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		Name	Protection	

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
- Calculation setups

Interpretation:
- Interpretation
- Document Links

☑ Methods
☑ Swiss Input Output Database
☐ USA Input Output Database
☐ USA Input Output Database System Expansion
☐ USLCI

Environmental extended Input Output analysis of Switzerland in the year 2005. Data and approach are described in a public report.
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:
- Emission and resources uses for 12 private consumption domains (final demand categories in the folder Swiss consumption)
- Emissions and resource uses for 43 product groups (folder Swiss production)
- Emissions and resource uses for 15 categories of imported goods and services (folder Imported production)
- Total emissions and resource uses of Swiss consumption, Swiss exports and Swiss imports.
- Total emissions and resource uses within the territory of Switzerland
- Trade statistics; import and export.

P

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	Infrastructure Process	Unit	G01b05, primary sector	UncertaintyType	StandardDeviation95%	GeneralComment
Location InfrastructureProcess Unit				CH 0 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)

File   Edit   Calculate   Tools   Window   Help

Documentation | Input/output | Parameters | System description

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)							

Production sector

	Amount	Unit	Distribution	SD^2 or 2*SDMin		Comment

Inputs

Output 1 CHF

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	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	0.021741	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			Lognormal			(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					,1,1,1,1,3); 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*SDMin	Max	Comment
Product, mining and quarrying/CHF2005/CH U	0.00047178	CHF2005	Lognormal	1.113		(1,1,1,1,1,3)

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	CHF2005	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,
...roduct.../CHF2005/GLO S	1.3409E-5	CHF2005	Lognormal	1.5458	(2,

Imported goods

Imported services

www.esu-services.ch

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*SDMin	Max	Con
G23, refineries/CHF2005/CH U	7.3922E8	CHF2005	Lognormal	1.113		(1,
G24, chemical industry/CHF2005/CH U	1.4254E6	95	Lognormal	1.113		(1,
G25, plastics and rubber/CHF2005/CH U	4.1794E7	C	Lognormal	1.113		(1,
G30b31, office and electrical machinery/CHF2005/CH U	3.7834E7	CHF20	normal	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

Beta Test

Questions about the structure?

