Feasibility and Challenges for providing Environmental Product Information based on LCA

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Purpose of and Requirements of Environmental Information for Products

- Quantifying environmental impacts of products and informing consumers about it in order to support sustainable consumption

- Criteria set for Environmental Product Information (EPI)
  - Is comprehensive concerning life cycle stages and environmental impacts
  - Is transparent and verifiable
  - Can be standardised (applicable for all types of products)
  - Scalable (single products, household, national economy)
  - Internationally transferable
  - Can be elaborated with reasonable effort
  - Allows an understandable communication of results
  - Clear separation of scientific modelling and political decisions

➢ We investigated the feasibility for the Federal Office for the Environment (FOEN)

➢ Here we present our personal viewpoint and not this of the FOEN

Analysing international EPI initiatives

- Different approaches based on life cycle thinking

- Focus on carbon footprint as one impact and only on single products

- Differences concerning inclusion of the use phase

- Organisational aspects range from driven by one stakeholder to approaches lead independently

- Different ideas for communication, absolute, relative, best of class

- ISO standards for env. product declaration (EPD) and life cycle assessment (LCA) only partly followed
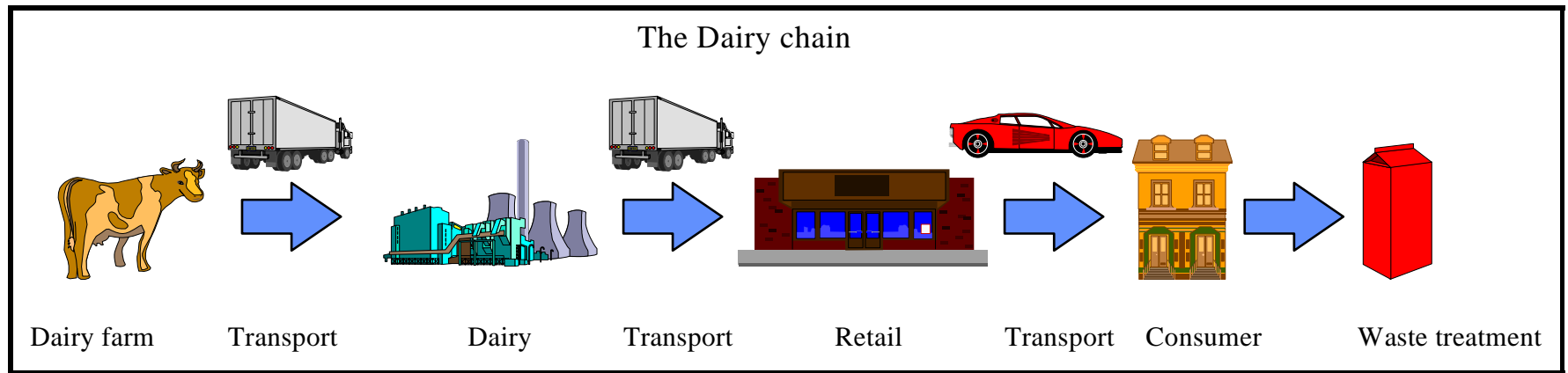
➢ So far no complete environmental information on all products

Which method shall be used for EPI?

- We investigated about ten different "methods", such as LCA, CF, EF, MFA, IOA, CED, etc.

- Different principles for data inventory (physical, economic, spatial) as one criterion

- Some "methods" are named according to indicator, e.g. carbon footprint, water footprint, energy analysis

- Method has to be chosen according to the question

- Good databases for LCA in Switzerland (ecoinvent)

➢ LCA methodology is recommended for EPI (in Switzerland)

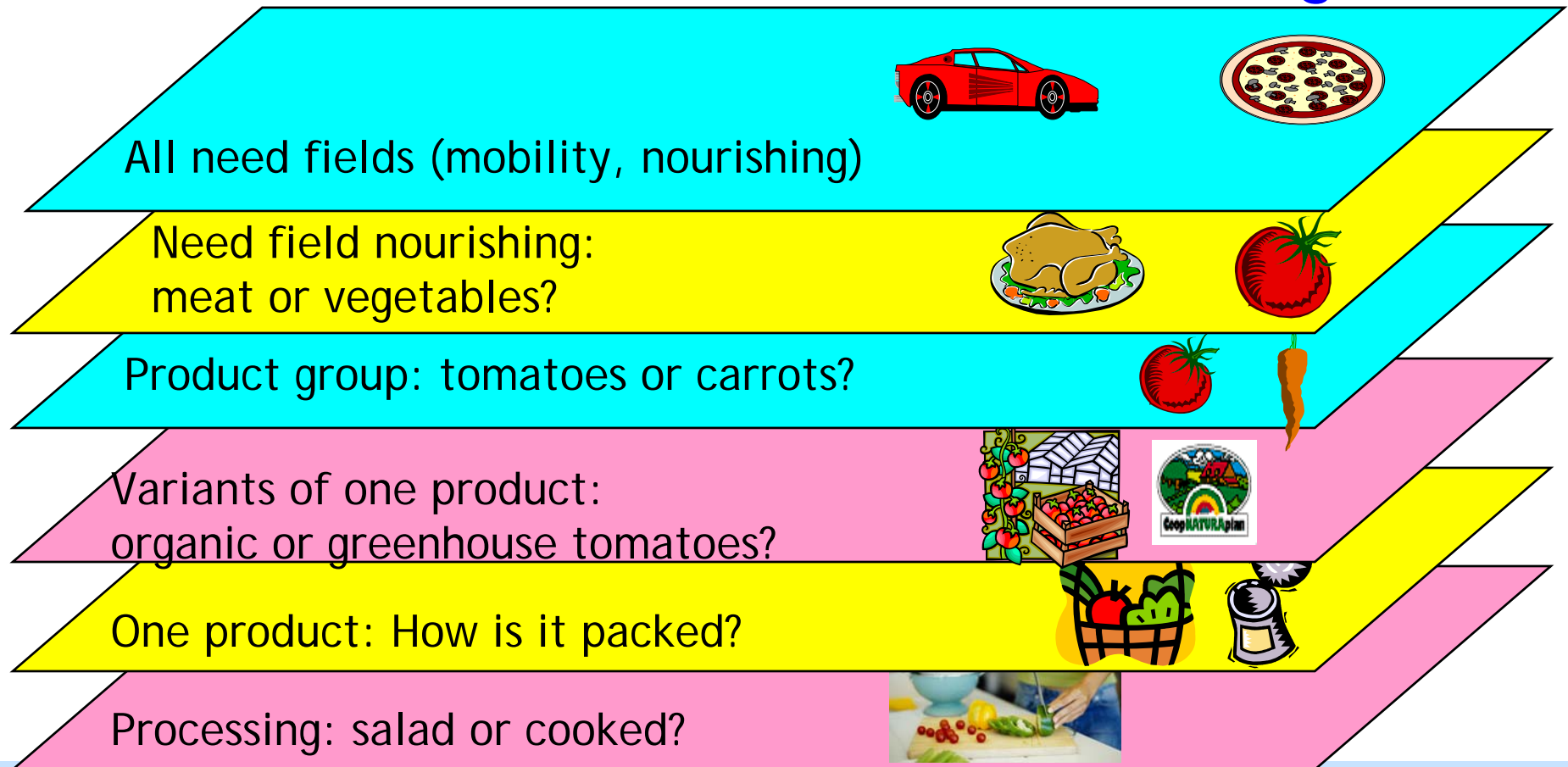➢ Follow ecoinvent v2.0 ideas of modelling and transparency

