



Swiss Centre for Life Cycle Inventories

A joint initiative of the
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ETH

EPA

FSO

EMPA

ENSI

FSM



ecoinvent: A Comprehensive Web-Based LCA Database

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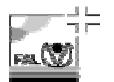
Gerald Rebitzer ¹, Rolf Frischknecht ²

¹ Swiss Federal Institute of Technology Lausanne (EPFL)

² ecoinvent Centre, Swiss Centre for Life Cycle Inventories

InLCA / LCM 2003 Conference, Seattle, USA

September 23, 2003



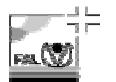
Problem Setting

- Various LCI-Databases in Switzerland
different methodological approaches
 - ➔ different results / incompatible datasets (general problem)!
- Data updates:
resource intensive (labor, costs), and
duplication of work
- Broad LCA expertise in Switzerland (LCI and LCIA)
- Demand for consistent LCI data of basic commodities for
 - Widespread application of LCA (e.g., in IPP)
 - specific tools such as planning tools in the building sector,
design for environment (manufacturing sector), etc.



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Therefore: ecoinvent 2000 Database



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- Joint Swiss LCA database (w/ international applicability)
- Consistent, harmonized, and quality controlled LCI data
- Matching LCIA data (equivalency factors)
- Newest LCIA methods (including the new IMPACT 2002+ method)
- Data in different levels of aggregation (unit-process on level of data collection as well as aggregated cradle-to-gate data)
- Inexpensive LCA data access via the Internet

Leads to:

- Enhanced feasibility of LCA application (reduced data efforts)
- Increased credibility and acceptance of LCA (transparency)
- Establishment of LCA as a tool to support routine and strategic decision-making in LCM, IPP, etc.

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

The logo for EPA (Environmental Protection Agency), featuring the letters "EPA" in white on a red rectangular background.

The logo for FSO (Federal Statistical Office), consisting of the letters "FSO" in a bold, black, sans-serif font.

The logo for EMPA (Empire of Materials), featuring a red shield with a white cross and the letters "EMPA" in black.

The logo for EAWAG (Eidgenössische Anstalt für Wasserbau und Gewässerforschung), featuring a stylized blue and white circular graphic.

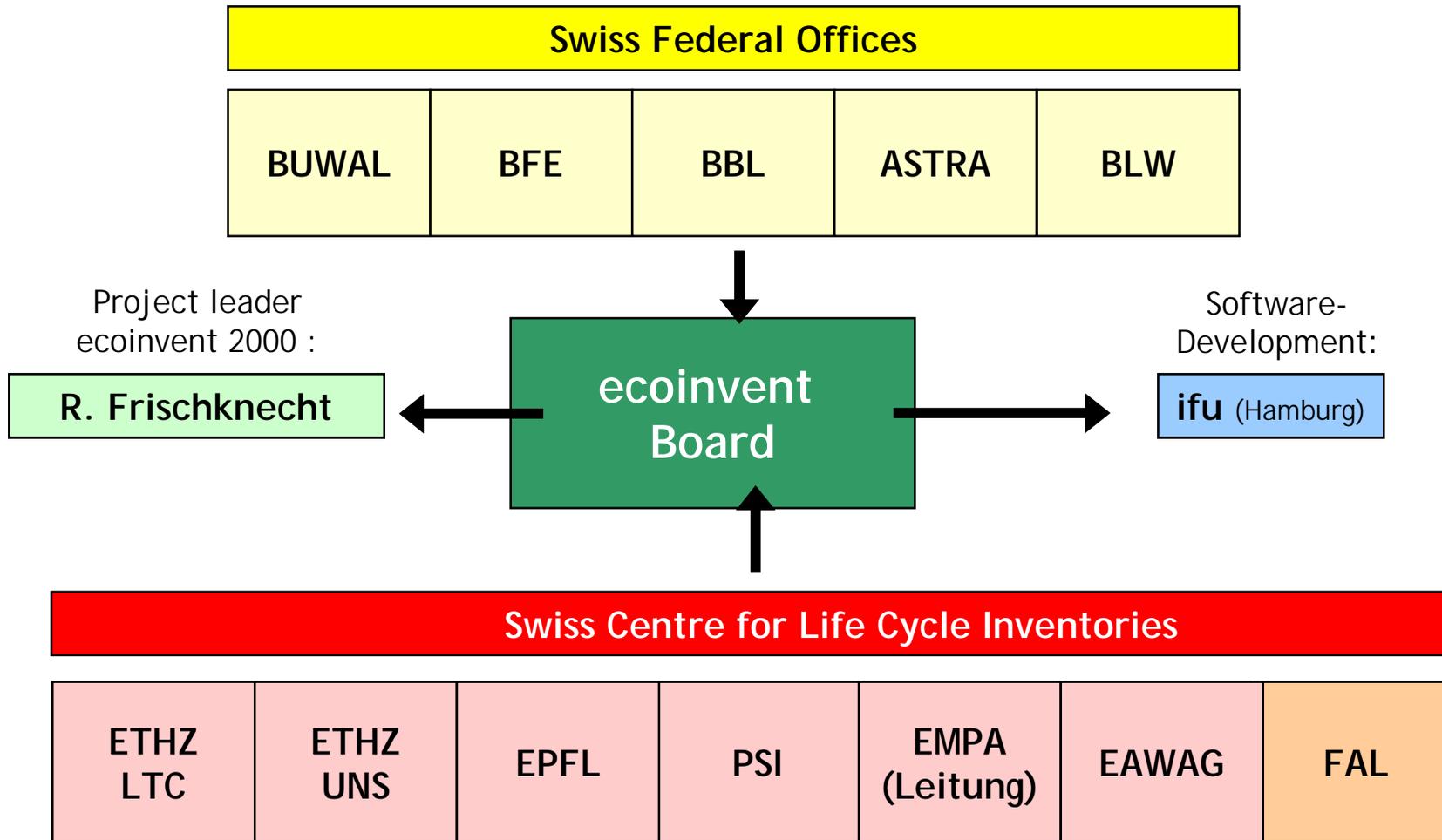
The logo for FAL (Federal Agency for Life Cycle Assessment), featuring a stylized graphic with a cross and the letters "FAL" below it.