Final demand

- Divide annual output by number of inhabitants in Switzerland

- 1.340639E-7 years per capita

vices.ch

Result Final Demand

Results energy production sector

Direct impacts

1 CHF2005
G40b41, energy
and water
distribution/CHF200
567

0.0342 CHF2005
G10b14, mining
and
quarrying/CHF2005
20.8

0.116 CHF2005
G45,
construction/CHF20
05/CH U
3.48

0.0368 CHF2005
G60b62,
transport/CHF2005
/CH U
5.18

0.059 kg
SITC-33,
petroleum,
petroleum products
46

4.03 MJ
SITC-35, electric
current,
import/kWh/CH S
608
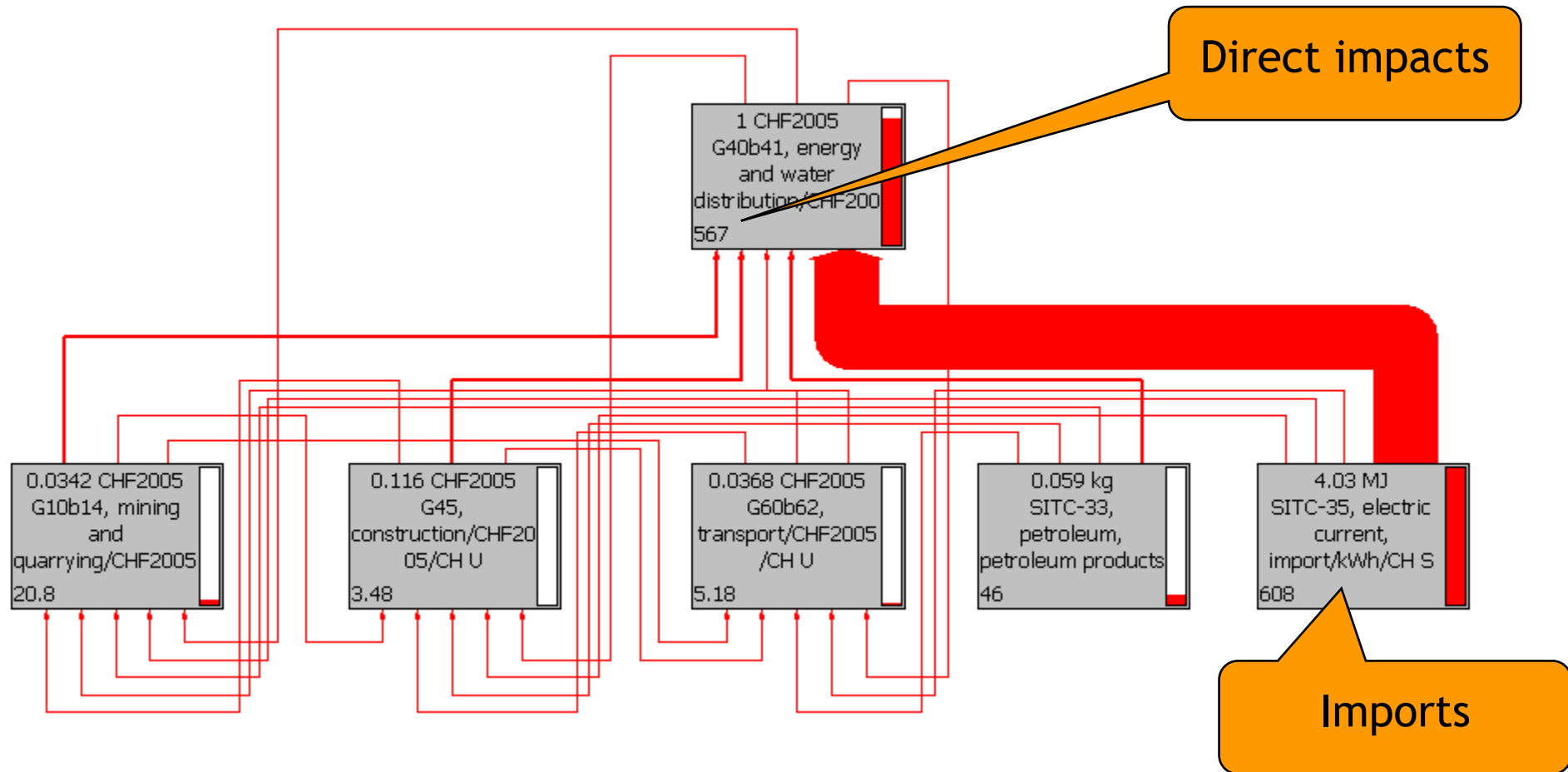
Imports

➢ See importance of importing sectors and direct emissions

Results agricultural sector
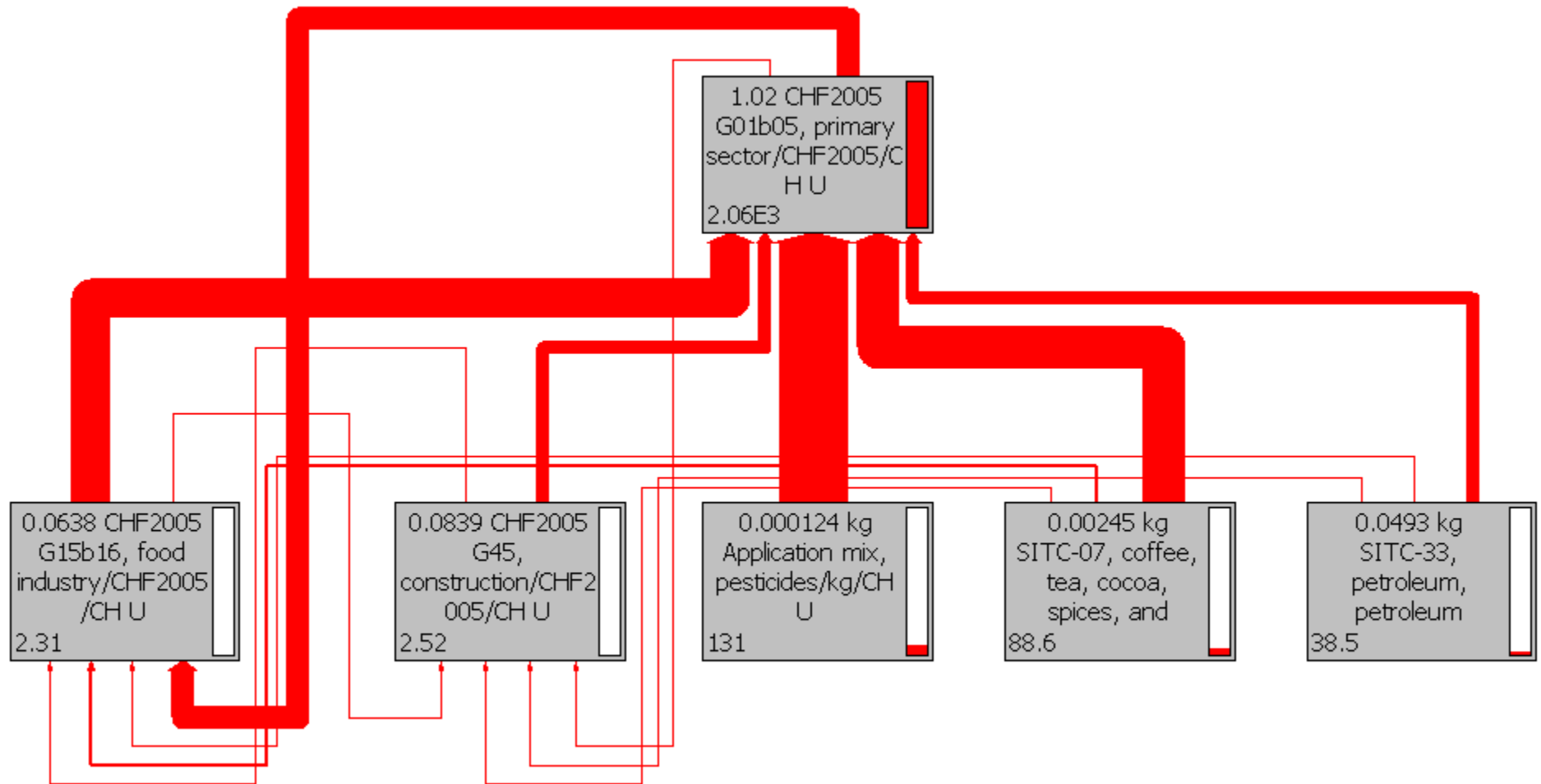
▶ Visualize loops and cross sector links

