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Use of IOA and combination of economic and environmental data in ecoinvent v3



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Presentation to the 45th Swiss LCA discussion forum
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Bo Weidema
ecoinvent Centre



Content



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- The ecoinvent “IO repository”
- Imports, exports and final consumption as activity datasets
- Classification of activities and products
- Parallel use of monetary and physical units
- Physical resource inputs and emissions
- Integration of satellite tables (valuation, waste, final use, capital formation and use) in the core supply-use table
- From repository to hybrid database



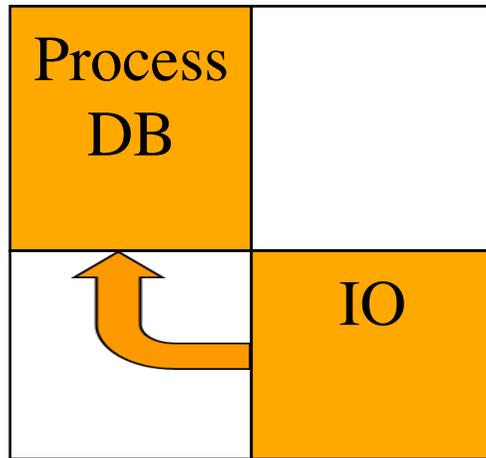
IO and process-based LCA databases



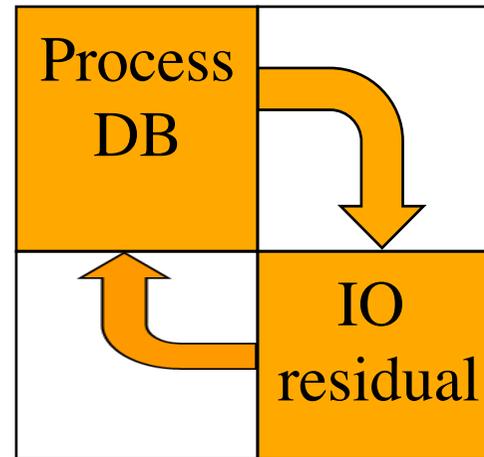
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- Make-Use convention: Columns = activities; Rows = products



tiered approach



embedded approach

- The **detail** of process-based data and the **completeness** of the make-use (IO) framework is combined in **hybrid** approaches



The ecoinvent “IO repository”



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- Repository: A place to store
- IO repository: A place to store Make-Use (IO) data
- One column in a Make-Use table = one activity dataset
- Each row = one exchange (input or output)
- Same format as process-based datasets: ecoSpold2
- Special activity types: IO and residual

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Imports, final consumption and exports



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- Besides the core technology matrix (producing industries):
 - Imports
 - Final consumption
 - Exports
- Again: Each column = One activity dataset

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	V'	N			Valuation	q
Total	g					
Products	U		y	E		q
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	g					



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Classification of activities and products



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- Activities: UN ISIC Rev. 4
- Products: UN CPC Ver. 2
- More parallel classifications as well:
 - Original local classifications (e.g. NAICS)
 - Other classifications (e.g. GPC)
 - User-defined tags

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Parallel use of monetary and physical units



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- Make-Use tables can only handle one unit per exchange (input or output): Monetary and physical tables stored separately
- ecoSpold 2 - and therefore the IO repository - can handle unlimited number of properties of each exchange, e.g.:
 - Monetary
 - Mass (wet, dry)
 - Composition (Cadmium content, Carbon content, etc.)
 - Lifetime

all stored in the same activity dataset

- Thus, from the same activity datasets, many different matrices can be produced, both monetary and physical

The logo for ETH (Eidgenössische Technische Hochschule), consisting of the letters "ETH" in a bold, italicized, sans-serif font.

The logo for EPFL (École Polytechnique Fédérale de Lausanne), consisting of the letters "EPFL" in a white, sans-serif font inside a red square.

The logo for PSI (Paul Scherrer Institut), consisting of the letters "PSI" in a white, sans-serif font inside a grey square.