Life Cycle Assessment of Products

The Dairy chain

| Dairy farm | Transport | Dairy | Transport | Retail | Transport | Consumer | Waste treatment |

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➤ Main responsibilities to be distinguished for environmental product information:

production – distribution – delivery - use phase - disposal

producer   -   retailer   -   consumer

Which questions to be answered by EPI?
Levels of Consumer Decision Making (DML)

All need fields (mobility, nourishing)

Need field nourishing:
meat or vegetables?

Product group: tomatoes or carrots?

Variants of one product:
organic or greenhouse tomatoes?

One product: How is it packed?

Processing: salad or cooked?

➢ It is possible to address all questions, but not with one analysis

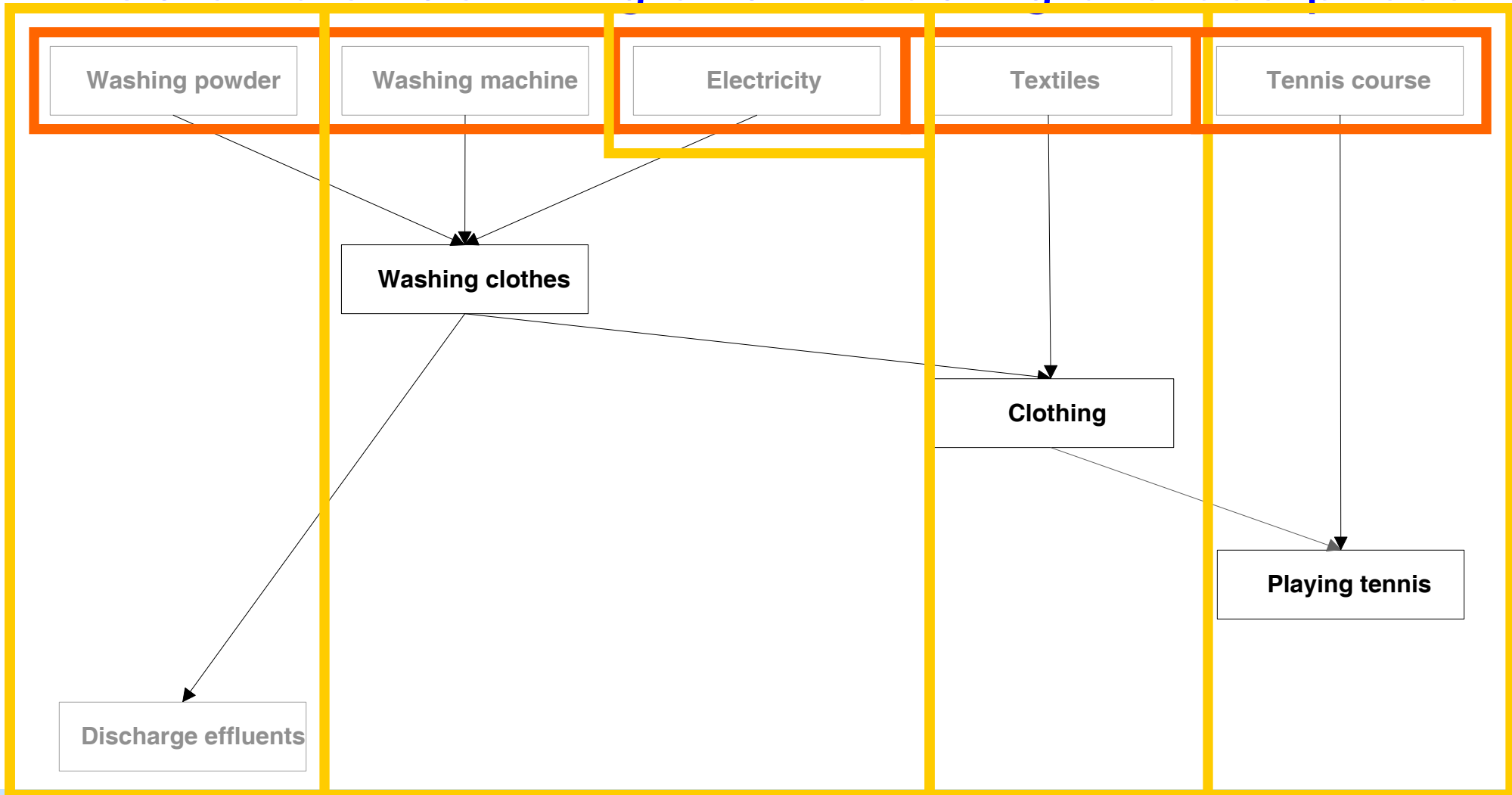➢ We recommend to address 1st highest level and refine downwards step by step