Visualize economic flows

- Show network

- Choose a product flow

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)   Σ %   4.7%   0%
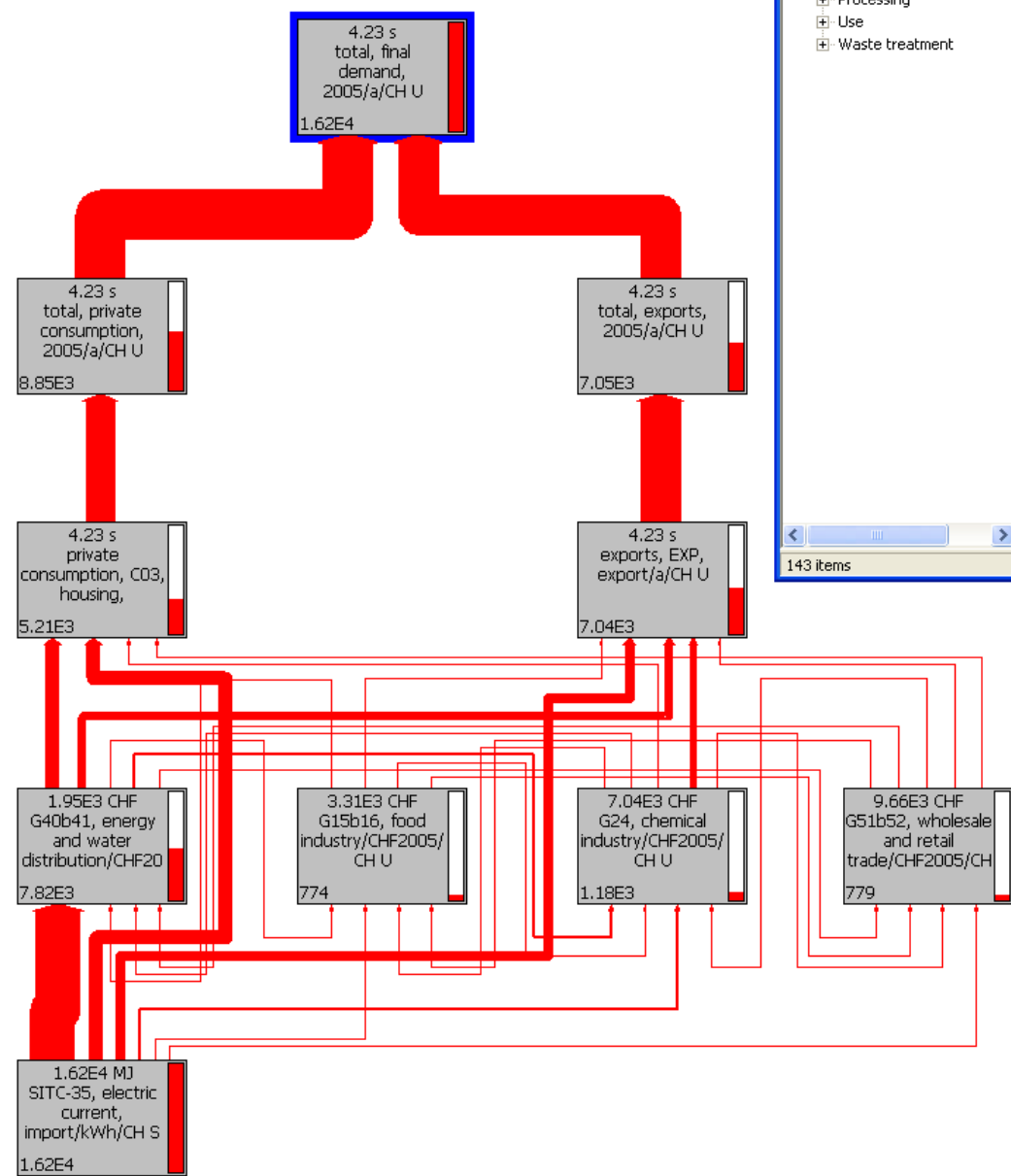
- Assembly
- Life cycle
- Disposal scenario
- Disassembly
- Reuse
- Process