The logo for EMPA (Empirech Materials Processing and Analysis), consisting of the letters "EMPA" in a white, sans-serif font inside a red square with a white cross.

The logo for ART (Applied Research Technology), consisting of the letters "ART" in a white, sans-serif font inside a red square with a white cross.



Physical resource inputs and emissions



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Balanced MSUT	Activities	Import	Final use	Export	Valuation	Total
Products	V'	N			Valuation	q
Total	g					

Products	U	y	E	q
Primary production factors	Labour costs			
	Net taxes			
	Net operating costs			
	Rent			
Total	g			

Balanced PSUT	Activities	Import	Final use	Export	Total
Products	V'	N			q
Total	g				

Products	U	y	E	q
Net additions to stocks	$-\Delta S$			
Supply of wastes	$-W_V$			
Use of wastes	W_U			
Resources	R			
Emissions	-B			
Total	g			

← From resource statistics

← Factor-based emissions



Integration of satellite tables



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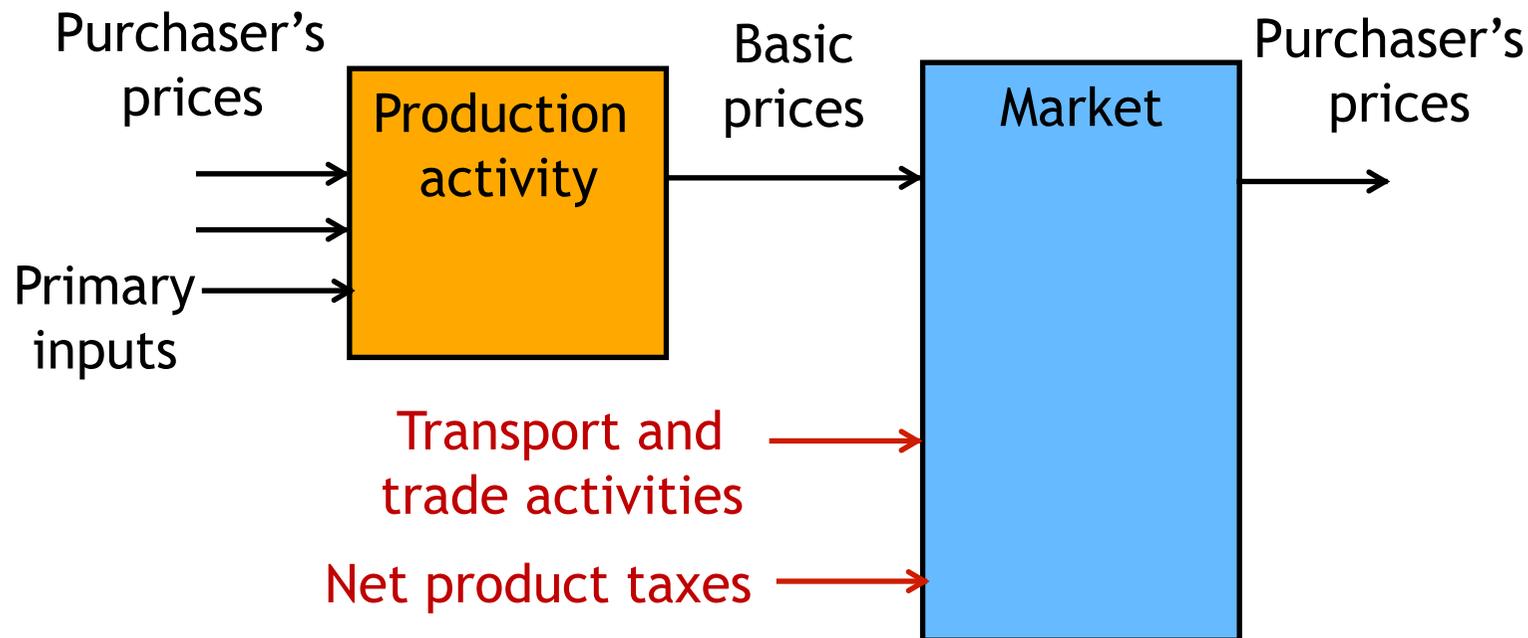
- The valuation table: Translating from V' in basic prices to U in purchaser's prices

Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	V'	N			Valuation	q
Total	g					
Products	U		y	E		q
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	g					



Integration of satellite tables

- The valuation table: Translating from V' in basic prices to U in purchaser's prices

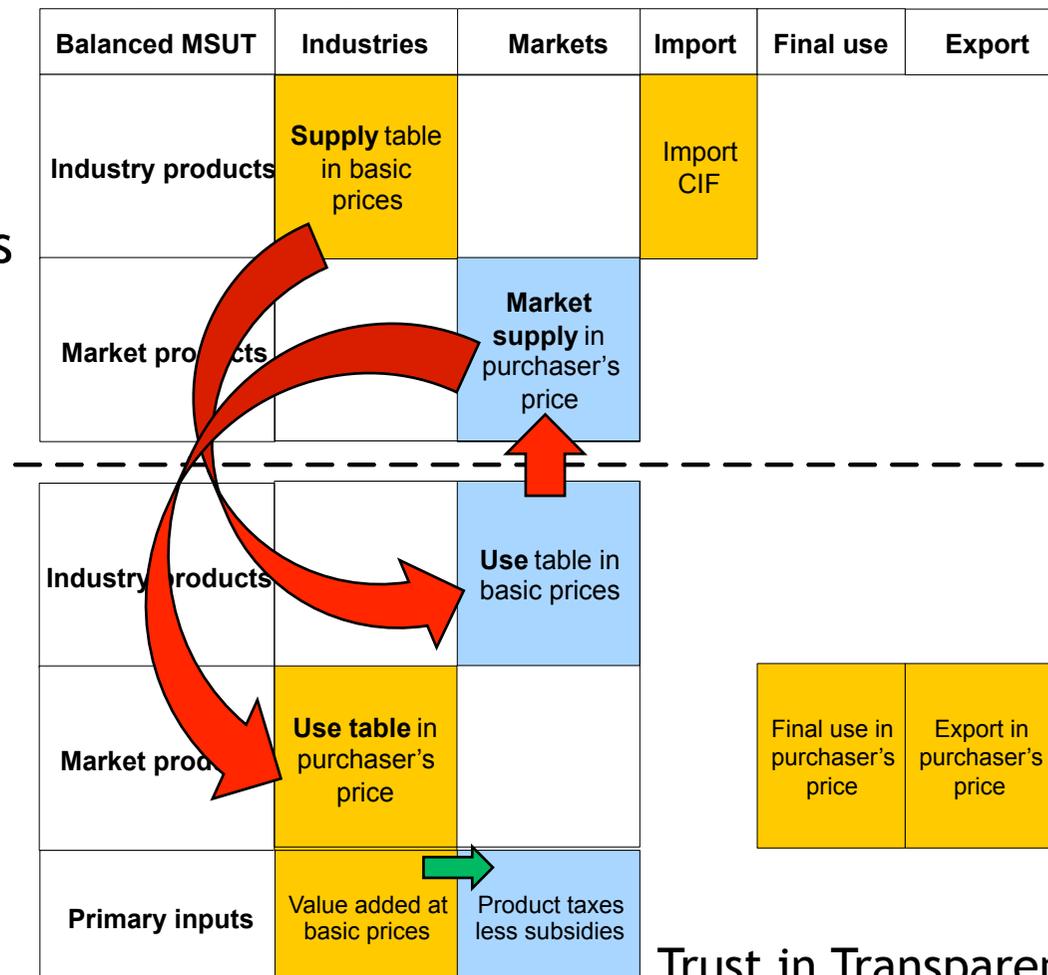


Integration of satellite tables



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- The valuation table: **Replaced by market activities** translating from V' in basic prices to U in purchaser's prices