Lasagne production and user behaviour
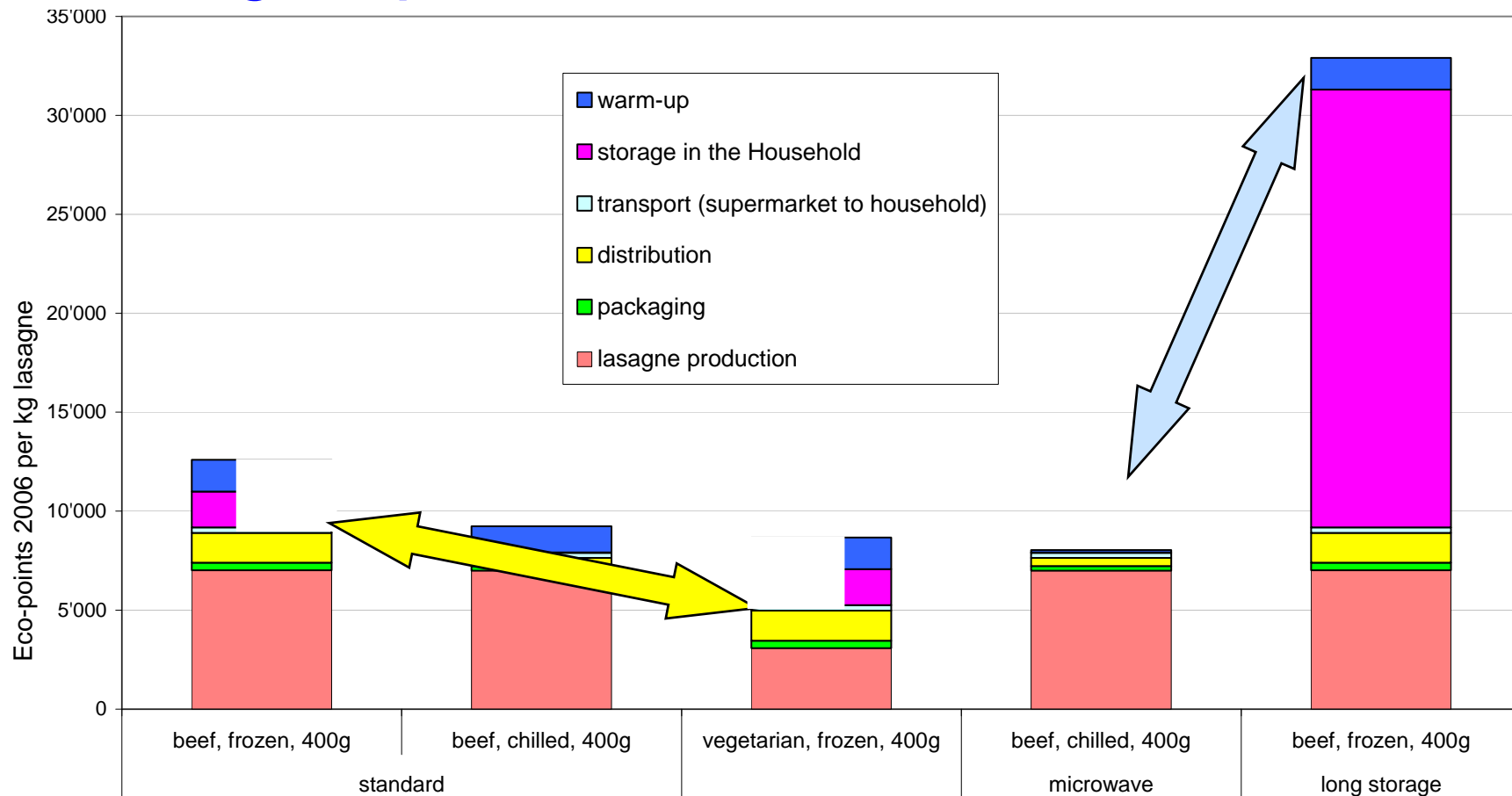
➢ **Differences in production less obvious if full life cycle is evaluated**

➢ **Important differences in the use phase difficult to handle**

Problems of defining and including the use phase

> Including full life cycle means double counting and high variability

System boundaries

- **In the basket**
  - + Allows add-up calculation of personal impacts
  - + Shows what the distribution chain has achieved
  - + Directs the buying decision to production with lower impacts
  - + Consistent with price and organic or fair trade label
  - – Misguiding if product influences the use phase

- **Full life cycle**
  - + Post purchase are important → life cycle thinking for comparison
  - – Functional unit must be clarified and restricts application
  - – As consumer behaviour is variable, information is not valid
  - – Product design or clear description must ensure forecasted benefits
  - – Double counting of impacts
  - – No add-up calculation possible

➢ No perfect solution

➢ "In the basket", without functional unit more consistent and easier to apply

➢ Include direct use phase emissions (combustion, effluent)

Product category rules for the use phase

- Investigate use phase additionally for energy using products with a plug or a tank

- Develop product category rules on important issues, e.g.
  - On what functional level can one compare in a product group?
  - Standard scenarios for the use phase e.g. driving cycle
  - Standard assumptions for modelling of emissions

- Overall comparability for all levels of decisions not feasible

- Examples: cars, electric devices, heating

- Do not include use phase for all other products, e.g. food products, washing powder, textiles