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	CH Input O
SITC-07, coffee, tea, cocoa, spices, and manufactures thereof, import/kg/CH S	CH Input O
SITC-08, feeding stuff for animals (not including unmilled cereals), import/kg/CH S	CH Input O
SITC-09, miscellaneous edible products and preparations, import/kg/CH S	CH Input O
SITC-11, beverages, import/kg/CH S	CH Input O
SITC-12, tobacco and tobacco manufactures, import/kg/CH S	CH Input O
SITC-21, hides, skins and furskins, raw, import/kg/CH S	CH Input O
SITC-22, oil-seeds and oleaginous fruits, import/kg/CH S	CH Input O
SITC-23, crude rubber (including synthetic and reclaimed), import/kg/CH S	CH Input O
SITC-24, cork and wood, import/kg/CH S	CH Input O
SITC-25, pulp and waste paper, import/kg/CH S	CH Input O
SITC-26, textile fibres (other than combed wool) and their wastes, import/kg/CH S	CH Input O
SITC-27, crude fertilizers and crude minerals, import/kg/CH S	CH Input O
SITC-28, metalliferous ores and metal scrap, import/kg/CH S	CH Input O
SITC-29, crude animal and vegetable materials, n.e.s., import/kg/CH S	CH Input O
SITC-32, coal, coke and briquettes, import/kg/CH S	CH Input O
SITC-33, petroleum, petroleum products and related materials, import/kg/CH S	CH Input O
SITC-34, gas, natural and manufactured, import/kg/CH S	CH Input O
SITC-35, electric current, import/kWh/CH S	CH Input O
SITC-41, animal oils and fats, import/kg/CH S	CH Input O
SITC-42, fixed vegetable fats and oils, crude, refined or fractionated, import/kg/CH S	CH Input O
SITC-43, animal or vegetable fats and oils, processed, import/kg/CH S	CH Input O
SITC-51, organic chemicals, import/kg/CH S	CH Input O

Translated name: SITC-35, Elektrischer Strom in kWh, Import
Included processes: This data set includes the imports of specific goods to Switzerland and its tran
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

Network diagram boxes:

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

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

S C:\Dokumente und Einstellungen\All Users\Dokumente\SimaPro\Database\ESUdatenbank_MU; 000 Reisen - [Edit processing process 'skiing, per pers... □ ×]

File   Edit   Calculate   Tools   Window   Help

Documentation | Input/output | Parameters | System description

LCI skiing day

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	Inputs

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	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*SDMin	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 ters
Operation, passenger car, petrol, fleet average/CH U	0.3051	km	Lognor				1,1
Light fuel oil, burned in boiler 100kW condensing, non-modulating/CH U	1.7824	MJ	Lognor				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 snow
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)

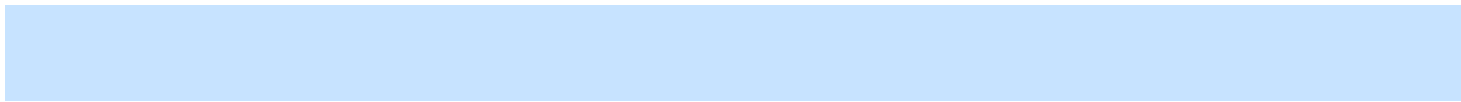**Infrastructure costs per day**
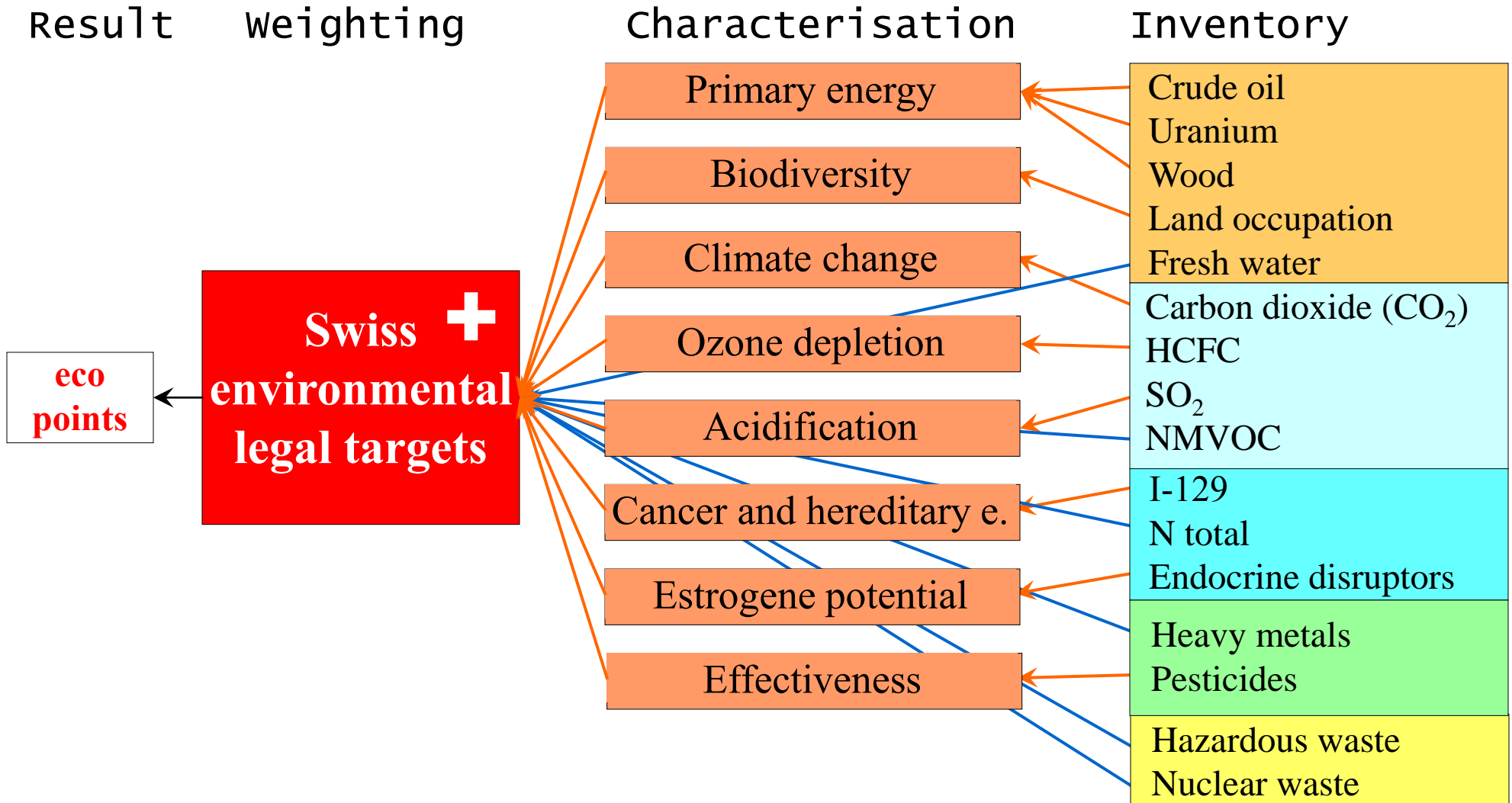
Ticketing costs per day