Integration of waste satellite tables



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Balanced MSUT	Activities	Import	Final use	Export	Valation	Total
Products	V'	N			Valuation	q
Total	g					
Products	U		y	E		q
Primary production factors	Labour costs					
	Net taxes					
	Net operating costs					
	Rent					
Total	g					

Balanced PSUT	Activities	Import	Final use	Export	Total
Products	V'	N			q
Total	g				
Products	U		y	E	q
Net additions to stocks	-ΔS				
Supply of wastes	-W _v				
Use of wastes	W _u				
Resources	R				
Emissions	-B				
Total	g				

← Additions to stock

← Supply and use of materials for treatment (wastes and materials for recycling)



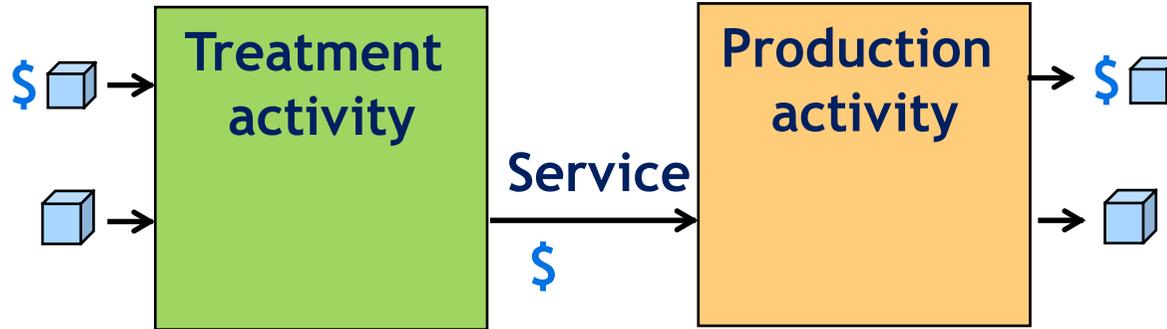
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Integration of waste satellite tables



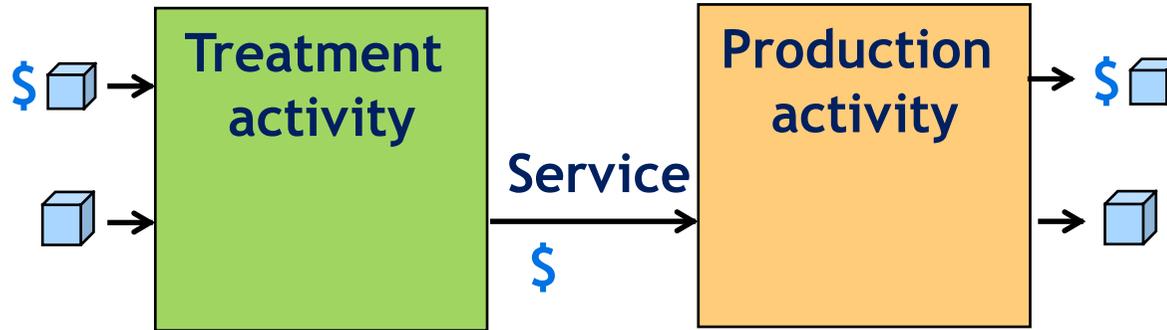
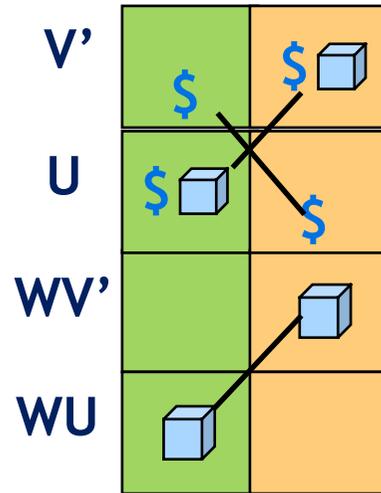
V'	\$	\$	cube
U	\$	cube	\$
WV'			cube
WU	cube		



