Environmental impacts of Swiss consumption and production: A combination of input-output-analysis with life cycle assessment

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45th LCA Discussion Symposium

Berne, 15. September 2011

Project Goals

- Develop a method for comprehensive analysis of environmental impacts in Switzerland (pilot project)
  - A production and consumption perspective
  - All relevant environmental issues
  - Combination of EE-IOA[1)] and LCA
- Set up a data base for analysis with reference year 2005
- Provision as SimaPro data for further analysis
- Identify most important areas of consumption and production

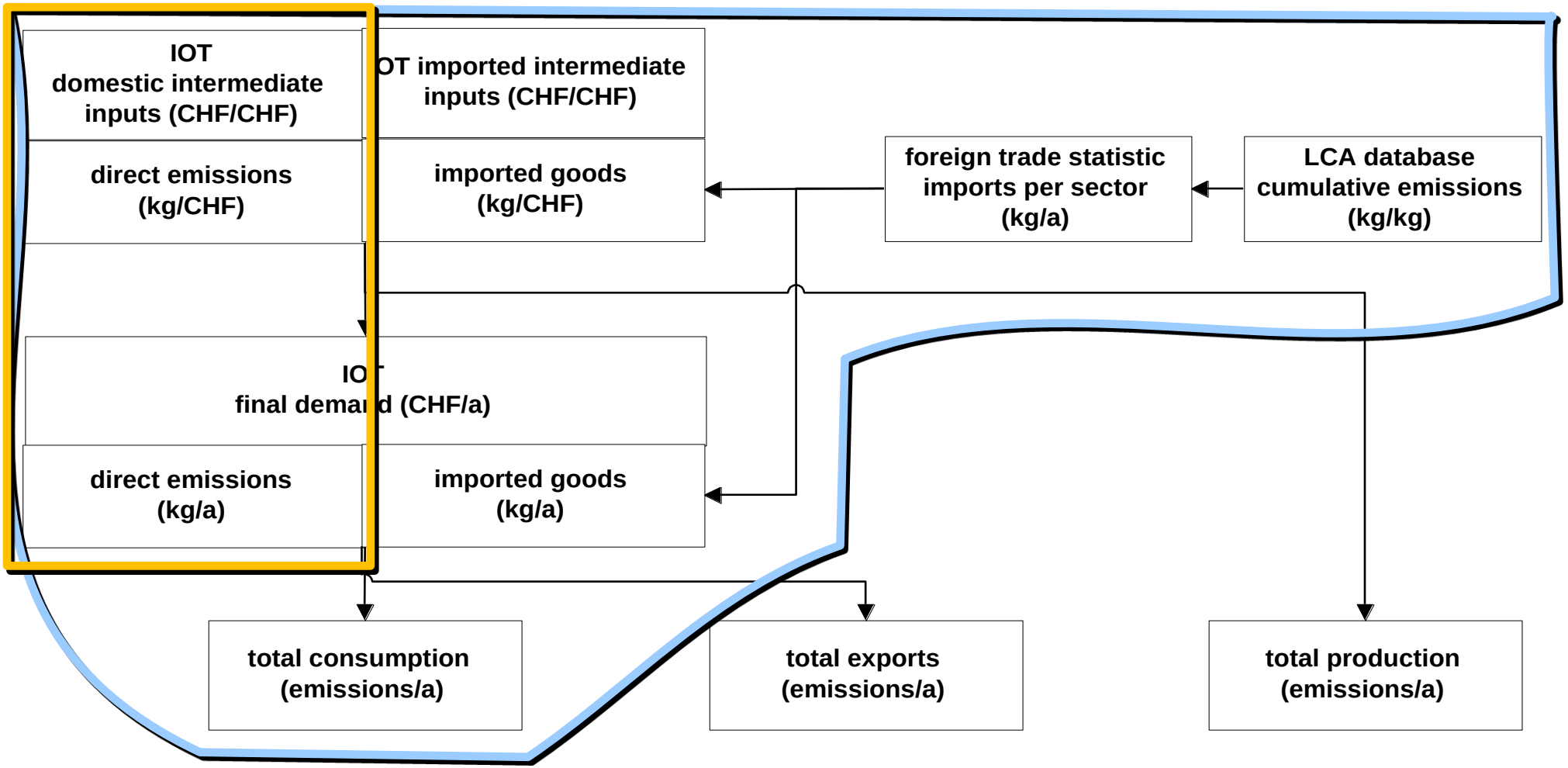
[1)] Environmentally Extended Input-Output Analysis

➢ Joint study by Rütter+Partner and ESU-services Ltd.

Outline of presentation

- **Data sources** for domestic and imported emissions and resource uses
- **Methodology** for linking LCA and economic data
- Impact assessment and results of analysis
- **Conclusions**
  - Key figures
  - Policy recommendations
  - Methodological issues
- **Outlook**

Combination of methods and data



- Several data sources are combined for the analysis

Life cycle impact assessment

Carbon Footprint, CED:

Ecological footprint: easy to understand, low

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

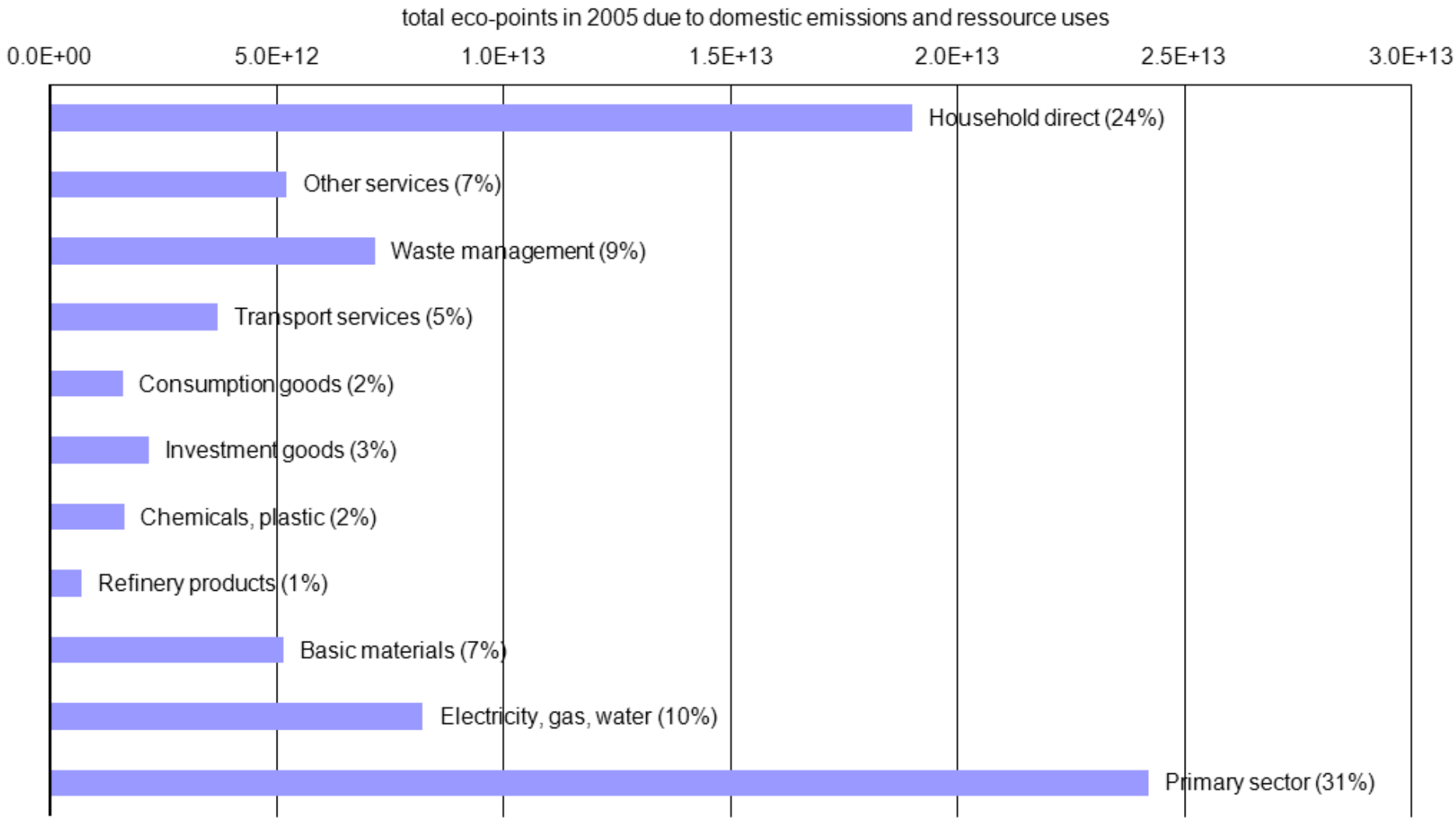
		One environmental issue		Several issues	
	LCIA method:	CED	Carbon footprint	Ecological footprint	Ecological scarcity 2006
	Impact category				
Resources	Energy,non-renew able	√	∅	∅	√
	Energy, renew able	∅	∅	∅	√
	Ore and minerals	∅	∅	∅	√
	Water	∅	∅	∅	√
	Biotic resources	∅	∅	∅	∅
	Land occupation	∅	∅	√	√
	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	∅	∅	∅	√
thers	Accidents	∅	∅	∅	∅
	Wastes	∅	∅	∅	√
	Littering	∅	∅	∅	∅

- It is necessary have one indicator that covers a range of environmental impacts
- Many stakeholders in Switzerland use the ecological scarcity method 2006

Data sources: Domestic Emissions

- Greenhouse gases and energy use according to BFE/BFS project for IOA (residence principle)
- All other emissions and resource uses according to current flows in the ecological scarcity method 2006 (territorial principle)
- Allocation to sectors and consumption based on information in basic data sources, GHG and energy allocation

Production perspective



- Primary sector most important for emissions in Switzerland

Data sources: Imports

- Foreign trade statistics in physical units (kg/a)
- ecoinvent data v2.2
- ESU data-on-demand (food and consumer goods)
- Matching physical units in trade statistics with monetary units of IOA (kg import goods per CHF import goods)

EcoSpold data: Imported Goods

Name	Location	InfrastructurePro	Unit	SITC-01, meat and meat preparations, import	SITC-01, meat and meat preparations, export	Unit	Faktor	meat and meat preparations	import	export
Location				CH	CH				103'102'216	9'521'410
InfrastructureProcess				0	0				103'102'216	9'521'410
Unit				kg	kg				103'102'216	9'521'410
transport, freight, rail	CH	0	tkm	0	8.36E-2	km	200	transport statistics	-	41.8%
transport, lorry >28t, fleet average	CH	0	tkm	0	1.14E-1	km	200	transport statistics	-	57.1%
transport, barge	RER	0	tkm	1.40E-1	8.15E-3	km	800	transport statistics	-	1.0%
transport, freight, rail	RER	0	tkm	8.25E-2	0	km	600	transport statistics	13.8%	-
transport, lorry >16t, fleet average	RER	0	tkm	4.09E-1	0	km	600	transport statistics	68.1%	-
transport, aircraft, freight	RER	0	tkm	3.46E-2	2.55E-3	km	5000	transport statistics	0.7%	0.1%
transport, transoceanic freight ship	OCE	0	tkm	1.74E+0	0	km	10000	transport statistics	17.4%	-
beef, IP, at slaughterhouse	CH	0	kg	9.31E-2	4.43E-4	011.00	1	Fleisch von Rindern, frisch, gekühlt oder gefroren	9'600'728	4'218
meat mixed, IP, at slaughterhouse	CH	0	kg	8.05E-1	8.64E-1	012.00	1	Fleisch (ohne solche Schlachtnebenerzeu	83'006'935	8'223'790
meat mixed, organic, at slaughterhouse	CH	0	kg	1.84E-2	1.24E-1	016.00	1	Fleisch und geniessb getrocknet oder gerä	1'897'149	1'178'393
meat mixed, IP, at slaughterhouse	CH	0	kg	8.34E-2	1.21E-2	017.00	1	Fleisch und geniessbare Schlachtnebenerzeugnisse, zubereitet oder haltbar gemacht, a.n.g.	8'597'404	115'009
storage, fresh meat, in cold store	RER	0	kg	8.98E-1	8.64E-1			storage of chilled me		
processing and distribution, meat, conserved	CH	0	kg	1.02E-1	1.36E-1			processing of meat		