Results skiing
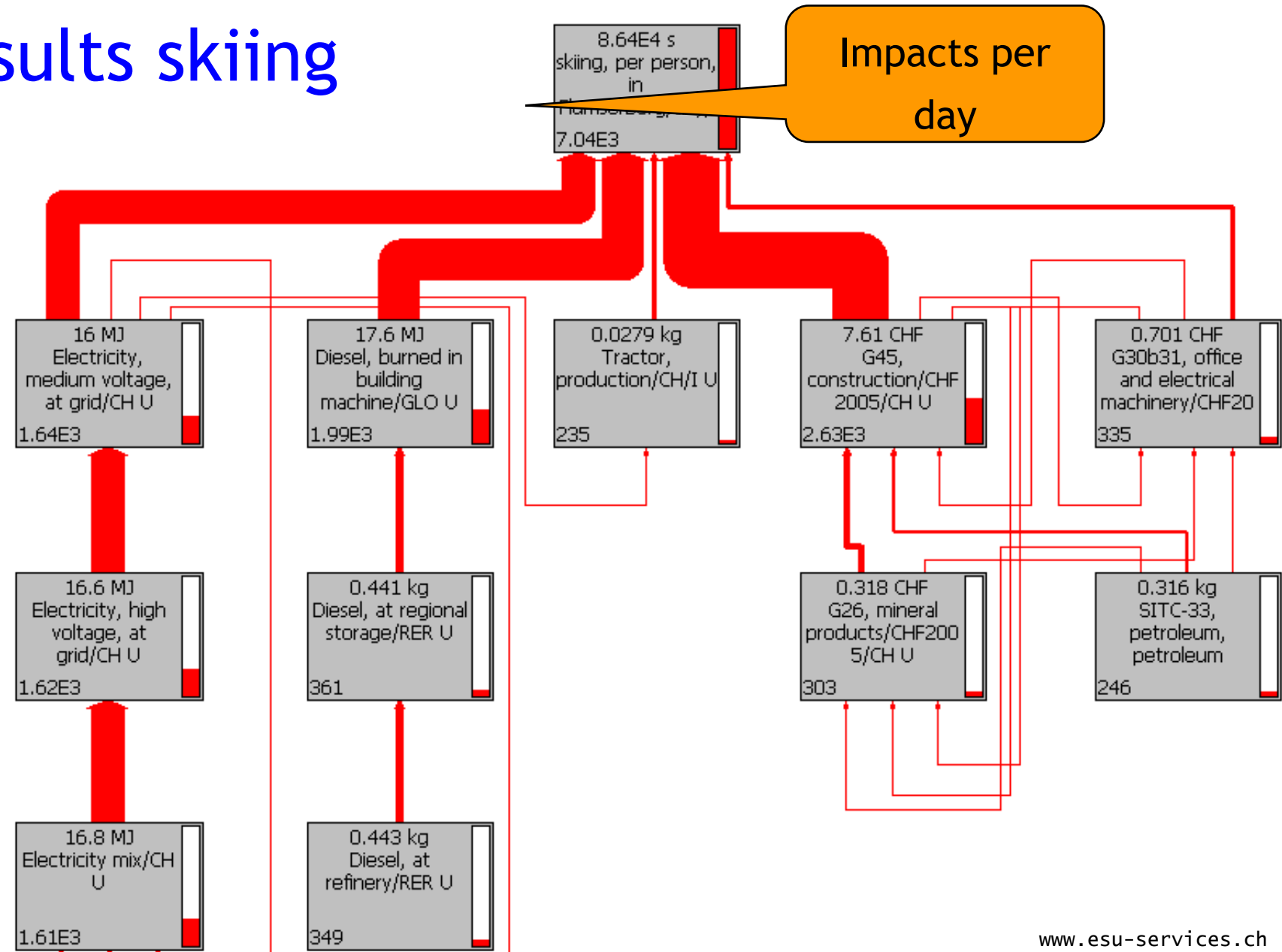
Conclusions

- 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

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

Characterisation	Inventory
Primary energy	Crude oil
Biodiversity	Uranium
Climate change	Wood
Ozone depletion	Land occupation
Acidification	Fresh water
Cancer and hereditary e.	Carbon dioxide (CO_2)
Estrogene potential	HCFC
Effectiveness	SO_2
	NMVOC
	I-129
	N total
	Endocrine disruptors
	Heavy metals
	Pesticides
	Hazardous waste
	Nuclear waste

Swiss ✚ environmental legal targets

eco points

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
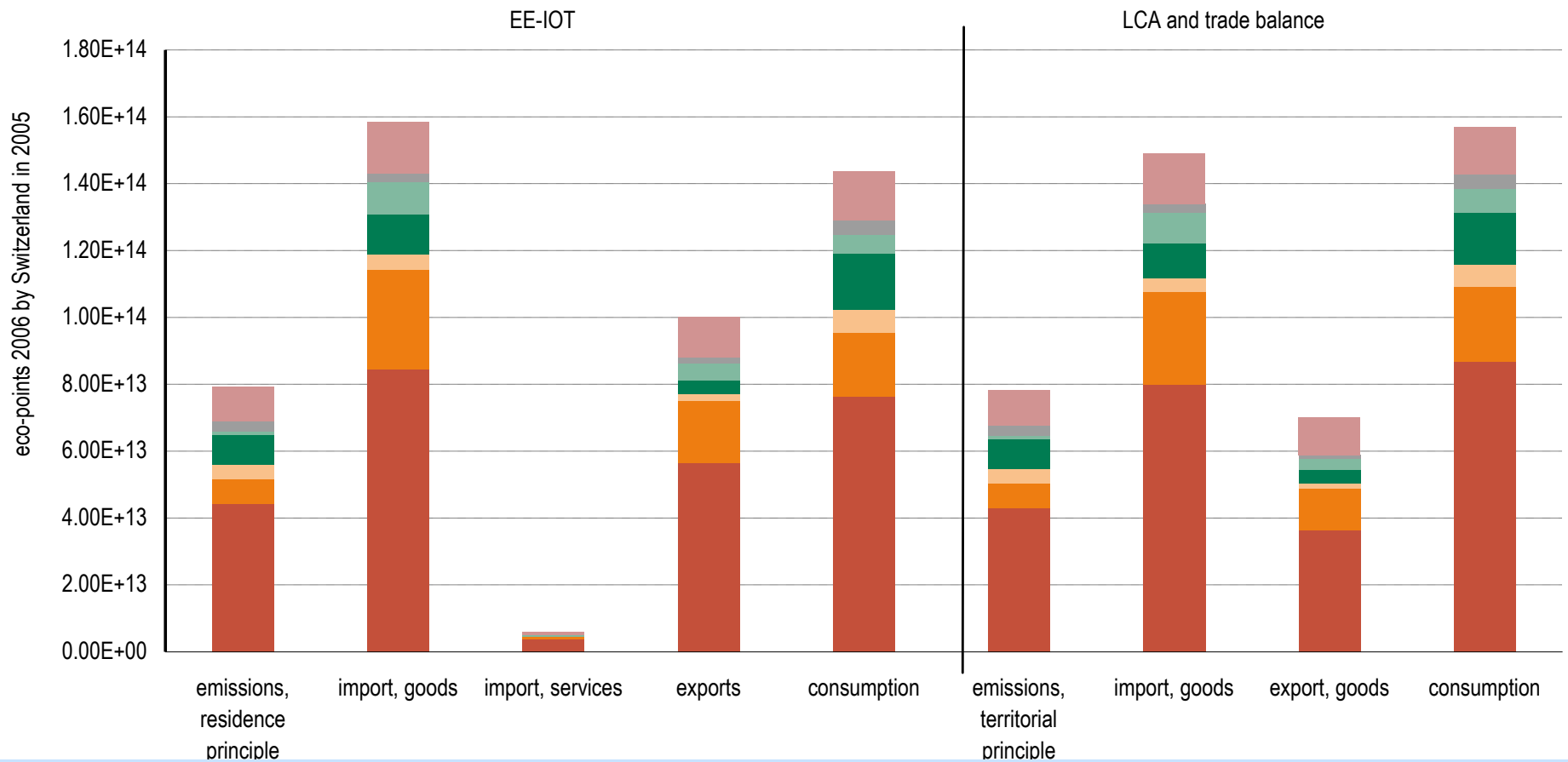
➤ Differences for imports and exports important for total balance