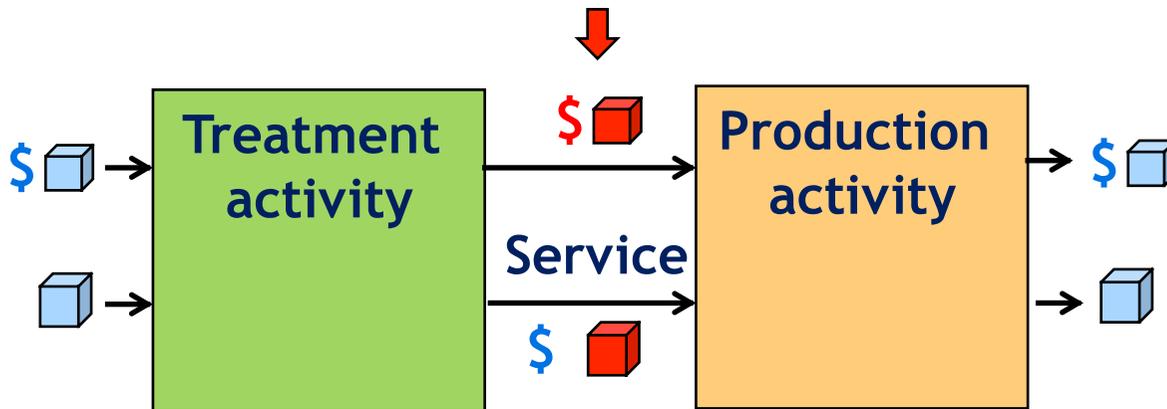
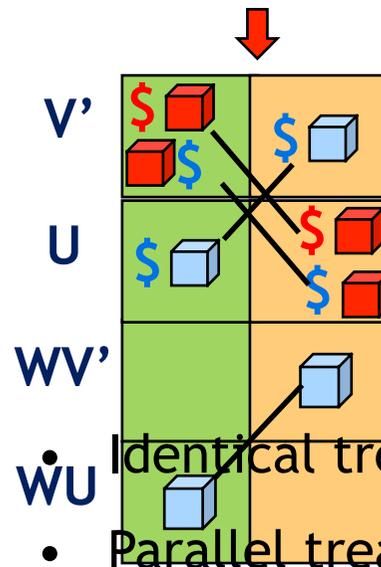
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Integration of waste satellite tables



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- Identical treatment of recycling and waste treatment
- Parallel treatment of monetary and physical waste flows



Integration of satellite tables



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- Additions to stock = linking to future waste treatment
- Capital formation and use integrated in the core make-use table through the use of an investment matrix

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From repository to hybrid database



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Balanced MSUT	Activities (a_U)	Products (c_U)	Export	Total
Activities (a_S)		V		g'
Products (c_S)	J		E	q
Import		N_V'		
Primary inputs	Labour and profit			
Total	g	q'		