average transport

average meat shares

storage & processing

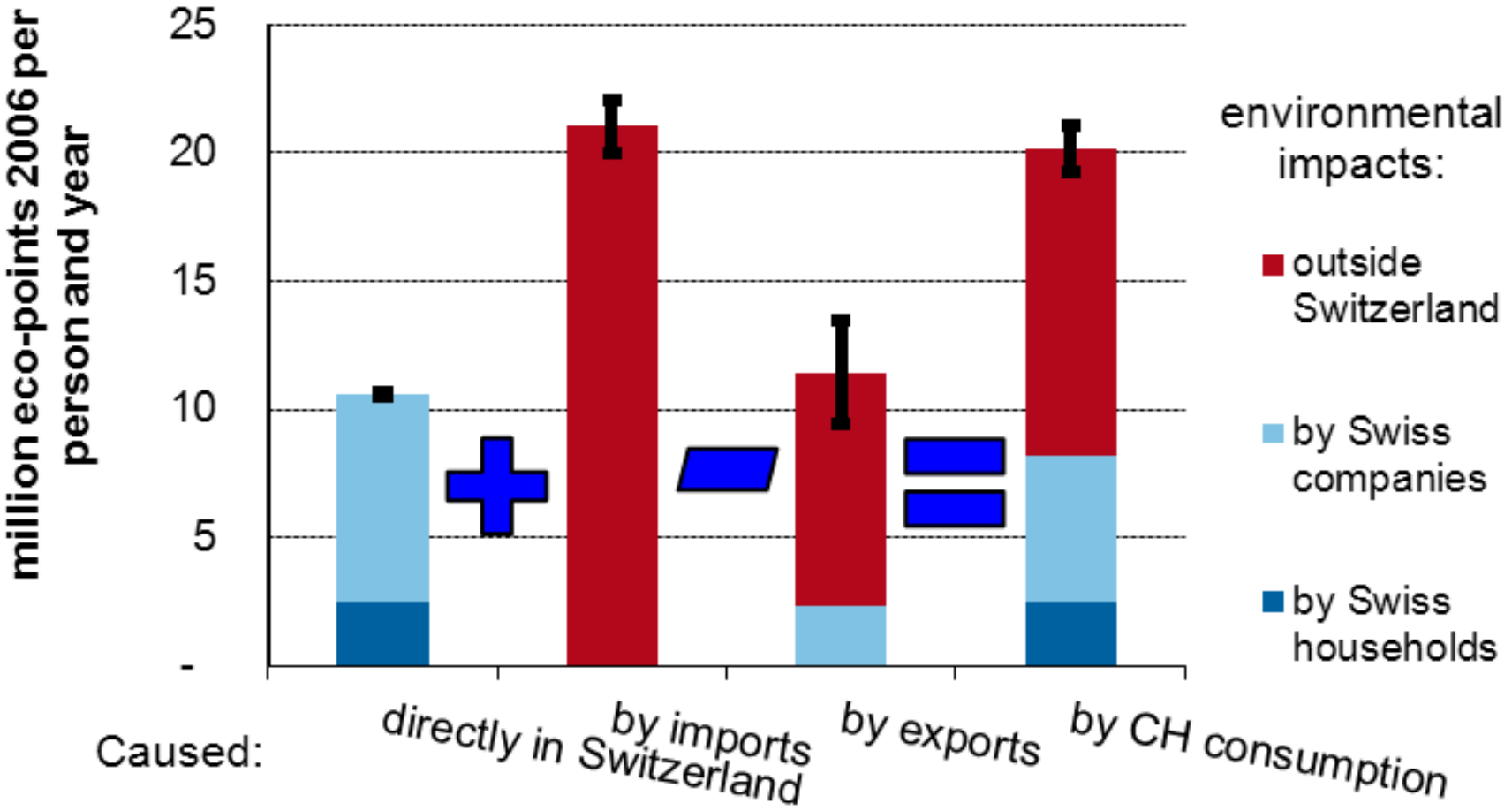
meat import (kg)

meat export (kg)

EcoSpold: Production Sector

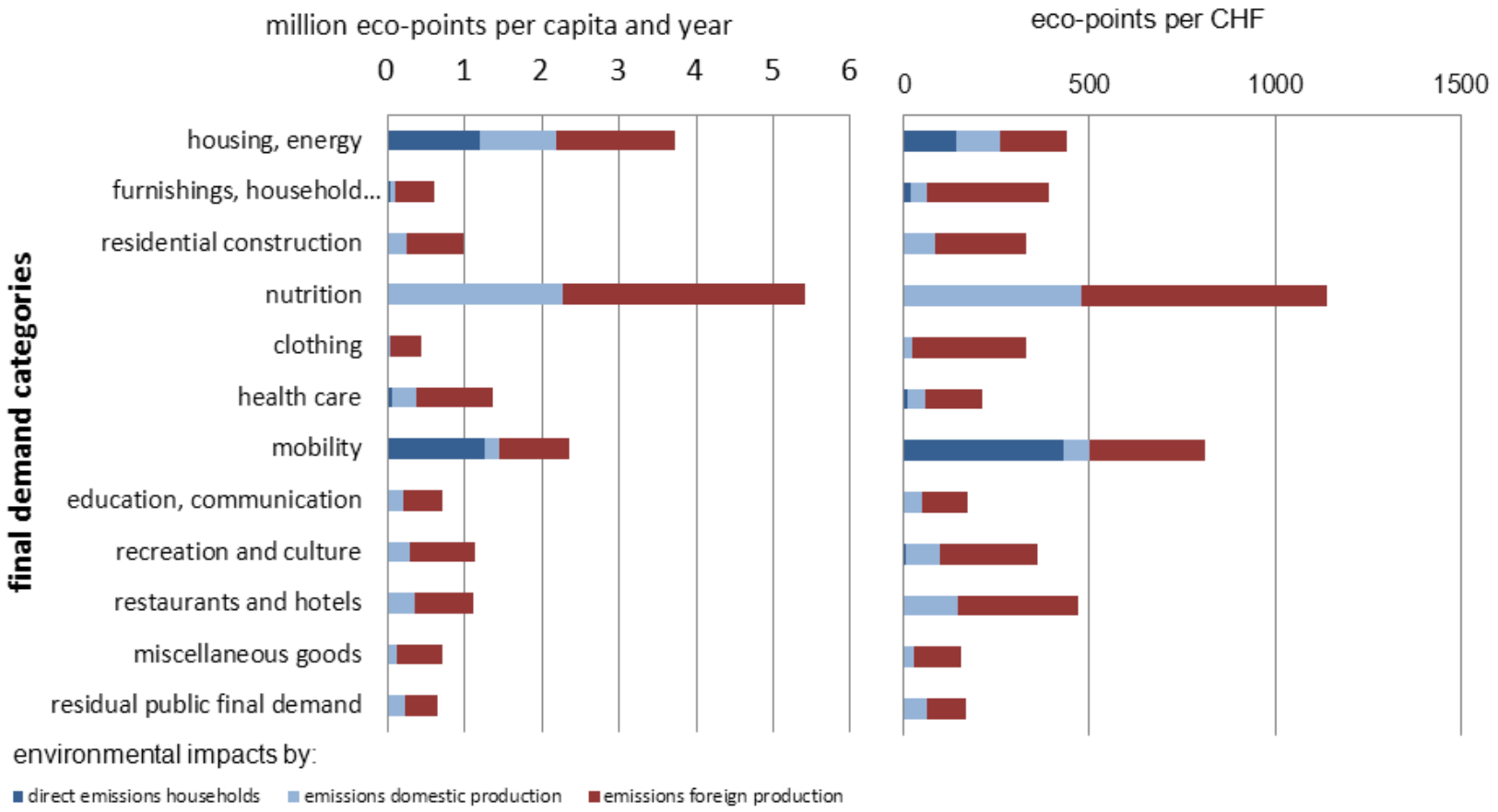
Name	Location	Infrastructure Process	Unit	G01b05, primary sector	UncertaintyType	StandardDeviation95%	GeneralComment
Location				CH			
InfrastructureProcess				0			
Unit				CHF2005			
G01b05, primary sector	CH	0	CHF2005	0.00E+00	1	1.11	(1,1,1,1,1,3); IOT original
G10b14, mining and quarrying	CH	0	CHF2005	4.72E-04	1	1.11	(1,1,1,1,1,3); IOT original
G15b16, food industry	CH	0	CHF2005	6.17E-02	1	1.11	(1,1,1,1,1,3); IOT original
G17, textile	CH	0	CHF2005	1.31E-04	1	1.11	(1,1,1,1,1,3); IOT original
G91b92, recreation, culture and sport	CH	0	CHF2005	1.66E-04	1	1.11	(1,1,1,1,1,3); IOT original
G93b95, private services	CH	0	CHF2005	5.74E-05	1	1.11	(1,1,1,1,1,3); IOT original
Carbon dioxide, in air	-	-	kg	5.45E-01	1	1.22	(4,2,1,1,1,3); BFS (2009); calculated with emissions from primary sector,
Carbon dioxide, fossil	-	-	kg	7.26E-02	1	1.07	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005), carbon monoxide and carbon dioxide in stratosphere subtracted
Carbon dioxide, biogenic	-	-	kg	1.60E-02	1	1.07	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Dinitrogen monoxide	-	-	kg	7.33E-04	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Methane, biogenic	-	-	kg	1.20E-02	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Sulfur hexafluoride	-	-	kg	1.15E-09	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Methane, tetrafluoro-, R-14	-	-	kg	2.51E-09	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	-	-	kg	1.69E-06	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Gravel, in ground	-	-	kg	0.00E+00	1	1.09	(2,1,1,1,1,3); BUWAL (2003c)
SITC-00, live animals other than animals of division 03, import	CH	-	kg	6.78E-05	1	1.55	(2,3,1,5,4,3); foreign trade statistic for import combined with IOT for imported goods and correction factor for residence principle
SITC-97, gold, non-monetary (excluding gold ores and concentrates), import	CH	-	kg	1.05E-09	1	1.55	(2,3,1,5,4,3); foreign trade statistic for import combined with IOT for imported goods and correction factor for residence principle
G50, motor vehicle trade	GLO	-	CHF2005	3.14E-05	1	1.55	(2,3,1,5,4,3); IOT for imported services
G85, health and social work	GLO	-	CHF2005	1.24E-04	1	1.55	(2,3,1,5,4,3); IOT for imported services

Results: Total balance



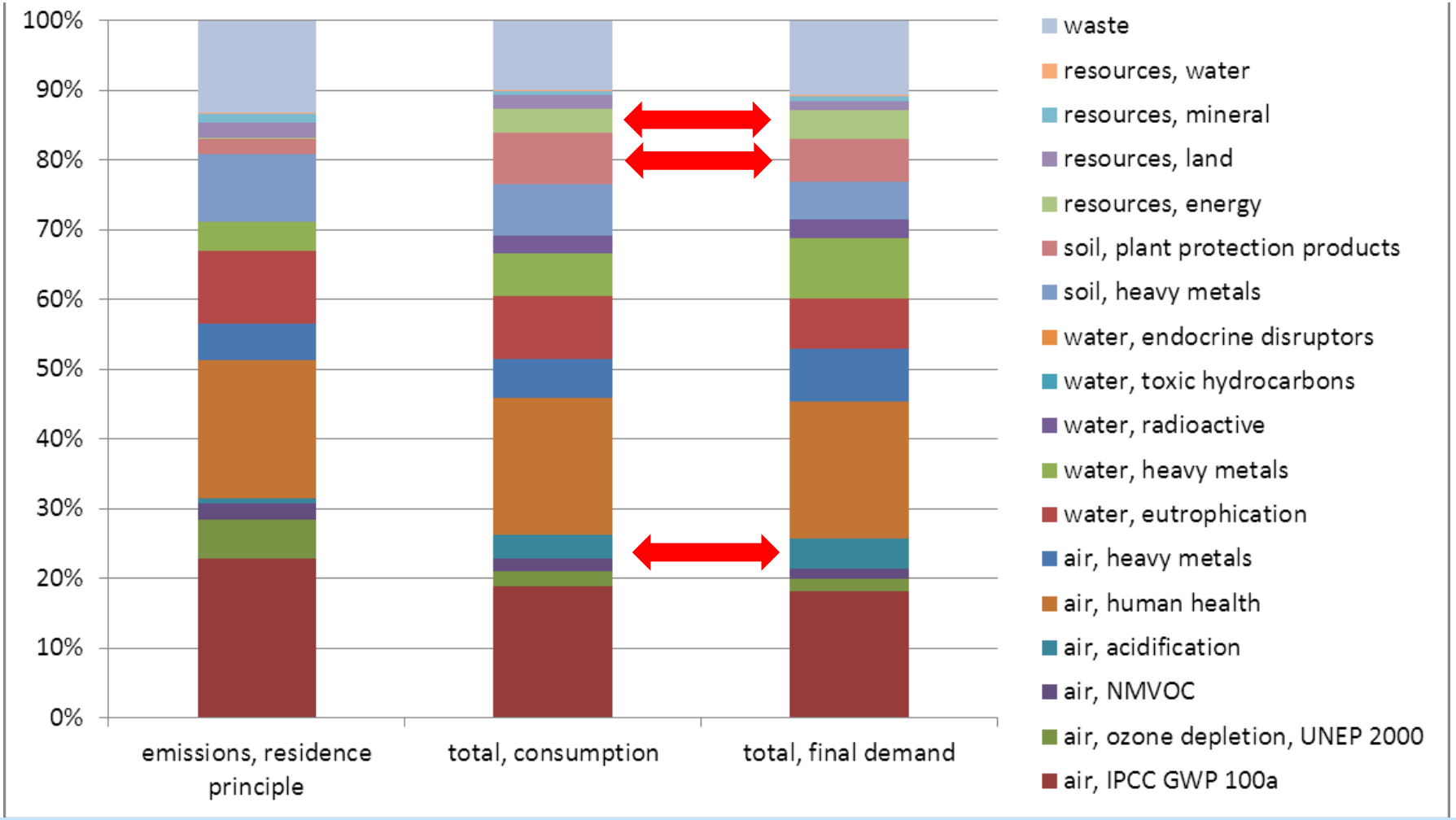
- Imports cause 60% of environmental impacts due to Swiss consumption