➢ Add additional information for the use phase only were necessary and feasible

Life Cycle Impact Assessment (LCIA) electricity production

Ecological scarcity   vs   ReCiPe
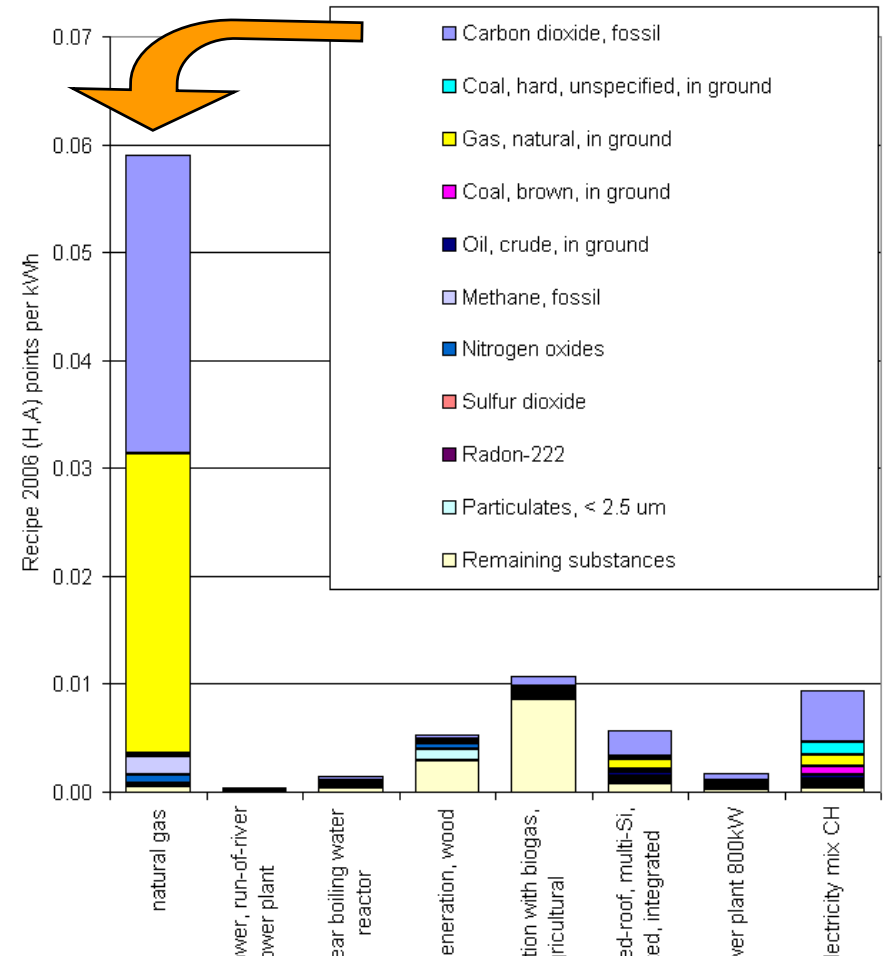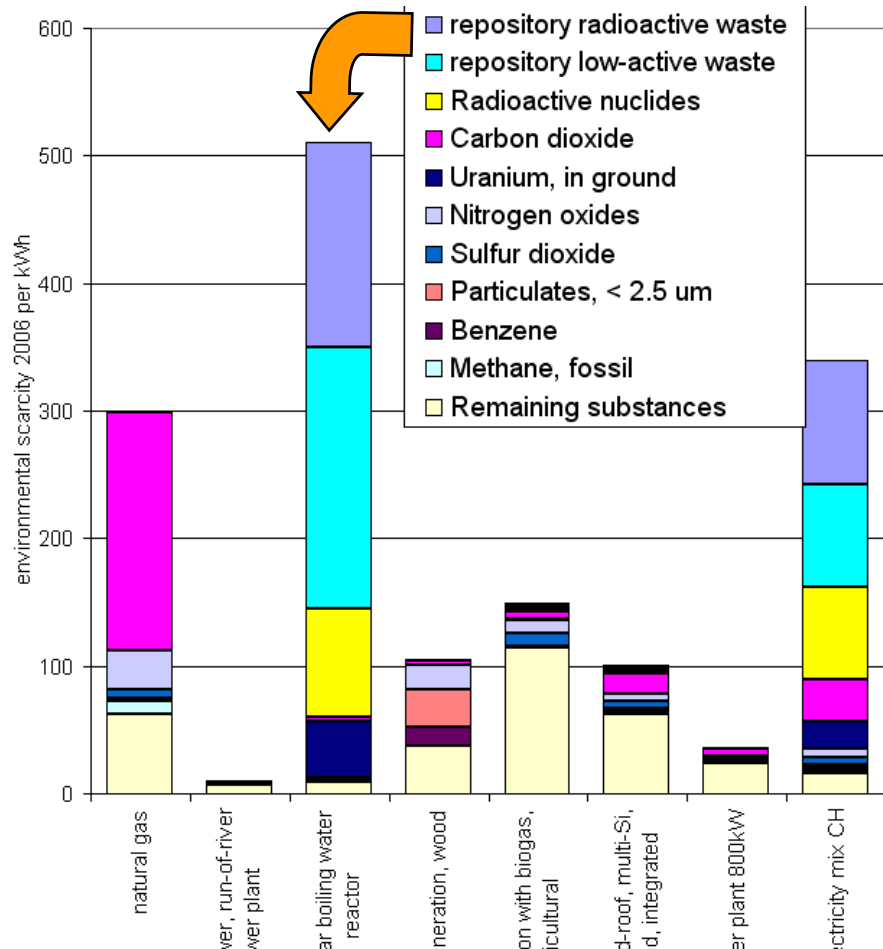
➤ Quite different assessment of nuclear power

Life cycle impact assessment (LCIA) methods

	environmental impacts	carbon footprint (kg CO2-eq)	ecological footprint (m2a)	ecological scarcity 2006 (UBP)	ReCiPe (points)
resources	abiotic resources, incl. water	∅	∅	√	√
	nuclear energy	∅	∅	√	√
	fossil energy	∅	∅	√	√
	land occupation	∅	√	√	√
	land transformation	∅	∅	∅	√
emissions	climate change	√	√	√	√
	ozone depletion	∅	∅	√	√
	toxicity	∅	∅	√	√
	summer smog	∅	∅	√	√
	acidification	∅	∅	√	√
	nutrification	∅	∅	√	√
	endocrine disruptors	∅	∅	√	∅
	noise, odour, litter	∅	∅	∅	∅
	ionising radiation	∅	∅	√	√
	waste (incl. radioactive waste)	∅	∅	√	∅