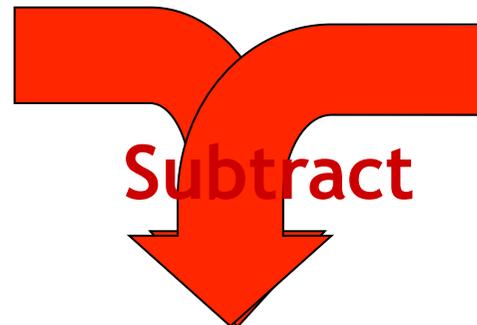
IO



Scale-up to IO-geography



Add industry-internal processes

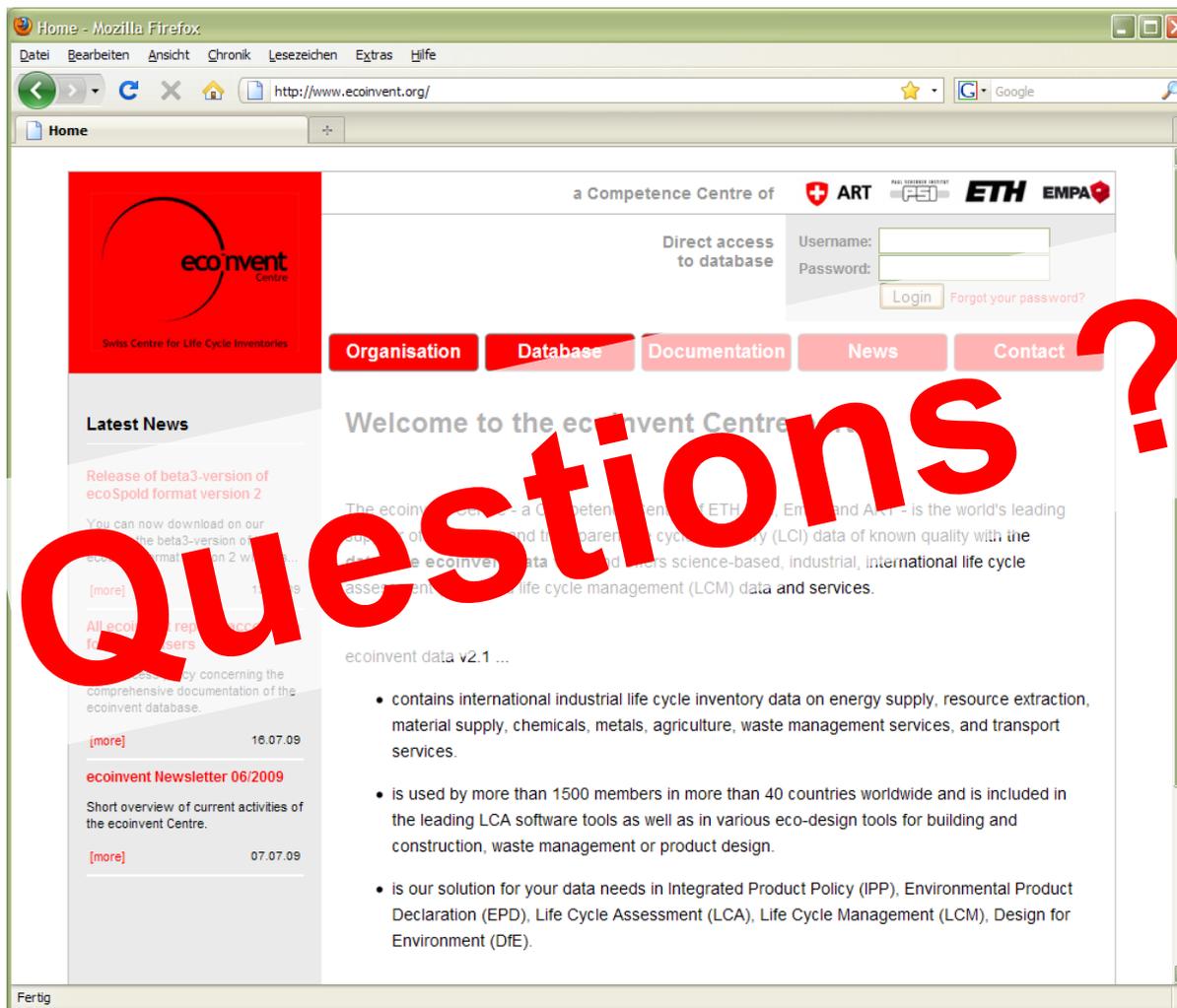


Subtract

Balanced MSUT	Activities (a_U)	Products (c_U)	Export	Total
Activities (a_S)				g'
Products (c_S)	U		E	q
Import		N_V'		
Primary inputs	Labour and profit			
Total	g	q'		

Hybrid DB:
Scaled-up processes & residuals





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ecoinvent Centre, c/o Empa, Lerchenfeldstrasse 5, CH-9014 St-Gallen, Switzerland

support@ecoinvent.org

www.ecoinvent.org

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