Analysis of exports

million tonnes CO2-eq. per year
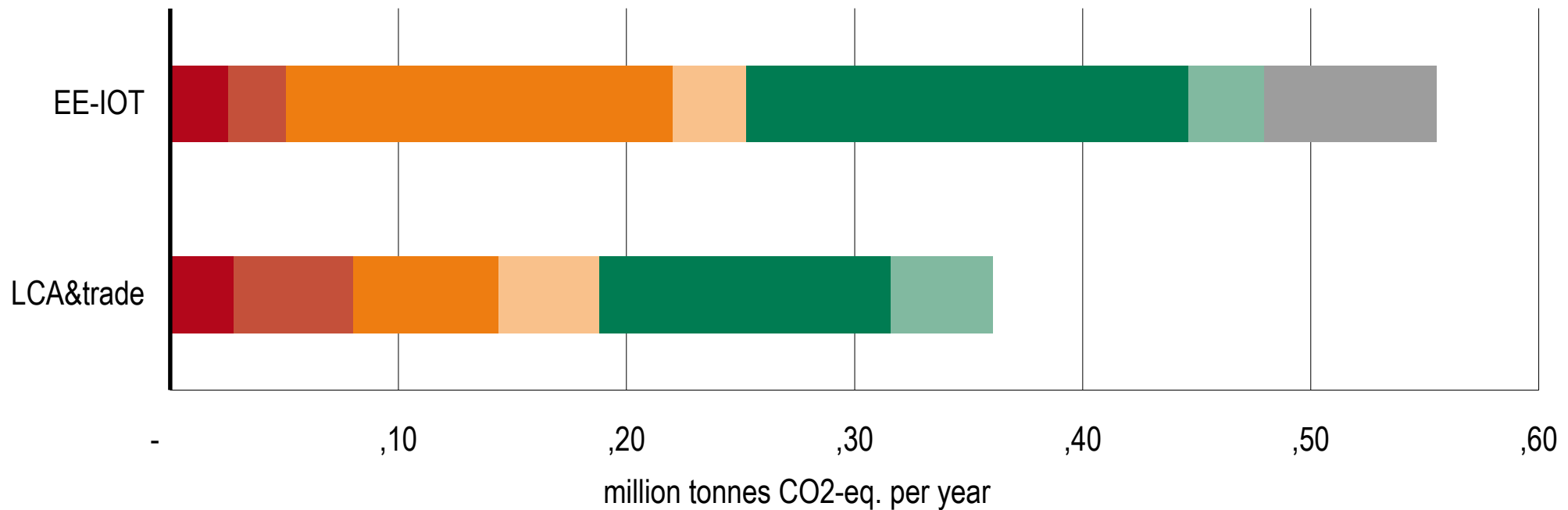
- ■ Food, beverages, tobacco
- ■ Other biomass products
- ■ Chemicals and chemical products
- ■ Metals and minerals
- ■ Manufactured goods
- ■ Electricity and energy
- ■ Services

➤ 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
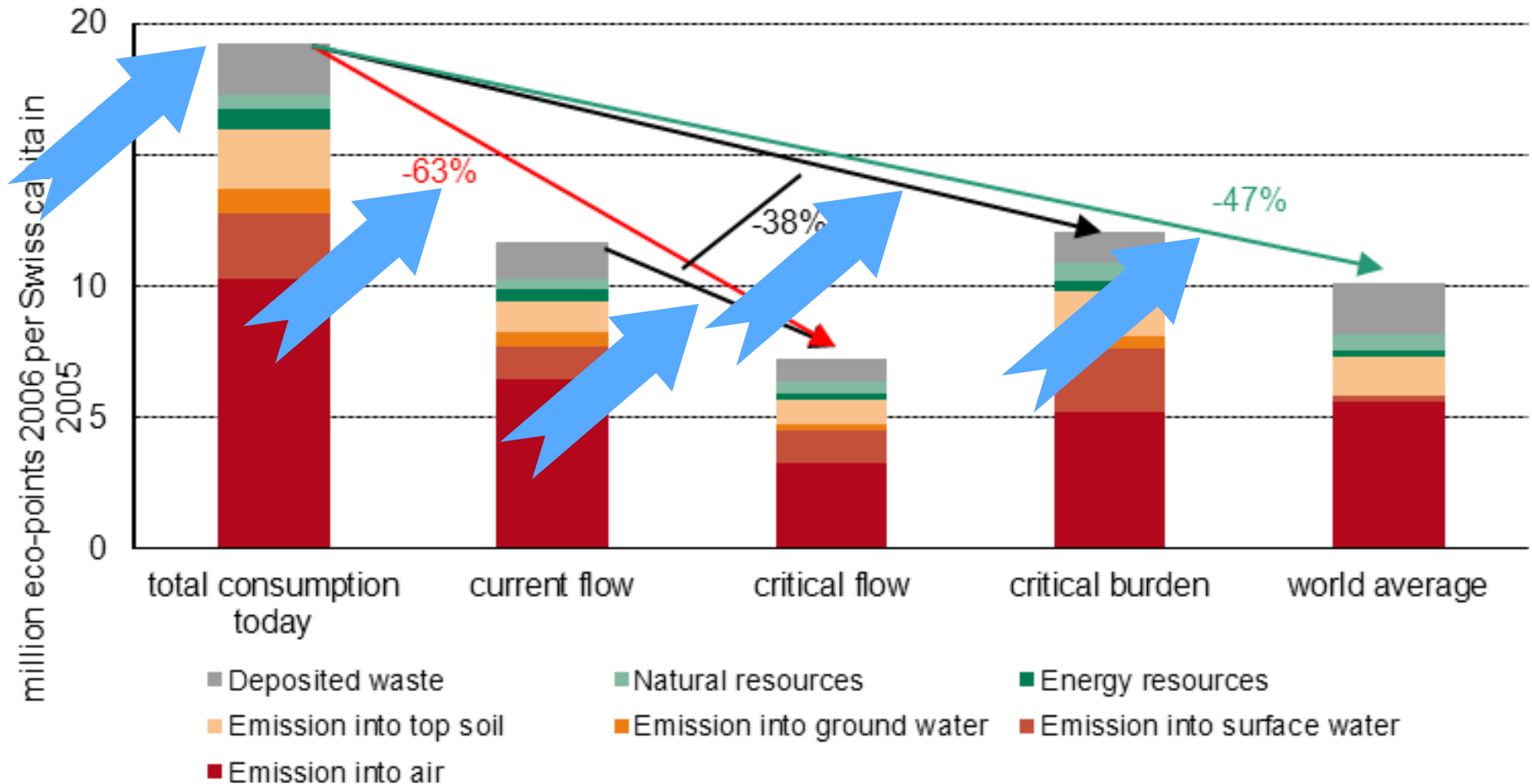
> 40% to 60% reduction of total impacts is necessary