Consumption perspective



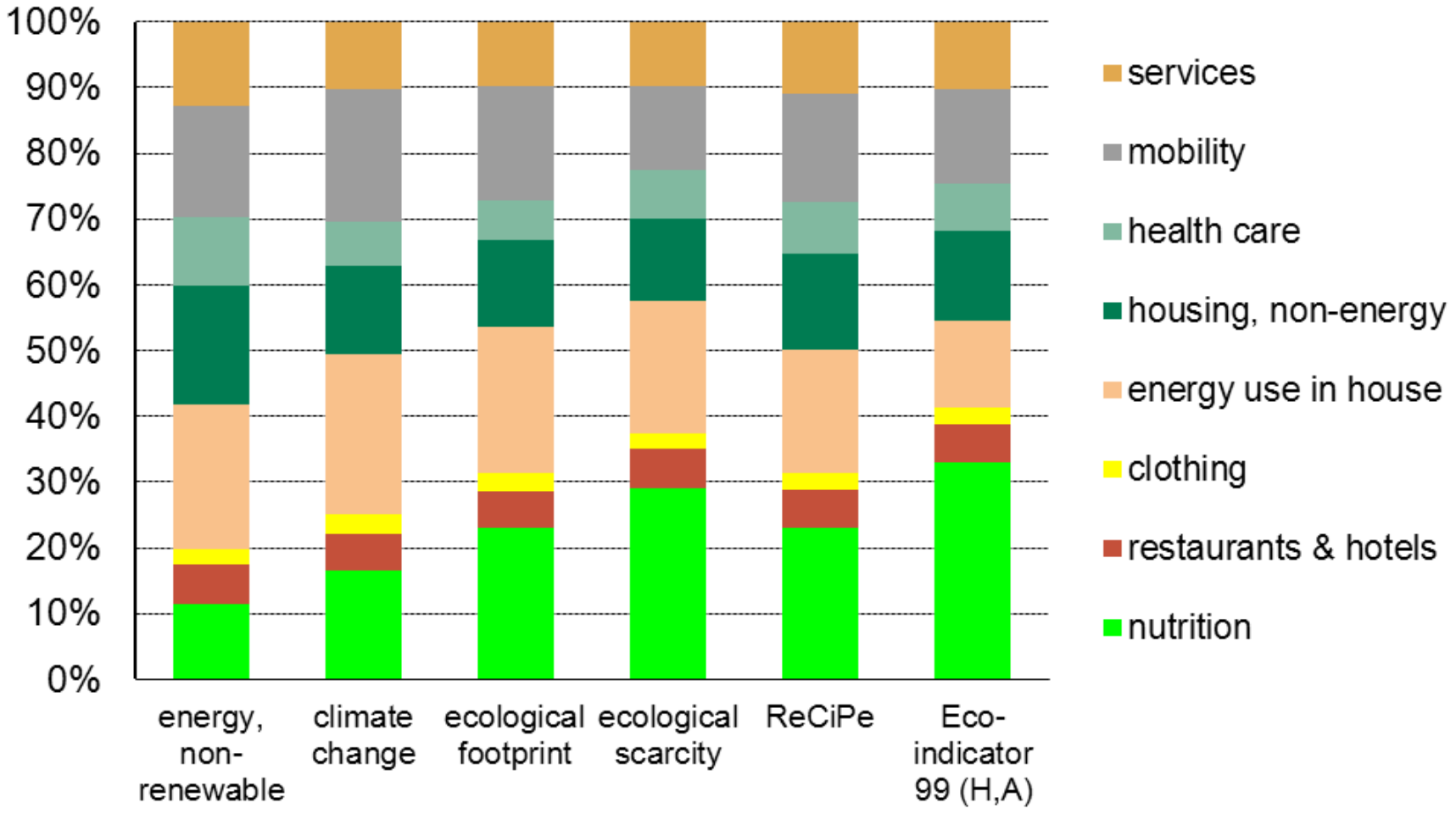
- Nutrition and mobility most intensive per money spent
- 40% of the environmental impacts due to nutrition occur abroad

Importance of emissions



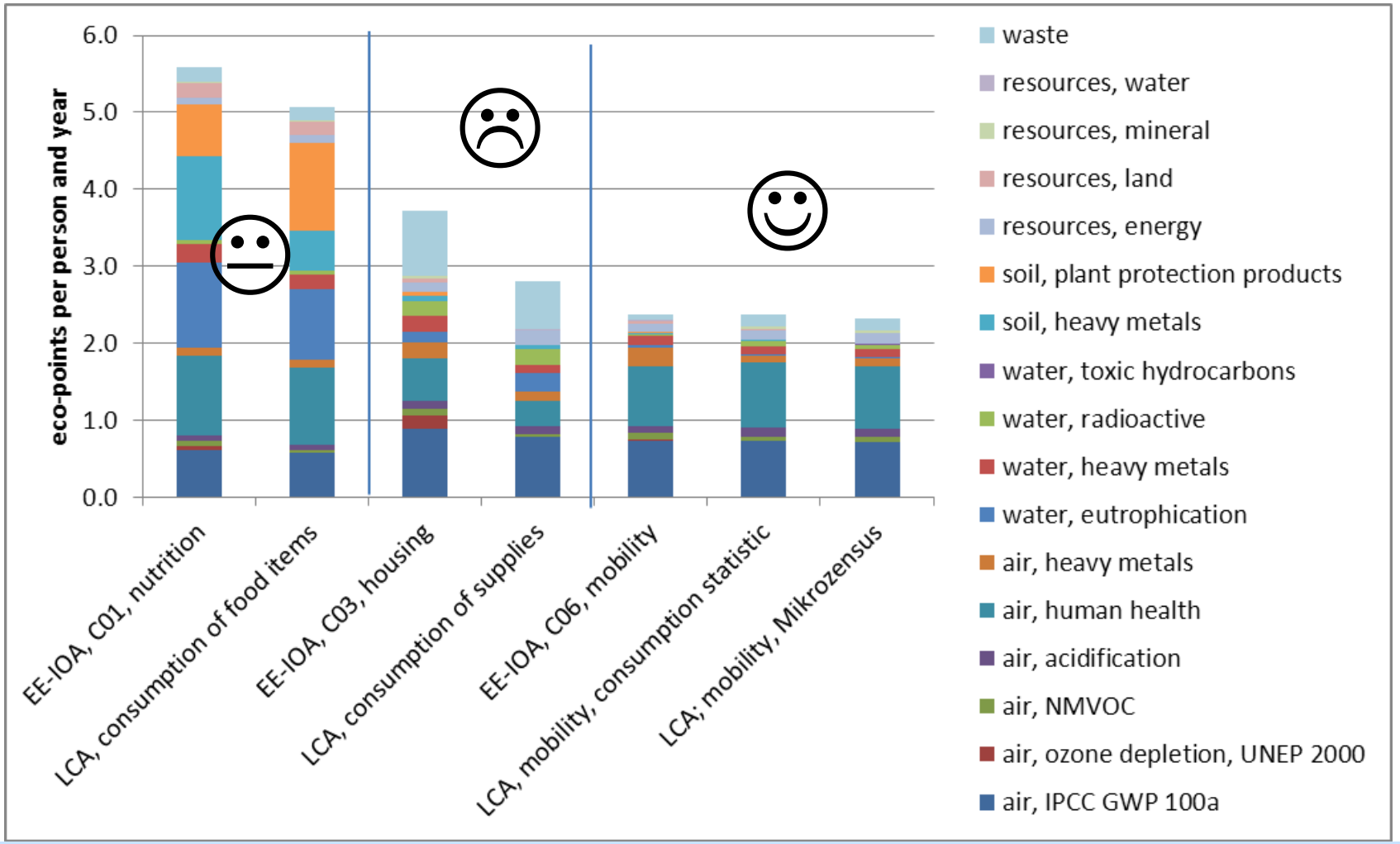
- Imports responsible for e.g energy, PPP, acidification

Different indicators on household consumption



- Energy and GHG indicators underestimate the contribution of nutrition

Verification by comparison with LCA data



- Helps to identify shortcomings and differences in LCA and EE-IOA

Uncertainties and data quality

- Estimated uncertainties in the range of 20-30% (similar to LCI)
- Final results calculated with about 50’000 datapoints provide stability even if single entries are wrong
- Several sources of uncertainty, e.g. combination of different methods, gaps in statistics and simplification
- The presented results have been cross checked with alternative approaches and other publications

➢ Main conclusions are considered to be reliable

Important Differences LCA versus IOT

	EE-IOA	LCA / LCI
Time horizon	One year of consumption and production	Integration of past, present and future emissions
Reference units	Monetary value of products, excluding taxes (Swiss Francs)	Physical flows e.g. kg, MJ, m3
System boundaries	In principle all inputs and outputs in one year are considered.	Cut-off criteria for flows, which are considered minor or which are difficult to investigate. E.g. business travel or research often not included.
Investment goods	Demand in the reference year and not for past provision or future use. Kept separately from production.	Investment goods are depreciated over life time to the production volume in this time.
Stocks of goods	Production of stocks of goods not sold in the particular time horizon is considered separately.	It is assumed that products produced by a company enter the market immediately.
Disposal services	Only included in the reference years. Not including disposal if stocks and infrastructure are built up.	Included. Future or past disposal assumed to be the same as today.
Allocation principle	Allocation by the value of single products. No subdivision going deeper than the sectors distinguished.	Different principles are applied. Joint production processes are subdivided to allocate impacts to single products.
Sectors and products covered	All economic sectors and thus all products are investigated.	Focus on products and services with high environmental relevance and/or large production volumes. Less knowledge on consumer products and services

Content related conclusions

- Environmental relevance of areas of consumption and categories of goods is shown

  → food purchases cause about 30% of the overall environmental impacts

- environmental intensity (ecopoints/CHF) of areas of consumption and categories of goods evaluated

  → food and waste management shows highest values

- Importance of imports: about 60% of the environmental impacts

Key figures per capita and year

- 12.8 Tonnes CO_2-eq
- 8300 Watt
- 20 Million eco-points

Methodological achievements

- The assessment considers the **whole life cycle** and is not restricted to domestic impacts
- This is necessary for Switzerland, because of the importance of **foreign trade**
- **All relevant environmental impacts** in contrast to simplified methods are weighted **transparently**
- The approach allows for an analysis of **production sectors** and **consumption activities**

Outlook

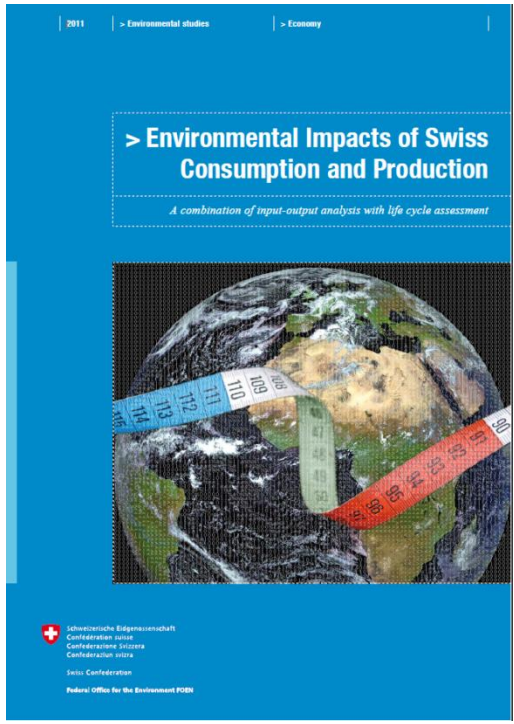
- Ten principal data sources and steps of analysis can be refined with different goals:
  - Better verification of the results in LCA and EE-IOA with alternative approaches
  - Improve the data for 2005 for known shortcomings
  - Update for some years (2005, 2008 and 2011) and follow up of environmental impacts
  - Calculate simplified time series (2nd approach)

Workshop in the afternoon
"The Swiss EE-IOA in SimaPro"

- Get an impression of the implementation in EcoSpold format
- Learn how to use the data in SimaPro
- Use evaluations with different LCIA methods
- Tree view for economic activities
- Use of new library in own Hybrid analysis (e.g. skiing)

Further Links

- Download of the study and electronic data
  - www.esu-services.ch/projects/ioa/
- ESU data-on-demand for imported goods
  - www.esu-services.ch/de/daten/datenverkauf/