➢ Matter of choice and values, but not of science (alone)

➢ We recommend the Swiss ecological scarcity 2006 method

International acceptance of LCIA

- No acceptance of single score methods in the international LCA community because not allowed by ISO 14040

- Different political views in different regions and communities e.g. nuclear energy, water scarcity, resources

- Ecological scarcity concept is being used in other nations and world regions (e.g. Japan) and can be applied where quantified environmental goals are available

➢ LCIA method developed as combination of a scientific and political process

➢ Different priorities set by different groups of people

Setting targets and simplification
Ecological Scarcity 2006
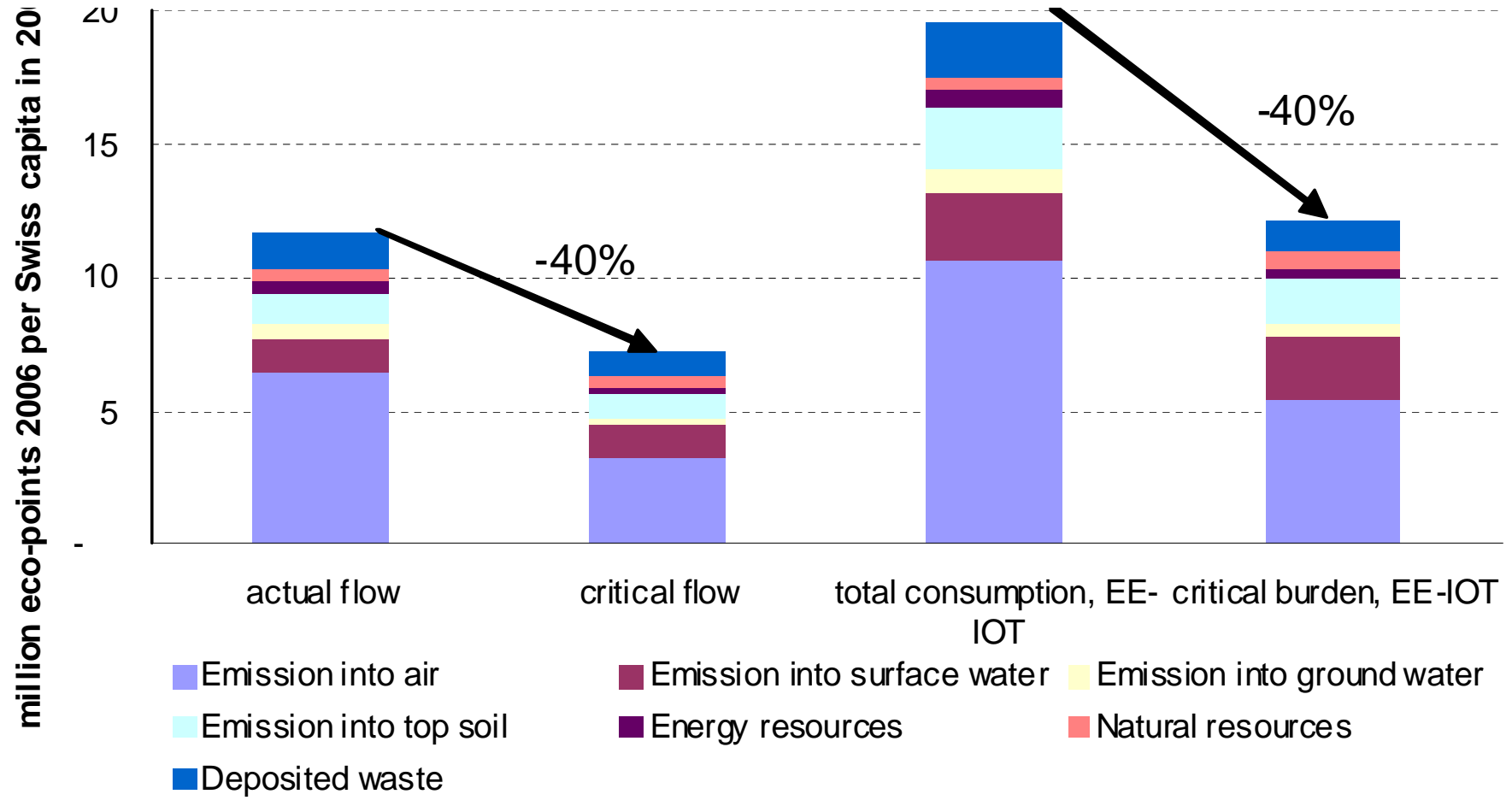
➢ Swiss policy aims for substantial reduction of emissions

Swiss Environmental Time Unit

Product	Ecological scarcity eco-points	Ecological Time eco-hours	Ecological Time
Annual budget	12'279'131	8760:00:00	365d 0h 0` 0``
Spinach, deep frozen, 1 kg	3'000	2:08:25	0d 2h 8` 25``
T-Shirt, cotton	12'400	8:50:46	0d 8h 50` 46``
Car, VW Golf	6'370'000	4544:23:36	189d 8h 23` 36``
Car driving, 10'000 km	2'320'000	1655:06:03	68d 23h 6` 3``
Mineral water, 1 litre	200	0:08:34	0d 0h 8` 34``
Flight, New York, 12'600 km	920'696	656:49:46	27d 8h 49` 46``
Electricity, 1 kWh	340	0:14:33	0d 0h 14` 33``

➢ Normalize the critical burden with the time budget

➢ Easier to understand than eco-points

➢ Practical examples provided with food and drinks today

Communication issues

- Overflow of information for products, especially food products

- Different means of communication allow different level of detail

- Clear guidance necessary without expecting too much background knowledge

- Different perception concerning simplicity and correctness

➢ It is necessary to develop a communication concept

Priorities for investigating EPI

- High environmental importance: mobility, housing, heating, nourishing

- Food important, but less variability in personal consumption patterns because of natural limits of eating

