzeit statt Fleisch
Primärenergieverbrauch, CH	**-35.0%**	**-5.9%**	**CH**	**Schätzung**	**Verzicht auf Fleisch**
	-52.0%		CH	Diese Studie	Verzicht auf tierische Produkte
	-19.7%		CH	Jungbluth 2003	Verzicht auf Fleisch
	-17.6%		CH	Jungbluth 2003	Verzicht auf Milch und Eier
	-8.0%		CH	Faist 2000	Ovo-lacto Vegetarier
	-24.0%		CH	Faist 2000	Vegane Ernährung
	-31.4%		CH	Jungbluth 2000	Einkauf von Vegetariern
	-1.4%		NL	Uitdenbogerd et al. 1998	Vegetarisch Essen
	-2.5%		NL	Kramer 2000	20% Reduktion des Fleischkonsums
	-4.5%		NL	Kramer 2000	20% Reduktion des Fleischkonsums, 2 mal pro Woche vegetarisch
	-33.3%		DE	Taylor 2000	Ovo-lacto Vegetarier
CO2-eq, CH	**-35.0%**	**-5.6%**	**CH**	**Schätzung**	**Verzicht auf Fleisch**
	-48.0%		CH	Diese Studie	Verzicht auf tierische Produkte
	-54.9%		CH	Leuenberger 2009	Vegi-Mahlzeiten
	-26.1%		CH	Jungbluth 2003	Verzicht auf Fleisch
	-28.9%		CH	Jungbluth 2003	Verzicht auf Milch und Eier
	-33.3%		DE	Taylor 2000	Ovo-lacto Vegetarier
	-3.3%		NL	Kramer 2000	20% Reduktion des Fleischkonsums
	-5.5%		NL	Kramer 2000	20% Reduktion des Fleischkonsums, 2 mal pro Woche vegetarisch

- Estimation 35% less environmental impacts on food consumption
- Total potential = Reduction potential * Share of consumption area

5.
TOTAL POTENTIALS
ANALYSIS FOR THE PRESENT SITUATION IN SWITZERLAND

Total potential for reduction of impacts



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

Reduction targets for environmental impacts

- Political targets according to ecological scarcity method 2006: - 38% for domestic situation or - 63% without exporting environmental impacts
- Reaching world average with ecological scarcity: -47%
- Ecological footprint concept: - 64%
- 2000-Watt: -68% on energy and – 88% on CO2-eq

➢ At least -40% reduction of environmental impacts is necessary

Maximum of total reduction potential

- Combination of
  - No luxury and meat products
  - Organic food
  - No waste and overconsumption

Indicator	Total environmental impacts	Carbon footprint	Primary energy demand
Total (per capita and year)	20'000'000	12.8	8'250
Nutrition	28%	16%	17%
Total potential nutrition	**-22%**	-12%	-11%

- In theory it is possible to achieve 80% reduction on food consumption
- In practice this encounters substantial changes of personal life styles

Summary

- Our methodology allows to investigate and compare the impacts of behavioural changes in all areas of consumption
- Most important are the areas of nutrition, mobility and energy use in households
- Combination of EE-IOA for broad overview and LCA for detailed analysis is feasible
- The highest potential within the area of food consumption exist for a healthy combination of less animal and luxury products and purchase of organic produced food items, without wastage

Thanks for financial contributions:
WWF Switzerland
Energieforschung Zurich – ewz-electricity supply Zurich
Swiss Federal Office for the Environment, FOEN

Further information about the projects
www.esu-services.ch/projects/lifestyle/

WWF Footprint calculator to be updated with the data
www.footprint.ch

Download of the background study and electronic data
www.esu-services.ch/projects/ioa/

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

Discussion forum LCA on sustainable consumption
www.esu-services.ch/news/df/#c833

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