Workshop:
Environmentally extended input-output-analysis in SimaPro

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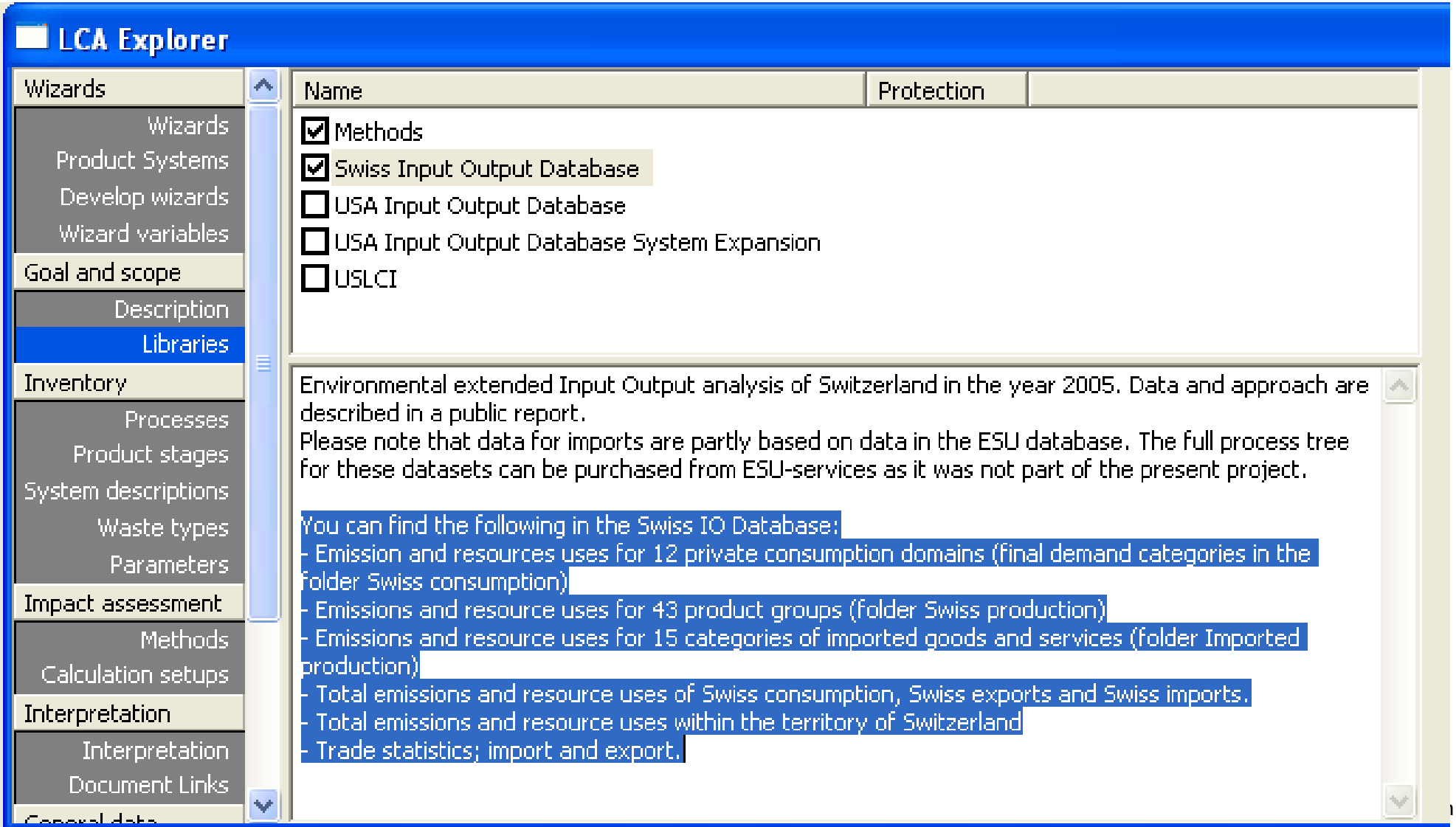
Outline

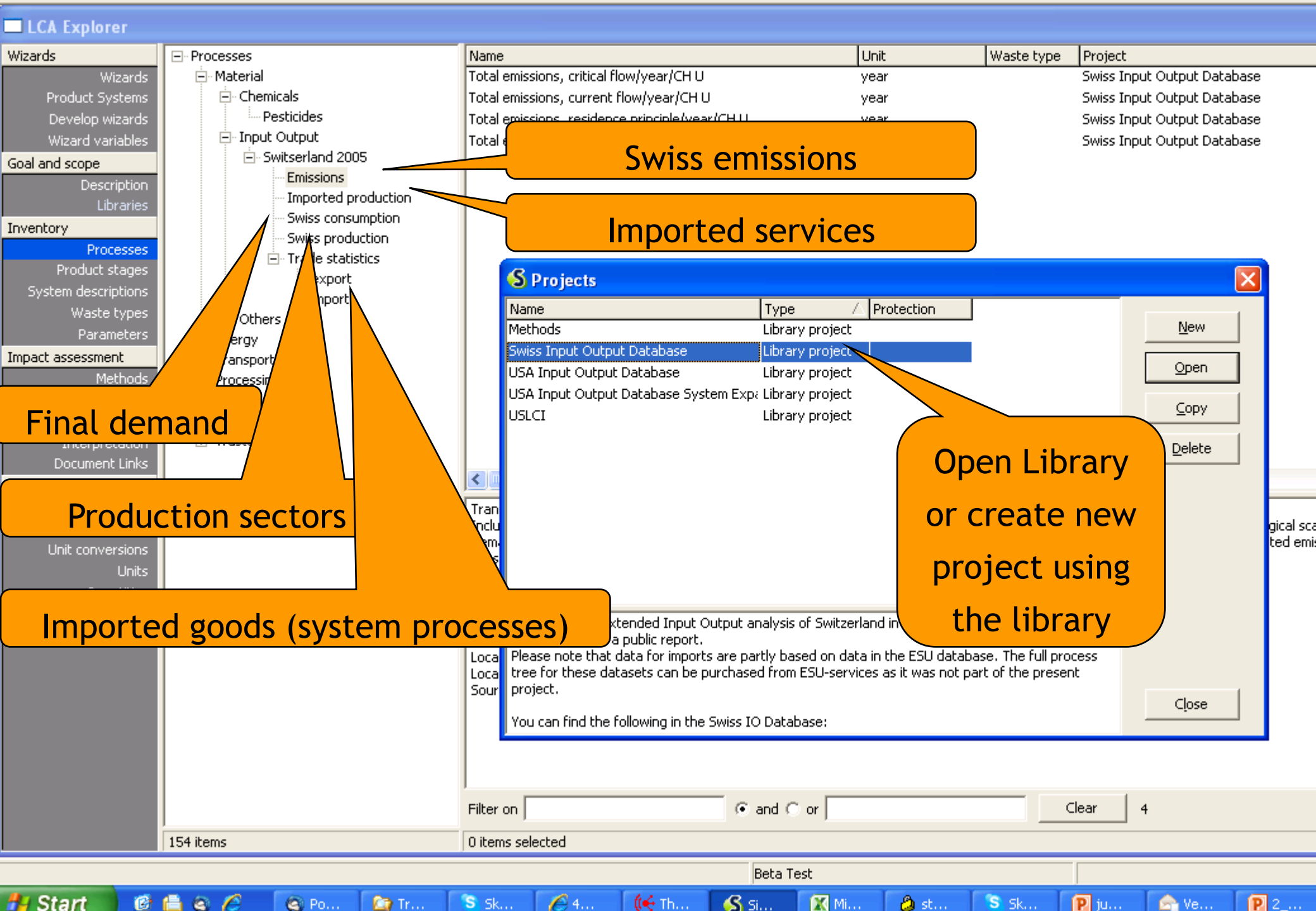
- Get an impression of the implementation in EcoSpold format
- Use evaluations with different LCIA methods
- Tree view for economic activities
- Use of new library in own Hybrid analysis (e.g. skiing)

How to get the data?

- Download on ESU website and import to SimaPro: www.esu-services.ch/de/daten/public-lci-reports/
- Wait for next SimaPro update in autumn which will provide a new library with the Swiss EE-IOA data
- Here I present the implementation as it will be provided with the update

Library (Swiss IO Database)




LCA Explorer
Wizards
Wizards
Product Systems
Develop wizards
Wizard variables
Goal and scope
Description
Libraries
Inventory
Processes
Product stages
System descriptions
Waste types
Parameters
Impact assessment
Methods
Document Links
Unit conversions
Units
Processes
Material
Chemicals
Pesticides
Input Output
Switserland 2005
Emissions
Imported production
Swiss consumption
Swiss production
Others
154 items
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year
Swiss Input Output Database
Total emissions, current flow/year/CH U
year
Swiss Input Output Database
Swiss emissions
Imported services
Projects
Name
Type
Protection
Methods
Library project
Swiss Input Output Database
Library project
USA Input Output Database
Library project
USA Input Output Database System Exp
Library project
USLCI
Library project
New
Open
Copy
Delete
Close
Please note that data for imports are partly based on data in the ESU database. The full process tree for these datasets can be purchased from ESU-services as it was not part of the present project.
You can find the following in the Swiss IO Database:
Filter on
and
or
Clear
0 items selected
Beta Test
Final demand
Production sectors
Imported goods (system processes)
Open Library or create new project using the library

EcoSpold data: Imported Goods

Name	Location	InfrastructurePro	Unit	SITC-01, meat and meat preparations, import	SITC-01, meat and meat preparations, export	Unit	Faktor	meat and meat preparations	import	export
Location				CH	CH				103'102'216	9'521'410
InfrastructureProcess				0	0				103'102'216	9'521'410
Unit				kg	kg				103'102'216	9'521'410
transport, freight, rail	CH	0	tkm	0	8.36E-2	km	200	transport statistics	-	41.8%
transport, lorry >28t, fleet average	CH	0	tkm	0	1.14E-1	km	200	transport statistics	-	57.1%
transport, barge	RER	0	tkm	1.40E-1	8.15E-3	km	800	transport statistics	-	1.0%
transport, freight, rail	RER	0	tkm	8.25E-2	0	km	600	transport statistics	13.8%	-
transport, lorry >16t, fleet average	RER	0	tkm	4.09E-1	0	km	600	transport statistics	68.1%	-
transport, aircraft, freight	RER	0	tkm	3.46E-2	2.55E-3	km	5000	transport statistics	0.7%	0.1%
transport, transoceanic freight ship	OCE	0	tkm	1.74E+0	0	km	10000	transport statistics	17.4%	-
beef, IP, at slaughterhouse	CH	0	kg	9.31E-2	4.43E-4	011.00	1	Fleisch von Rindern, frisch, gekühlt oder gefroren	9'600'728	4'218
meat mixed, IP, at slaughterhouse	CH	0	kg	8.05E-1	8.64E-1	012.00	1	Fleisch (ohne solches von Rindern) und geniessbare Schlachtnebenerzeugnisse, frisch, gekühlt oder gefroren, für die menschliche	83'006'935	8'223'790
meat mixed, organic, at slaughterhouse	CH	0	kg	1.84E-2	1.24E-1	016.00	1	Fleisch und geniessbare Schlachtnebenerzeugnisse, gesalzen, in Salzlake, getrocknet oder geräuchert; geniessbares Mehl von Fleisch oder von	1'897'149	1'178'393
meat mixed, IP, at slaughterhouse	CH	0	kg	8.34E-2	1.21E-2	017.00	1	Fleisch und geniessbare Schlachtnebenerzeugnisse, zubereitet oder haltbar gemacht, a.n.g.	8'597'404	115'009
storage, fresh meat, in cold store	RER	0	kg	8.98E-1	8.64E-1			storage of chilled meat		
processing and distribution, meat, conserved	CH	0	kg	1.02E-1	1.36E-1			processing of meat		

- Details available as XML for download on ESU webpage
- In SimaPro you will find a system process because of proprietary background data

EcoSpold: Production Sector

Name	Location	InfrastructureProcess	Unit	G01b05, primary sector	UncertaintyType	StandardDeviation95%	GeneralComment
Location				CH			
InfrastructureProcess				0			
Unit				CHF2005			
G01b05, primary sector	CH	0	CHF2005	0.00E+00	1	1.11	(1,1,1,1,1,3); IOT original
G10b14, mining and quarrying	CH	0	CHF2005	4.72E-04	1	1.11	(1,1,1,1,1,3); IOT original
G15b16, food industry	CH	0	CHF2005	6.17E-02	1	1.11	(1,1,1,1,1,3); IOT original
G17, textile	CH	0	CHF2005	1.31E-04	1	1.11	(1,1,1,1,1,3); IOT original
G91b92, recreation, culture and sport	CH	0	CHF2005	1.66E-04	1	1.11	(1,1,1,1,1,3); IOT original
G93b95, private services	CH	0	CHF2005	5.74E-05	1	1.11	(1,1,1,1,1,3); IOT original
Carbon dioxide, in air	-	-	kg	5.45E-01	1	1.22	(4,2,1,1,1,3); BFS (2009); calculated with emissions from primary sector,
Carbon dioxide, fossil	-	-	kg	7.26E-02	1	1.07	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005), carbon monoxide and carbon dioxide in stratosphere subtracted
Carbon dioxide, biogenic	-	-	kg	1.60E-02	1	1.07	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Dinitrogen monoxide	-	-	kg	7.33E-04	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Methane, biogenic	-	-	kg	1.20E-02	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Sulfur hexafluoride	-	-	kg	1.15E-09	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Methane, tetrafluoro-, R-14	-	-	kg	2.51E-09	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	-	-	kg	1.69E-06	1	1.50	(1,1,1,1,1,3); BFS (2009) (NAMEA-air for 2005)
Gravel, in ground	-	-	kg	0.00E+00	1	1.09	(2,1,1,1,1,3); BUWAL (2003c)
SITC-00, live animals other than animals of division 03, import	CH	-	kg	6.78E-05	1	1.55	(2,3,1,5,4,3); foreign trade statistic for import combined with IOT for imported goods and correction factor for residence principle
SITC-97, gold, non-monetary (excluding gold ores and concentrates), import	CH	-	kg	1.05E-09	1	1.55	(2,3,1,5,4,3); foreign trade statistic for import combined with IOT for imported goods and correction factor for residence principle
G50, motor vehicle trade	GLO	-	CHF2005	3.14E-05	1	1.55	(2,3,1,5,4,3); IOT for imported services
G85, health and social work	GLO	-	CHF2005	1.24E-04	1	1.55	(2,3,1,5,4,3); IOT for imported services