- As a first step generic values highlighting main differences as e.g. meat vs vegetables, air-transported, greenhouse production can be sufficient

Conclusions on what is feasible

- EPI can help to consider environmental impacts

- All concepts can only be used to answer clear questions

- It is feasible to show the life cycle until the shop and add-up the impacts for total consumption

- A comprehensive impact assessment method is mainly a matter of choice and workload

- Clear procedure and guidelines are necessary

Conflicts between different goals

Criterion demanded for good EPI	Choices to be made	DML 1	DML 2	DML 3	DML 4	DML 5	DML 6	DML 7	DML 8	DML 9	Develop PCR	at shop	full life cycle	Impacts per unit	Impacts per function	Quantitative results	Qualitative results	carbon footprint	ecological footprint	ecological scarcity 2006	ReCiPe	Food	Textiles	Electricity	Housing	Mobility	Environmental profile	Ecological currency	Ecological time
Goal and Scope →											**LCI**			**LCIA**								**Priorities**					**Communication**		
Allows a fair comparison of single products	.	.	+	+	+	+	.	-	-	-	+	-	+	-	+	+	-	.	.	+	+	-	-	+	.	+	+	.	.
Allows a good guidance for sustainable consumption	-	-	-	.	.	+	+	+	+	.	.	+	+	+	-	.	+	+	+	+	-	.	.	+	+	+	.	.	+
Includes all relevant aspects in the full life cycle	-	-	+	+	+	.	-	-	-	-	+	-	+	-	+	+	.	+	+	+	+	.	.	+	+	+	+	.	.
Low uncertainties of judgements	+	+	.	.	.	.	+	+	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	+	-	+	-	-	+
Inclusion of several environmental impacts	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	+	+	.	.	.	.	.	+	+	+
Approach is transparent for consumer	.	.	.	.	+	+	+	+	+	.	.	+	-	+	-	+	-	+	-	.	+	.	.	.	.	.	.	.	+
Low workload	-	-	-	-	-	-	.	+	+	+	+	+	.	+	.	-	+	+	+	-	-	-	-	+	-	+	-	+	+
Add up of impacts is possible (life cycle, household, national)	-	-	-	+	+	+	+	+	+	+	-	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	-	+	+
One approach is possible for all products	-	-	-	-	-	-	+	+	+	+	-	+	+	+	-	+	+	+	+	.	.	-	-	+	.	.	+	+	+
Worldwide accepted as a method	-	-	.	+	+	.	.	.	.	.	.	.	.	+	+	.	.	+	+	-	-	.	.	.	.	.	.	-	-
Information on traded products is valid	.	.	+	+	+	-	-	-	-	-	.	+	-	+	-	+	.	+	+	-	+	.	.	.	.	.	.	-	-
Communication is understandable	-	-	+	+	+	+	+	+	+	+	+	+	-	+	+	.	+	+	+	+	.	.	.	.	.	.	+	.	+
Value judgements are separated	.	.	.	.	.	.	.	.	.	.	+	+	.	+	-	+	.	-	-	+	-	.	.	.	.	.	+	-	+

Legend

Criterion can be fulfilled	+ (green)
Criterion difficult to be fulfilled	- (red)
Neutral concerning criterion or unsure	. (yellow)

➢ It is not possible to fulfil all criteria with one concept

Summary of Main Challenges

- Levels of decision making and main questions addressed

- System boundaries concerning distribution and use phase

- Not feasible to show the full life cycle and add-up the impacts with one type of information

- Product category rules and comparability

- Low workload vs. accuracy of results

- Comprehensive impact assessment method that gives the right direction for consumer decisions

- No international agreement on weighting of environmental goals

➢Methodological challenges go beyond the ones known for LCA
➢There is not one concept to answer all questions with one number

Summary of Recommendations

- Inform about environmental impacts cradle-to-basket based on LCA

- Additional EPI for products with a plug/tank for use phase based on specific PCR

- Simplify communication of ecological scarcity 2006 method by using eco-time

- Start with generic values assisting the higher level of decision making, e.g. meat vs. vegetables

- Refine the approach by differentiating within need fields → product groups → single products and developing PCR

- Use general guidelines for methodology and reviewing building on ecoinvent v2.0

Recommendations for next steps

- Establish an independent organisation for guiding and review

- Write down the general methodology as a handbook

- Agree on environmental targets and develop a communication concept

- Start with case studies and data already available for consumer products

- Develop PCR for energy using products (e.g. Umwelttettikette)

Recommendations for other options of politics

- Financial incentives: subsidies or tax reduction
- Regulations on advertisement
- Regulations on production processes
- Mandatory EPD instead of product labels
- Awareness rising with leaflets and brochures
- Generic web calculators for environmental impacts of products
- Wiki database for environmental impacts of consumer products