Project Partners



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LCI DB: Economic Sectors Covered



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EMPA SG

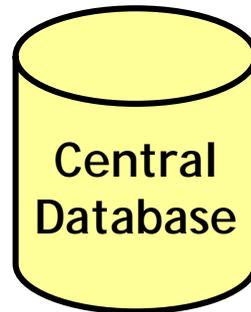
- Plastics
- Paper & cardboard
- Basic chemicals
- Detergents
- Waste treatment

FAL

- Agriculture

PSI

- Energy supply
 - > Fuels
 - > Electricity
 - > Heat



ETHZ ICB

- Basic chemicals

ETHZ UNS

- Transports

EMPA Dü

- Metals
- Building materials
- Wood & Forestry
- Basic chemicals

Main Features of LCI Datasets



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- Same approach and level of detail for all processes included
- Processes are interlinked:
change in electricity mix causes change in environmental performance of all other datasets
 - ➔ selected updates possible, consistency maintained
- Min/mean/max values for all datasets
- Quality control measures (reviews) implemented
- Standardized data(exchange) format
- Not focused on a specific application field (such as construction / architecture) ➔ broad application

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The logo for EMPA (Empa - Swiss Federal Laboratories for Materials Science and Technology), featuring a red shield with a white cross and the letters "EMPA" in black.

The logo for EAWAG (Eidgenössisches Anstalt für Wasserbau und Luftreinhaltung), featuring a blue circular emblem with a white cross and the letters "EAWAG" in black.

The logo for FHNW (Fachhochschule Nordwestschweiz), featuring a black and white emblem with a cross and the letters "FHNW" in black.

EcoSpold: ecoinvent Data Format



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- Data exchange between project partners
- Extensive documentation
- Confidential implementation of LCI raw data possible
- Efficient implementation of LCI data in LCA software systems
- Based on SPOLD 97/99 data format
- Adapted to ISO Technical Specification 14048

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The logo for FSO (Federal Office for the Environment), featuring the letters "FSO" in a bold, black, sans-serif font on a grey rectangular background.

The logo for EMPA (Empa - Swiss Federal Laboratories for Materials Science and Technology), featuring a red shield-like shape on the left and the letters "EMPA" in a bold, black, sans-serif font on the right.