- Several 100 inputs and outputs per CHF of output
- CHF output calculated without taxes (e.g. VAT, mineral oil tax, etc)

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File Edit Calculate Tools Window Help

Documentation | Input/output | Parameters | System description

Production sector

Name	Amount	Unit	Quantity	Allocation %	Waste type	Category	Comment
G01b05, primary sector/CHF2005/CH U	1	CHF2005	Currency	100 %		Input Out...\Swiss production	SWITZERLAND
(Insert line here)							

Output 1 CHF

	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Comment
Inputs							

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Comment
Carbon dioxide, in air	in air	0.54535	kg	Lognormal	1.2165			(4,2,1,1,1,3); BFS (2009); calculated emissions from primary sector,
Energy, gross calorific value, in biomass	biotic	3.0682	MJ	Lognormal	1.0882			(2,1,1,1,1,3); BFS (2009), BFE (2004) allocation to primary sector
Energy, solar, converted	in air	0.023183	MJ	Lognormal	1.0882			(2,1,1,1,1,3); BFS (2009)
Energy, geothermal, converted	in ground	031741	MJ	Lognormal	1.0882			(2,1,1,1,1,3); BFE (2004)
Occupation, traffic area, road network	land		m2a	Lognormal	1.5088			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001); investments in building sec
Occupation, industrial area, built up	land							(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, industrial area, vegetation	land	0.0005371	m2a	Lognormal	1.5088			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, arable	land	0.24813	m2a	Lognormal	1.1249			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, permanent crop, vine	land	0.013768	m2a	Lognormal	1.1249			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, permanent crop, fruit	land	0.040593	m2a	Lognormal	1.1249			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, pasture and meadow	land	1.0576	m2a	Lognormal	1.1249			(2,1,1,1,1,3); area statistics for 1992 (BfS 2001)
Occupation, forest	land	0.9143						,1,1,1,3); FAO (2010), Weber & ld (2007) and BWG (2003); incl. ing water of thermal power plants
Occupation, shrub land, sclerophyllous	land	0.21976	m2a		1.5088			(2,1,1,1,1,3); Rubli et al. (2005), only mining and quarrying sector
Water, unspecified natural origin/m3	in water	0.034378		Lognormal	1.0882			(2,1,1,1,1,3); BUWAL (2003c)
(Insert line here)								

Residential emissions

Intermediate suplies

Known inputs from technosphere (materials/fuels)

Name	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Comment
Facture, mining and quarrying/CHF2005/CH U	0.00047178	CHF2005	Lognormal	1.113			(4,1,1,1,1,3)

Documentation | Input/output | Parameters | System description

SITC-84, articles of apparel and clothing accessories, import/kg/CH S	2.2598E-5	kg	Lognormal	1.5458			(2,
SITC-85, footwear, import/kg/CH S	3.0337E-6	kg	Lognormal	1.5458			(2,
SITC-87, professional, scientific and controlling instruments and apparatus, n.e.s., import/kg	1.46E-5	kg	Lognormal	1.5458			(2,
SITC-88, photographic apparatus, equipment and supplies and optical goods; watches and c	1.9745E-5		Lognormal	1.5458			(2,
SITC-89, miscellaneous manufactured articles, n.e.s., import/kg/CH S	0.00021764						(2,
SITC-93, specific trade incidents, import/kg/CH S	1.2565E-5	kg	Lognormal	1.5458			(2,
SITC-97, gold, non-monetary (excluding gold ores and concentrates), import/kg/CH S	1.0508E-9						(2,
G50, motor vehicle trade/CHF2005/GLO S	3.1352E-5		Lognormal	1.5458			(2,
G51b52, wholesale and retail trade/CHF2005/GLO S	0.0015991	CHF2005	Lognormal	1.5458			(2,
G55, hotels and restaurants/CHF2005/GLO S	0.000344	CHF2005	Lognormal	1.5458			(2,
G60b62, transport/CHF2005/GLO S	0.0019565	CHF2005	Lognormal	1.5458			(2,
G63, auxiliary transport/CHF2005/GLO S	0.00015591	CHF2005	Lognormal	1.5458			(2,
G64, post and telecommunications/CHF2005/GLO S	0.00029666	CHF2005	Lognormal	1.5458			(2,
G65, financial intermediation/CHF2005/GLO S	0.0014113	CHF2005	Lognormal	1.5458			(2,
G66, insurance and pension funding/CHF2005/GLO S	0.0029504	CHF2005	Lognormal	1.5458			(2,
G71u74, other business activities/CHF2005/GLO S	0.00017329	CHF2005	Lognormal	1.5458			(2,
G72, informatics/CHF2005/GLO S	2.6313E-5	CHF2005	Lognormal	1.5458			(2,
G73, research and development/CHF2005/GLO S	9.7506E-5	CHF2005	Lognormal	1.5458			(2,
[illegible]	1.3409E-5	CHF2005	Lognormal	1.5458			(2,

Imported goods

Imported services

Documentation | Input/output | Parameters | System description

Known outputs to technosphere. Products and co-products

Name	Amount	Unit	Quantity	Allocation %	Waste type	Category	Comme
Private consumption, C06, mobility/year/CH U	1	year	Time	100 %		Input O...\Swiss consumption	SWITZ
(Insert line here)							

Final demand

ount	Unit	Distribution	or 2*SD	Min	Max	Comment
Inputs						

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD			
Occupation, traffic area, road network	land	6.9257E8	m2a	Lognormal	1.5088			(2,1,1,1,1,3); area statistics (BfS 2001); investments in b
(Insert line here)								

Known inputs from technosphere (materials/fuels)

Name	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Co
G23, refineries/CHF2005/CH U	7.3922E8	CHF2005	Lognormal	1.113			(1,
G24, chemical industry/CHF2005/CH U	1.4254E6	05	Lognormal	1.113			(1,
G25, plastics and rubber/CHF2005/CH U	4.1794E7	CH	Lognormal	1.113			(1,
G30b31, office and electrical machinery/CHF2005/CH U	3.7834E7	CHF20	gnormal	1.113			(1,
G34, motor vehicles/CHF2005/CH U	4.1016E7	CHF2005	al	1.113			(1,
G35, other transport equipment/CHF2005/CH U	1.4307E8	CHF2005		1.113			(1,
G50, motor vehicle trade/CHF2005/CH U	3.7195E9	CHF2005	Log	13			(1,
G51b52, wholesale and retail trade/CHF2005/CH U	1.6189E9	CHF2005	Lognor				(1
G60b62, transport/CHF2005/CH U	4.1323E9	CHF2005					
G63, auxiliary transport/CHF2005/CH U	3.1039E8	CHF2005					
G70, real estate/CHF2005/CH U	1.7988E8	CHF2005	Lognormal	1.113			(1,
G71u74, other business activities/CHF2005/CH U	1.0452E9	CHF2005	Lognormal	1.113			(1,
G75, public administration/CHF2005/CH U	2.8158E8	CHF2005	Lognormal	1.113			(1,
G80, education/CHF2005/CH U	3.6342E8	CHF2005	Lognormal	1.113			(1,
SI	1.154E5						(2, imp goo prir
SITC-24, cork and wood, import/kg/CH S	5734	kg	Lognormal	1.5458			(2, imp goo prir
ther than combed wool) and their wastes, import/kg/CH S	8244.4	kg	Lognormal	1.5458			(2

Impacts per year in CH

Domestic ressource use

Supplies by CH companies

Imported goods

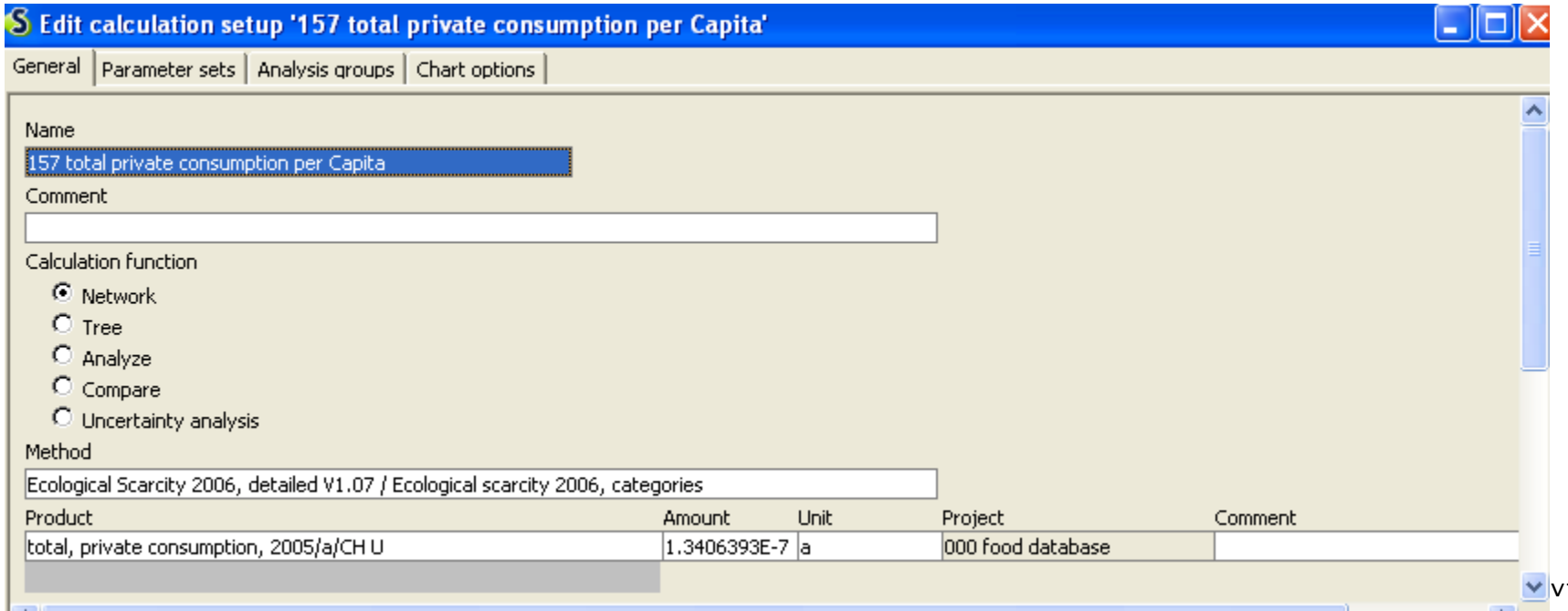
Sie sind derzeit offline.