www.esu-services.ch
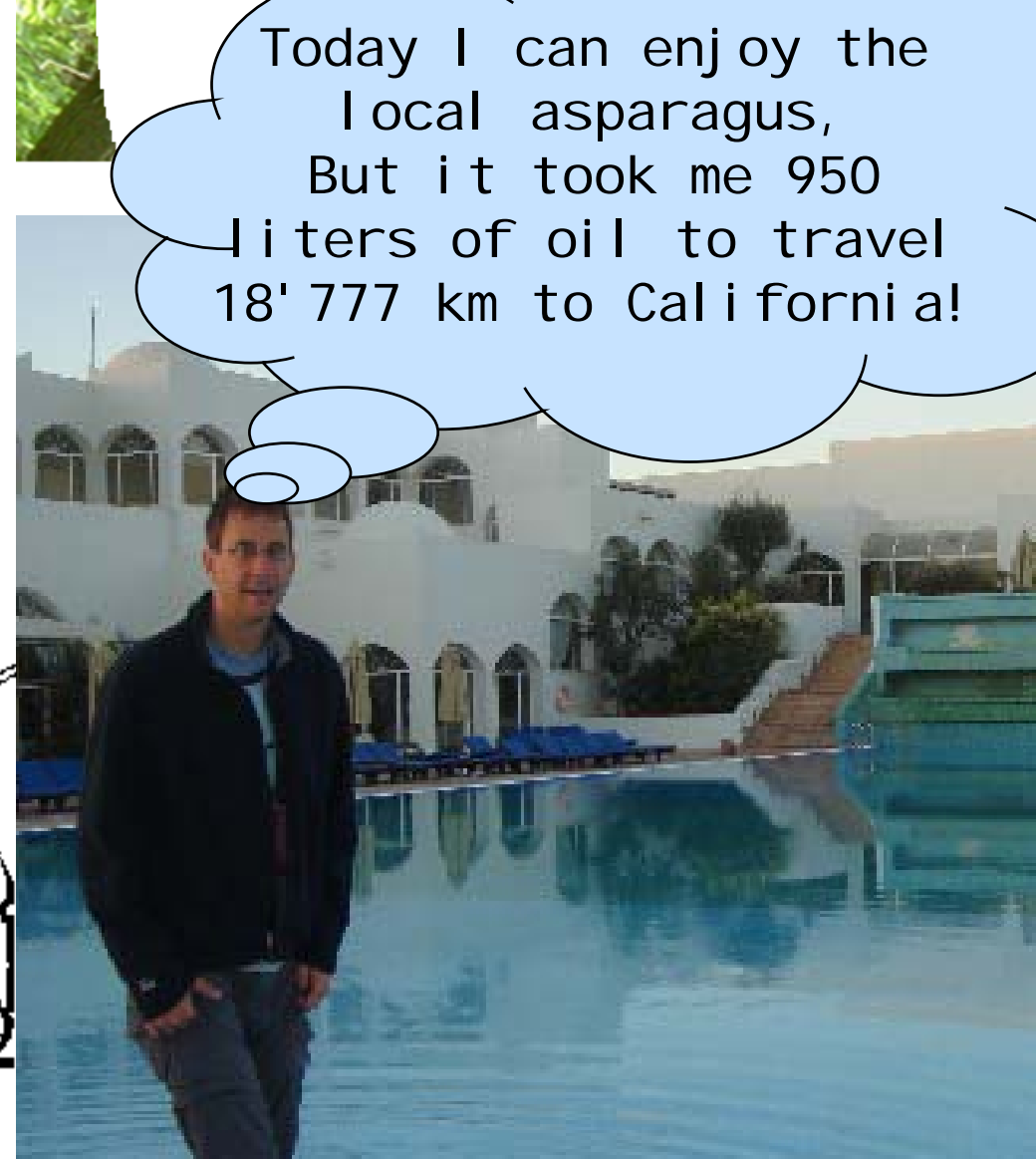
> Keep the relevance of decisions in mind and do not get lost in details!

Annexe

Ecological Scarcity 2006

Result **Weighting** **Characterisation** **Inventory**

Primary energy

Biodiversity

Climate change

Ozone depletion

Acidification

Cancer and hereditary e.