Verification by comparison with LCA data
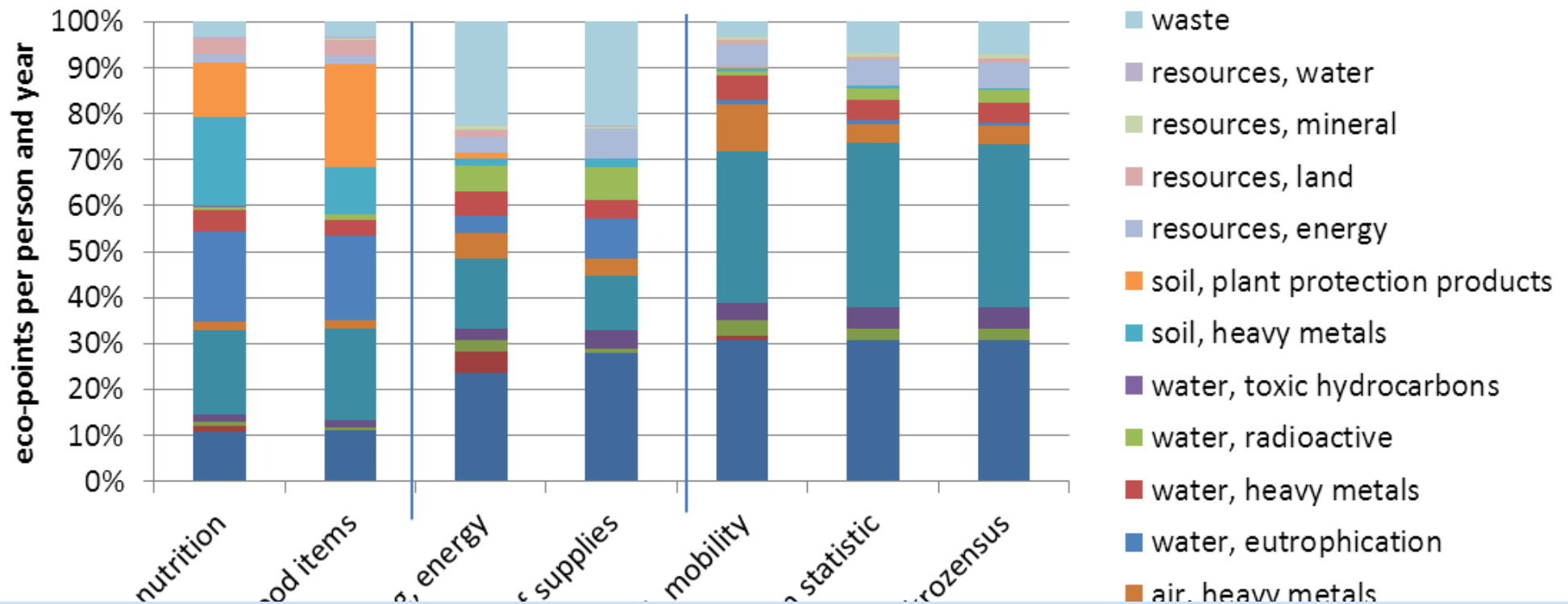
➢ Food: plant protection and heavy metals in LCA

➢ Energy: resources in IOA

➢ Mobility: heavy metals to water in LCA, waste in IOA