Beta Test

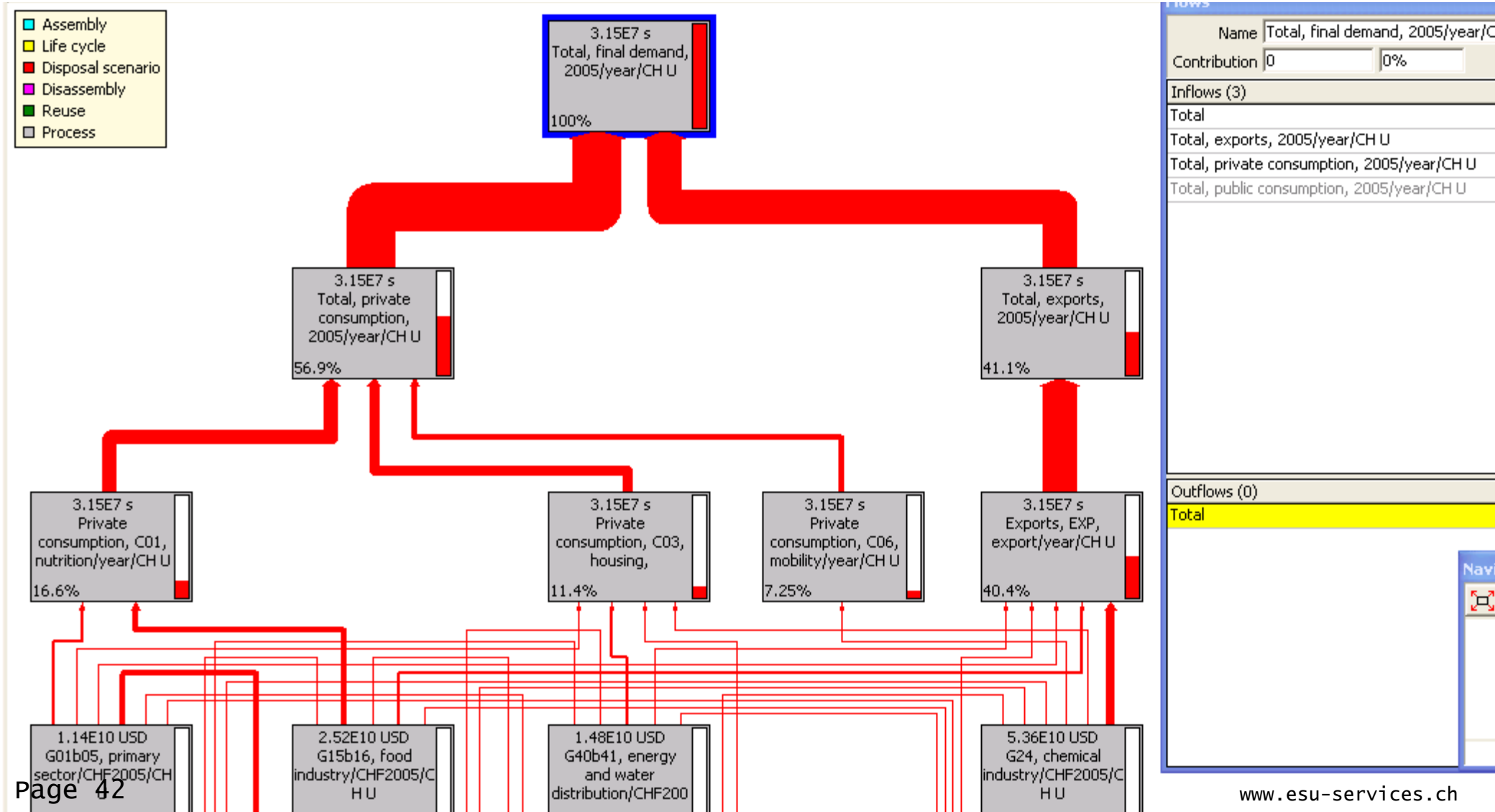
Questions about the structure?

Final demand

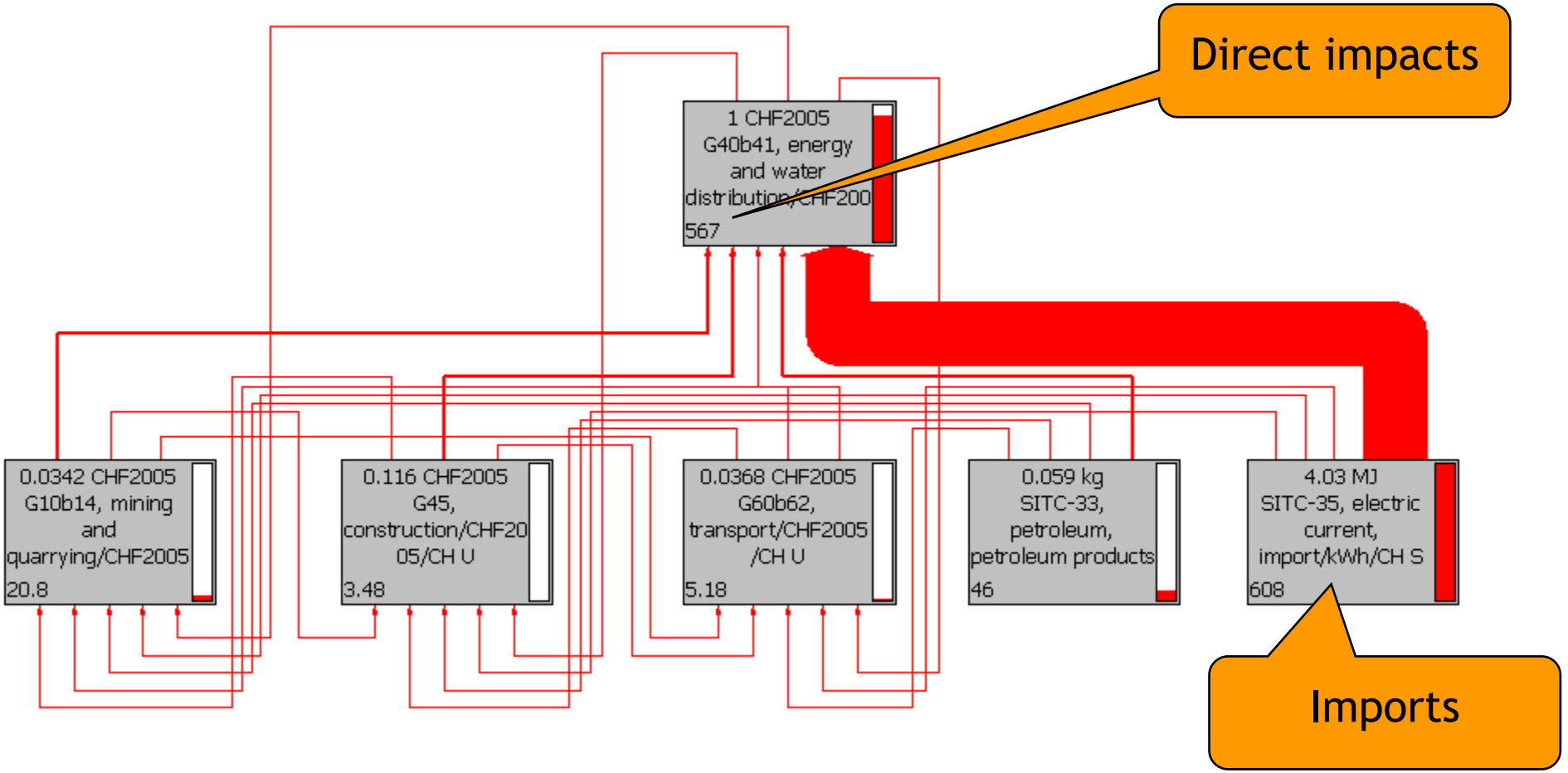
- Divide annual output by number of inhabitants in Switzerland
- 1.340639E-7 years per capita