Estrogene potential

Effectiveness

Swiss ✚ environmental legal targets

eco points

Crude oil
Uranium
Wood
Land occupation
Fresh water

Carbon dioxide (CO_2)
HCFC
SO_2
NMVOC

I-129
N total
Endocrine disruptors

Heavy metals
Pesticides

Hazardous waste
Nuclear waste
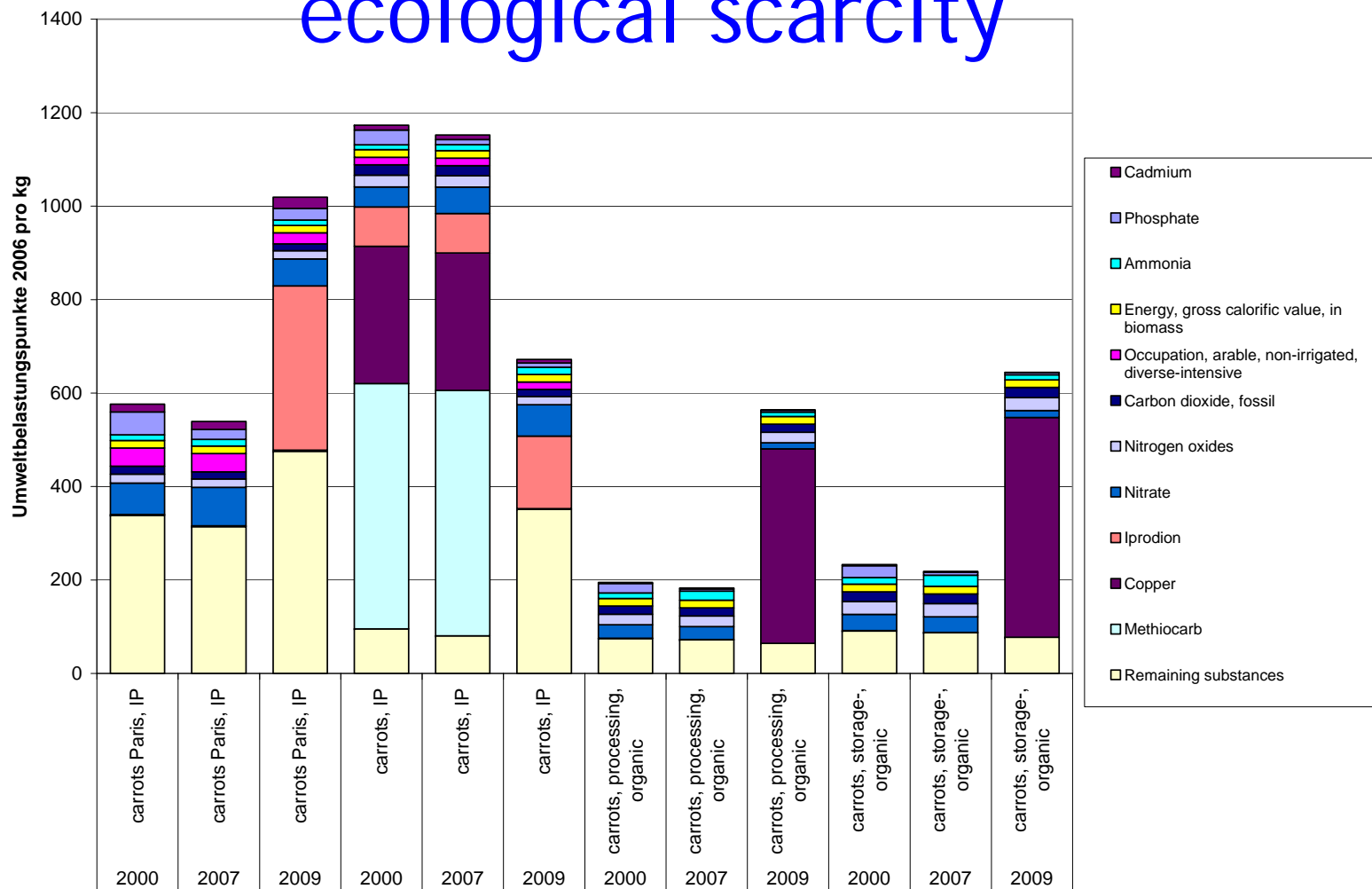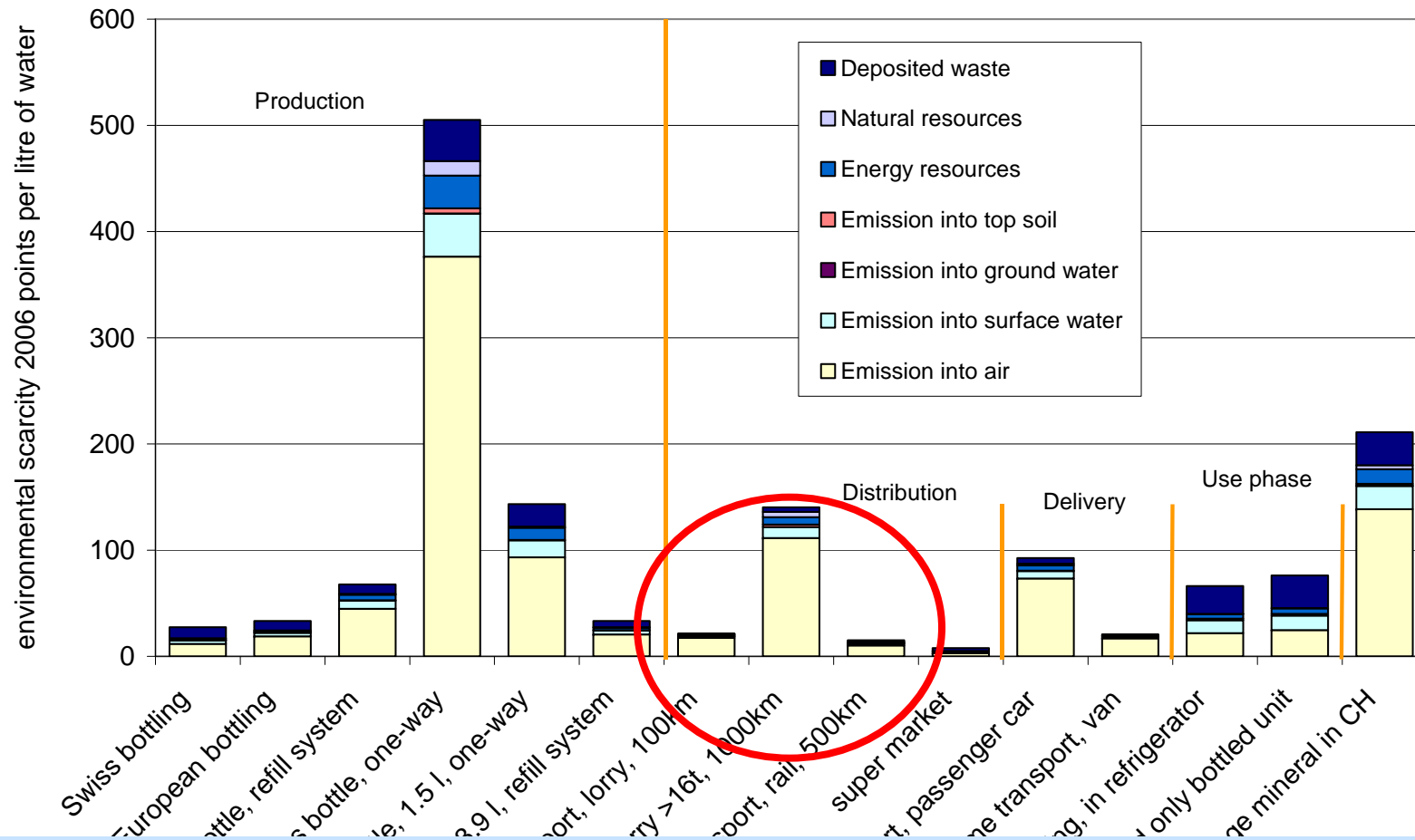
Carrots, variation of data and pollutants ecological scarcity

➢ Variability on pesticide use has major implications

Distribution of mineral water

> Impacts of distribution vary considerably by point of sale

> Not feasible to assist comparisons without considering difference

Conclusions on case studies

- Full life cycle thinking difficult to apply

- Different issues identified for LCIA methods

- Workload and functional unit depends on DML addressed

- No principle restriction concerning the products investigated

- Background data needed for consumer products

Different interests on communication

- Consumers want to get clear and simple recommendations

- LCA experts want to show all relevant aspects

- Producers want to be better than others

- Distributors want to strengthen their image

- Government wants to guide consumption

Research questions facilitating an EPI

- Investigate background data for consumer products (e.g. textiles, electronics)

- Provide statistical data e.g. on pesticide use

- Further develop Swiss ecological scarcity (e.g. land transformation, pesticides)

- Find international agreement on LCIA and weighting

- Investigate the acceptance and understanding of EPI by consumers