Result Final Demand

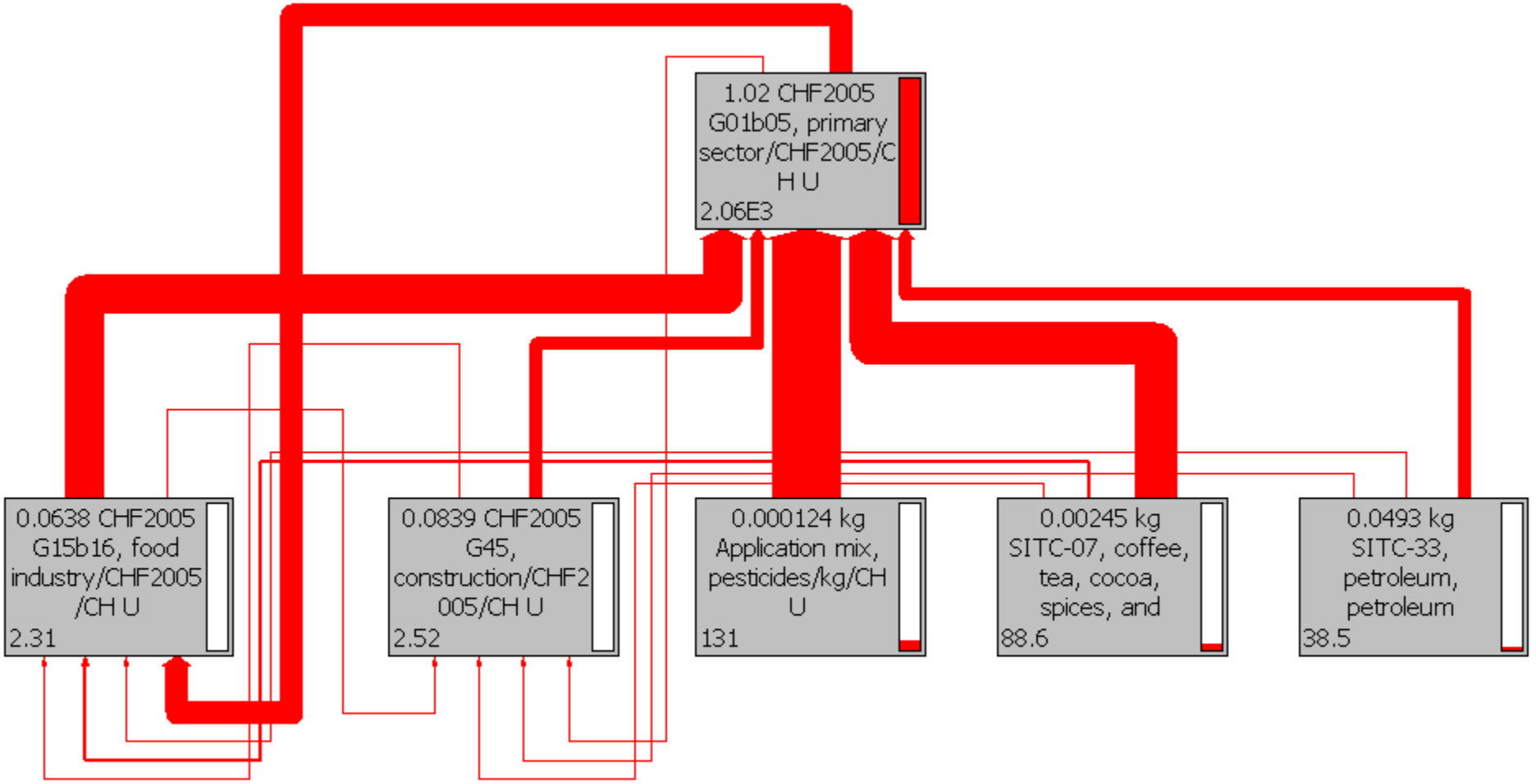


Results energy production sector



- See importance of importing sectors and direct emissions

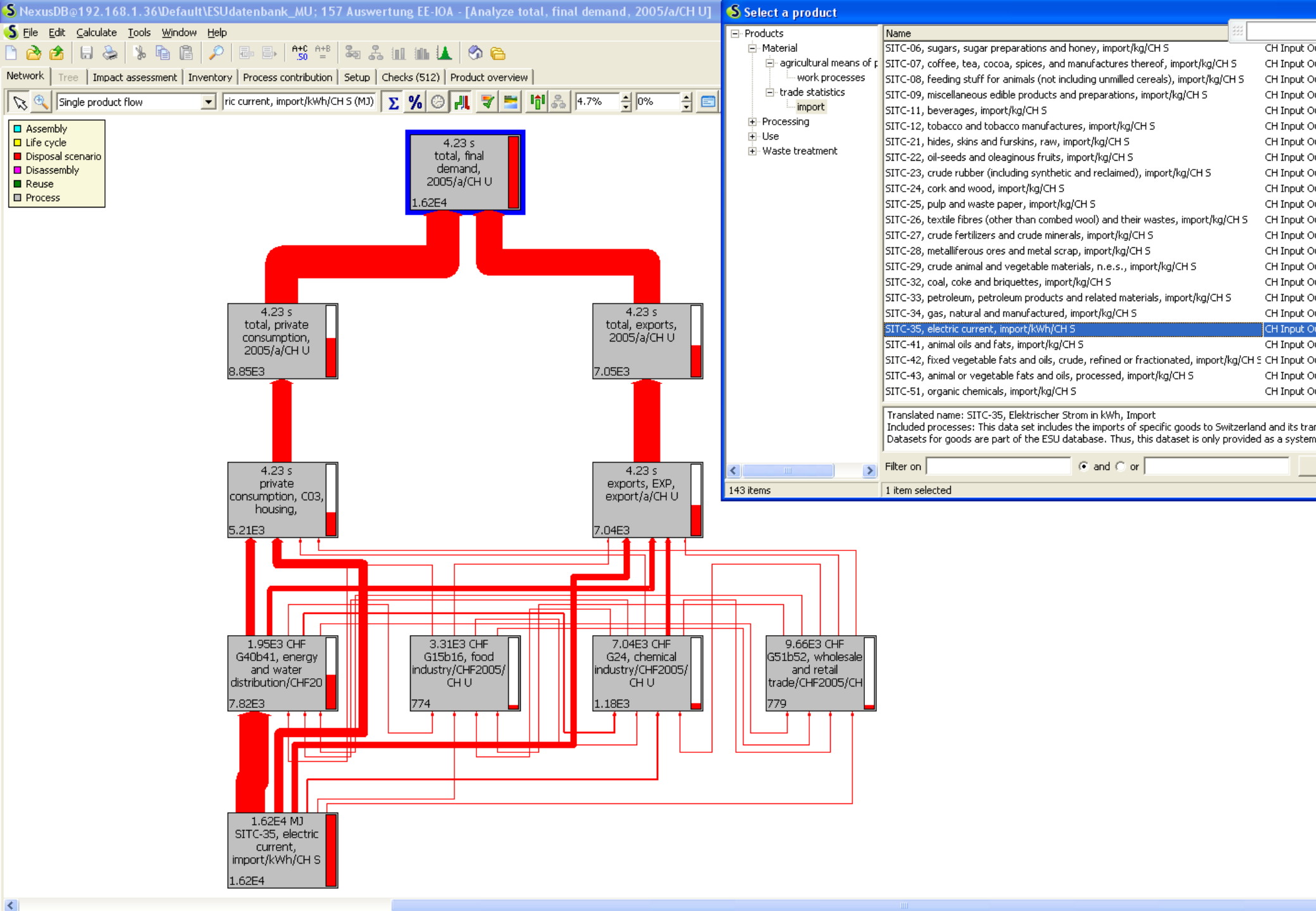
Results agricultural sector



- Visualize loops and cross sector links

Visualize economic flows

- Show network
- Choose a product flow

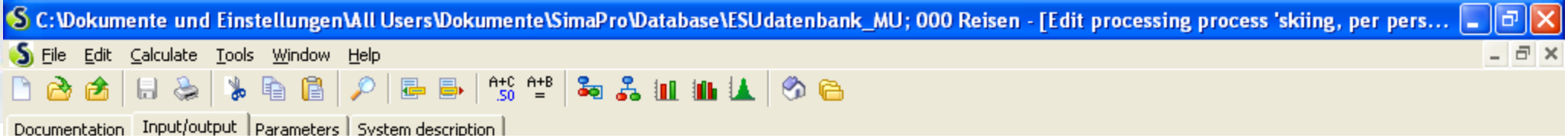

NexusDB@192.168.1.36\Default\ESUdatenbank_MU; 157 Auswertung EE-IOA - [Analyze total, final demand, 2005/a/CH U]
File Edit Calculate Tools Window Help
Network Tree Impact assessment Inventory Process contribution Setup Checks (512) Product overview
Single product flow
ric current, import/kWh/CH S (MJ)
4.7%
0%
Assembly
Life cycle
Disposal scenario
Disassembly
Reuse
Process
4.23 s total, final demand, 2005/a/CH U
1.62E4
4.23 s total, private consumption, 2005/a/CH U
8.85E3
4.23 s total, exports, 2005/a/CH U
7.05E3
4.23 s private consumption, C03, housing,
5.21E3
4.23 s exports, EXP, export/a/CH U
7.04E3
1.95E3 CHF G40b41, energy and water distribution/CHF20
7.82E3
3.31E3 CHF G15b16, food industry/CHF2005/ CH U
774
7.04E3 CHF G24, chemical industry/CHF2005/ CH U
1.18E3
9.66E3 CHF G51b52, wholesale and retail trade/CHF2005/CH
779
1.62E4 MJ SITC-35, electric current, import/kWh/CH S
1.62E4
Select a product
Products
Material
agricultural means of p
work processes
trade statistics
import
Processing
Use
Waste treatment
Name
SITC-06, sugars, sugar preparations and honey, import/kg/CH S
SITC-07, coffee, tea, cocoa, spices, and manufactures thereof, import/kg/CH S
SITC-08, feeding stuff for animals (not including unmilled cereals), import/kg/CH S
SITC-09, miscellaneous edible products and preparations, import/kg/CH S
SITC-11, beverages, import/kg/CH S
SITC-12, tobacco and tobacco manufactures, import/kg/CH S
SITC-21, hides, skins and furskins, raw, import/kg/CH S
SITC-22, oil-seeds and oleaginous fruits, import/kg/CH S
SITC-23, crude rubber (including synthetic and reclaimed), import/kg/CH S
SITC-24, cork and wood, import/kg/CH S
SITC-25, pulp and waste paper, import/kg/CH S
SITC-26, textile fibres (other than combed wool) and their wastes, import/kg/CH S
SITC-27, crude fertilizers and crude minerals, import/kg/CH S
SITC-28, metalliferous ores and metal scrap, import/kg/CH S
SITC-29, crude animal and vegetable materials, n.e.s., import/kg/CH S
SITC-32, coal, coke and briquettes, import/kg/CH S
SITC-33, petroleum, petroleum products and related materials, import/kg/CH S
SITC-34, gas, natural and manufactured, import/kg/CH S
SITC-35, electric current, import/kWh/CH S
SITC-41, animal oils and fats, import/kg/CH S
SITC-42, fixed vegetable fats and oils, crude, refined or fractionated, import/kg/CH S
SITC-43, animal or vegetable fats and oils, processed, import/kg/CH S
SITC-51, organic chemicals, import/kg/CH S
CH Input Ou
Translated name: SITC-35, Elektrischer Strom in kWh, Import
Included processes: This data set includes the imports of specific goods to Switzerland and its tra
Datasets for goods are part of the ESU database. Thus, this dataset is only provided as a system
Filter on
and
or
143 items
1 item selected

Hybrid Analysis

- Choose ecoinvent and IOA library
- CHF output in IOA relates to price without consumption taxes and subsidies!
- Reduce costs for an input item for VAT, mineral oil tax, etc.
- Separate retail costs from production costs
- Combine inputs in one data set

Example for skiing

- We know direct inputs as e.g. electricity, water and land occupation
- Details about the construction of infrastructure (e.g. cable cars, lifts, ski slopes, etc.) are not known
- Rough estimation with costs for infrastructure



LCI skiing day

(Insert line here)

Inputs

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Comment
Water, well, in ground	in water	0.33007	m3	Lognormal	1.05			(1,1,1,1,1,1,BU:1.0
Transformation, from forest, extensive	land	0.030944	m2	Lognormal	2			(1,1,1,1,1,1,BU:2);
Transformation, to pasture and meadow, intensive	land	0.030944	m2	Lognormal	1.2			(1,1,1,1,1,1,BU:1.2
Occupation, pasture and meadow, intensive	land	1.5472	m2a	Lognormal	1.1			(1,1,1,1,1,1,BU:1.1 skiing area; Zermatt

(Insert line here)

Known inputs from technosphere (materials/fuels)

Name	Amount	Unit	Distribution	SD^2 or 2*SD	Min	Max	Comment
Electricity, medium voltage, at grid/CH U	4.359	kWh	Lognormal	1.05			(1,1,1,1,1,1 administratio
Diesel, burned in building machine/GLO U	17.55	MJ	Lognormal	1.05			(1,1,1,1,1,1
Operation, passenger car, petrol, fleet average/CH U	0.3051	km	Logno				,1,1
Light fuel oil, burned in boiler 100kW condensing, non-modulating/CH U	1.7824	MJ	Logno				,1,1
Tractor, production/CH/I U	0.027929	kg					,1,1
Passenger car/RER/I U	1.2695E-6	p	Lognormal	3			(1,1,1,1,1,1 life time)
G45, construction/CHF2005/CH U	7.4931	CHF2005	Lognormal	1.05			(1,1,1,1,1,1 slope installa artificial snov
G30b31, office and electrical machinery/CHF2005/CH U	0.52612	CHF2005	Lognormal	1.05			(1,1,1,1,1,1 ystem

(Insert line here)

Known inputs from technosphere (electricity/heat)

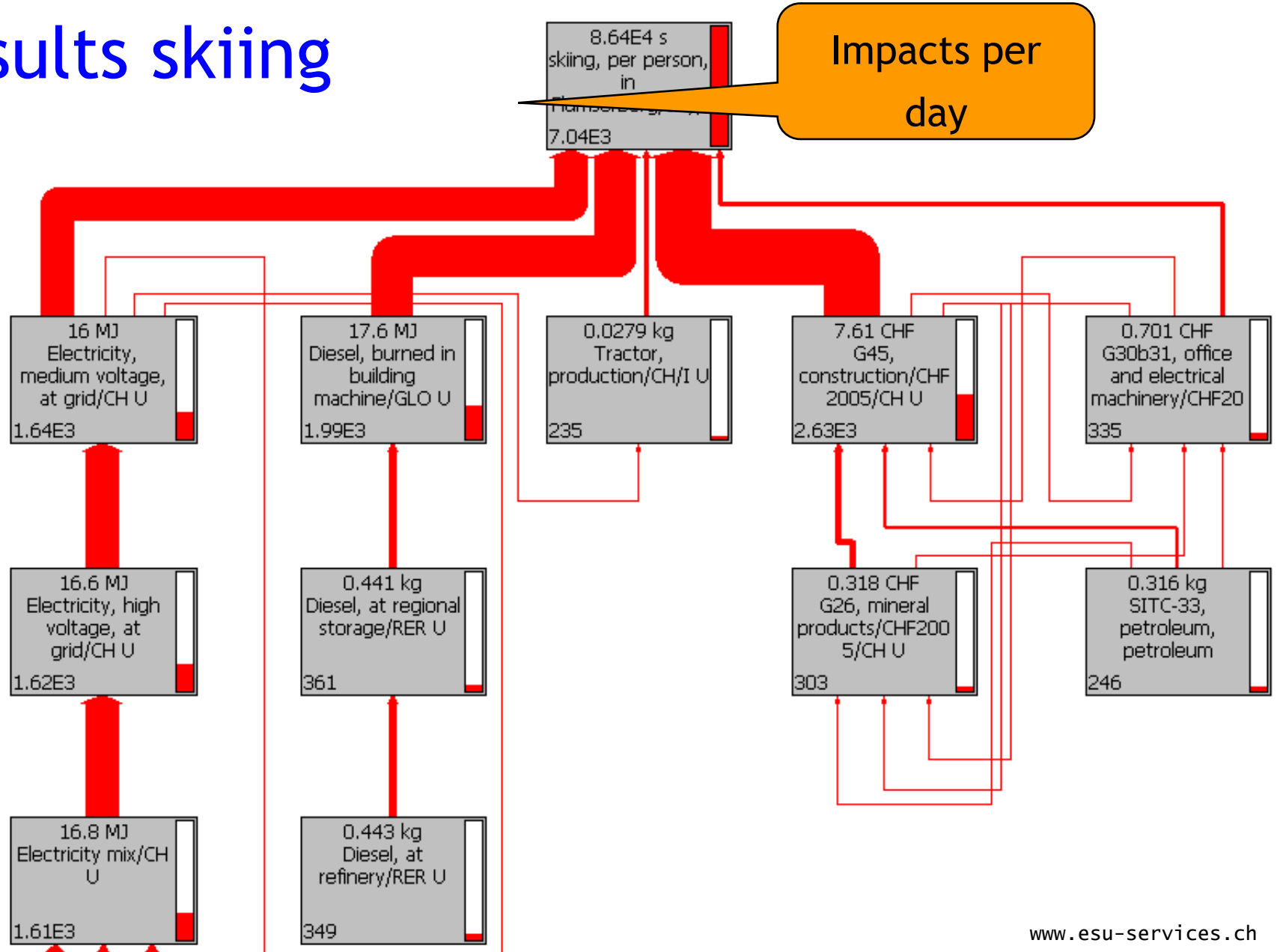
Name	Amount	Unit	Distribution	SD^2 or

(Insert line here)

Infrastructure costs per day

Ticketing costs per day

Results skiing

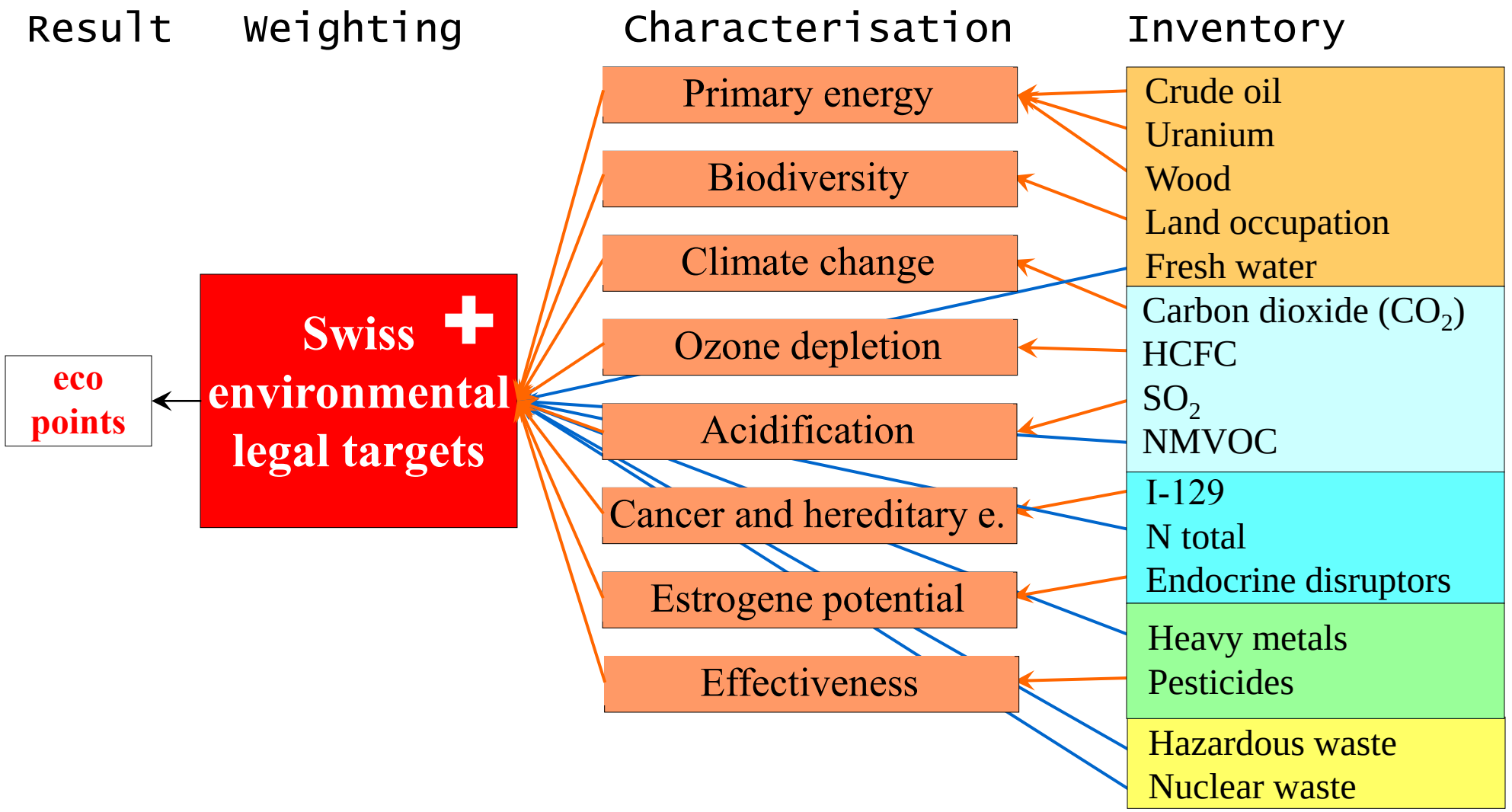


Conclusions

- Swiss IOA library is a powerful extension for rough assumptions
- SimaPro allows a more in depth analysis of production and consumption activities
- Visualization of environmental and economic flows between production sectors is possible
- Swiss EE-IOA can be complementary to LCA but not a real alternative for detailed product comparisons

Annexe

Ecological Scarcity 2006

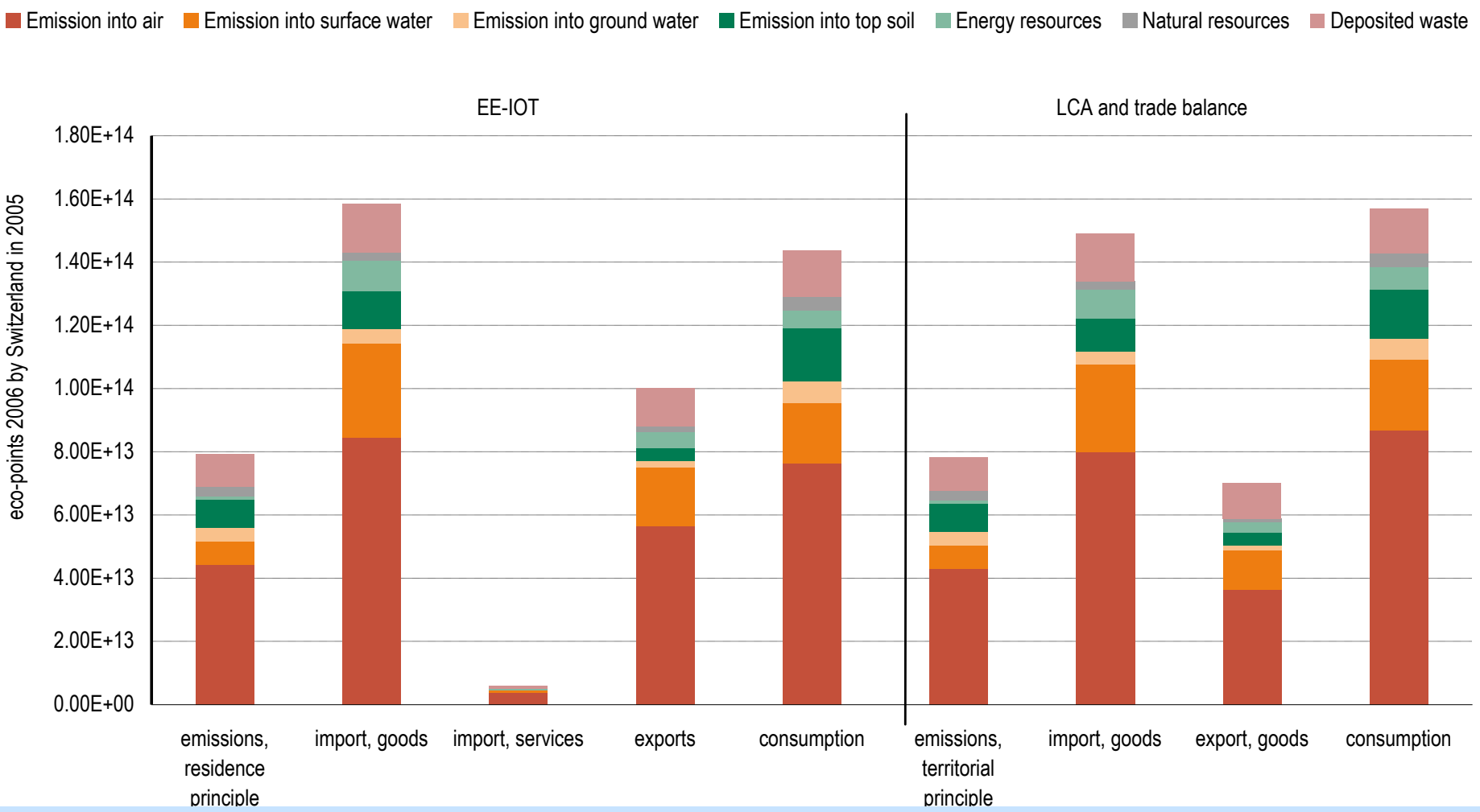


International acceptance of eco-points

- 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

Two approaches for the total balance



- Differences for imports and exports important for total balance

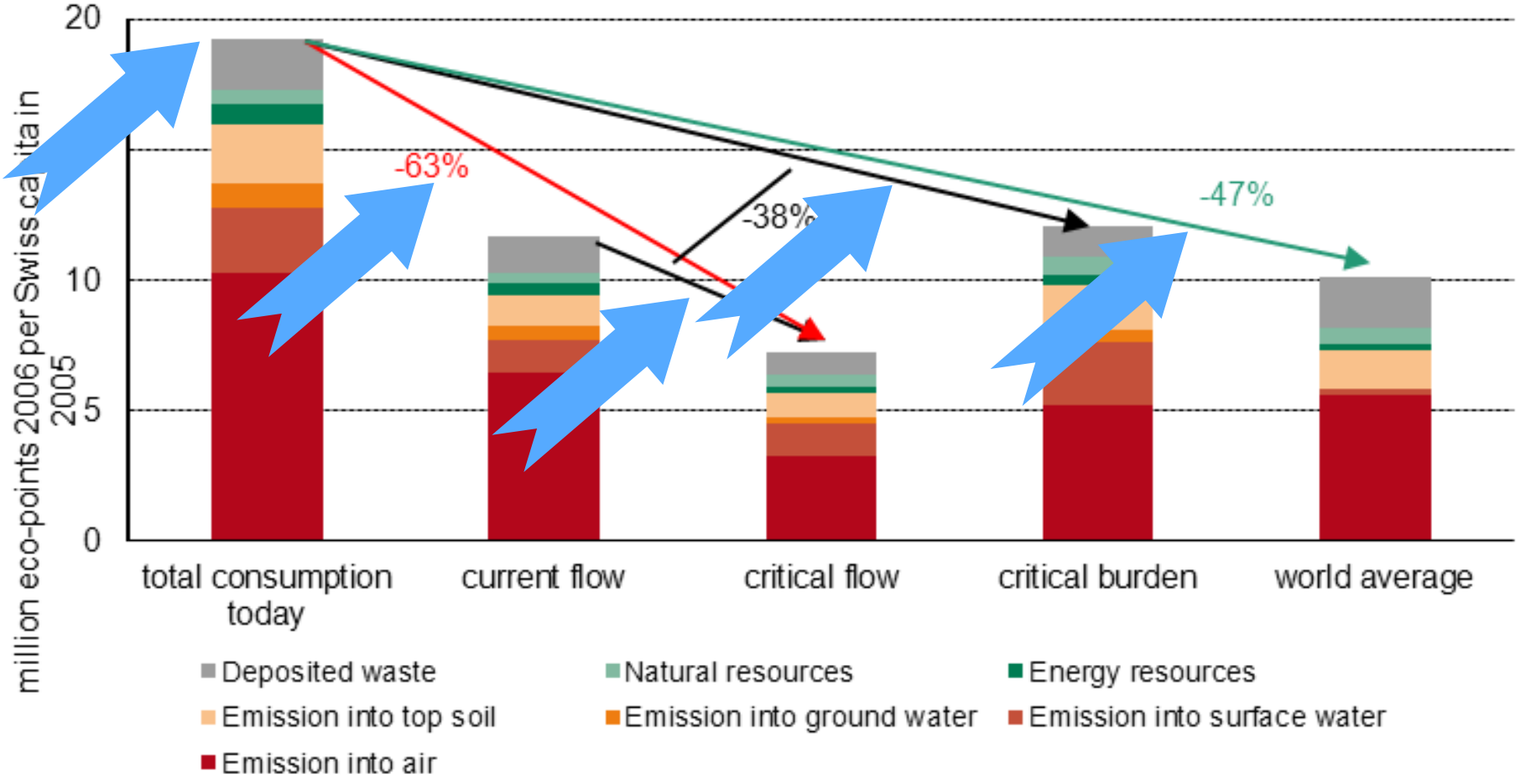
Analysis of exports

➢ Reasons for differences (Chemicals, Energy, Services)?

Higher exports in calculation with IOT

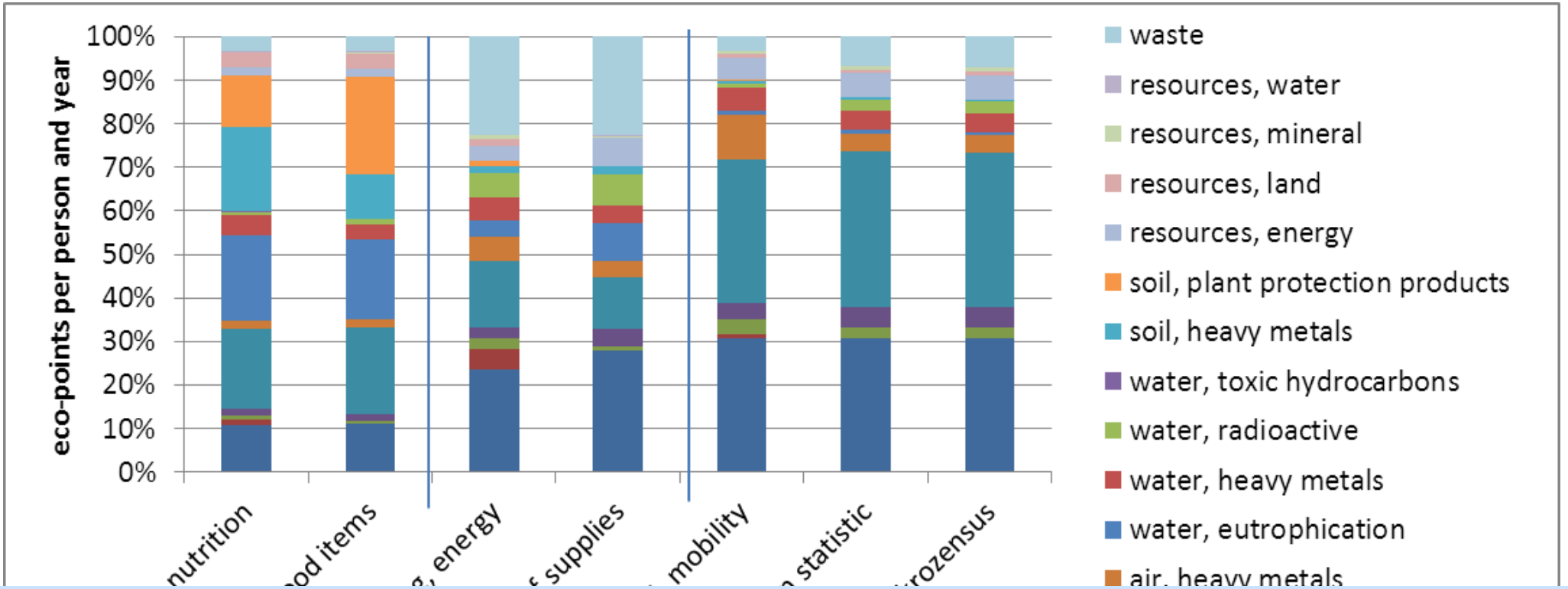
- Underestimation of exporting fine chemicals in LCA approach. → High prices? Better LCA data for chemical industry in CH
- Underestimation of service export because not included in trade balance
- Underestimation of electricity exports in IOT (only 1/3) → Re-exports underestimated. Disaggregation in IOT would be necessary.

Setting reduction targets



- 40% to 60% reduction of total impacts is necessary

Verification by comparison with LCA data



- Food: plant protection and heavy metals in LCA
- Energy: resources in IOA
- Mobility: heavy metals to water in LCA, waste in IOA