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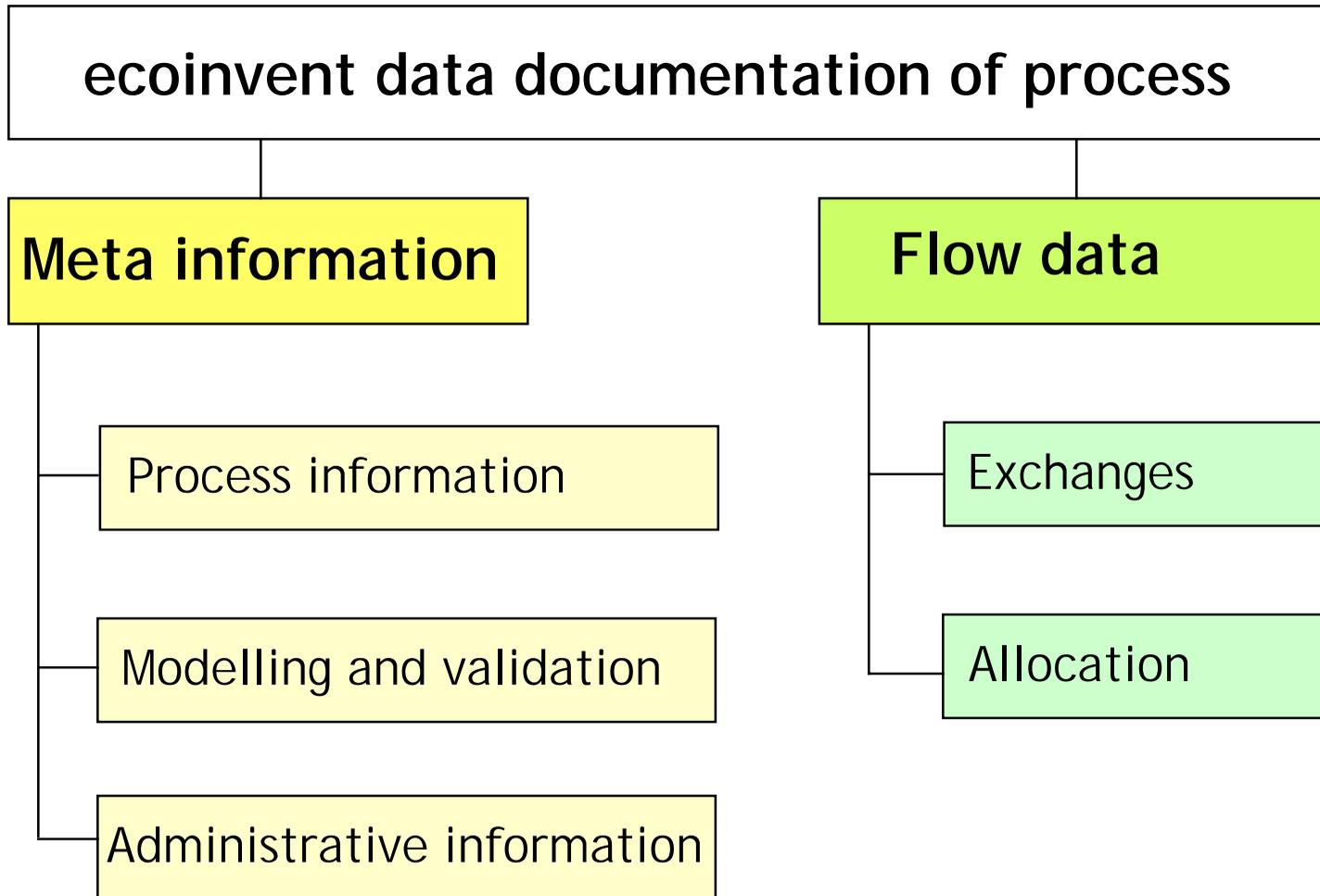
The logo for FAL (Federal Agency for Air Quality), featuring a grey square with a white cross on the left and the letters "FAL" in a bold, black, sans-serif font on the right.

Structure of Data Format



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EcoSpold Fields: Data Requirements



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Field	Unit proc.	Results	Elem. flows	Impact ass.
ReferenceFunction	Always	Always	Always	Always
Geography	Always	Always	Never	Never
Technology	Possible	Possible	Never	Never
TimePeriod	Always	Always	Never	Possible
DataSetInformation	Always	Always	Always	Always
Representativeness	Possible	Possible	Never	Never
Sources	Always	Always	Never	Always
Validations	Possible	Possible	Possible	Possible
DataEntryBy	Always	Always	Possible	Always
DataGeneratorAndPublication	Always	Always	Never	Always
Persons	Always	Always	Possible	Always
Exchanges	Always	Always	Never	Always
Allocations	Possible	Never	Never	Never



Meta Information in Web-Interface



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Meta information	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
Process information	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
Reference function	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
name	electricity, medium voltage, production UCTE, at grid
localName	Strom, Mittelspannung, Produktion UCTE, ab Netz
infrastructureProcess	no
unit	kWh
category	electricity
subCategory	supply mix
localCategory	Elektrizität
localSubCategory	Versorgungsmix
amount	1
includedProcesses	crade to busbar emissions, including construction, operation and dismantling of power plants
infrastructureIncluded	yes
datasetRelatesToProduct	yes
Geography	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
location	UCTE
Technology	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
text	average power plant technologies
Time period	electricity, medium voltage, production UCTE, at grid, UCTE, [kWh]
dataValidForEntirePeriod	yes
startYear	1990
endYear	1995



Flow Information in Web-Interface

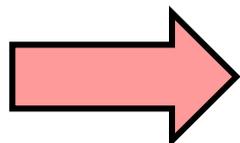


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Flow data								steel, converter, low-alloyed, at plant, RER, [kg]
Exchanges								steel, converter, low-alloyed, at plant, RER, [kg]
From Nature								steel, converter, low-alloyed, at plant, RER, [kg]
Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%	
resource/ in water								
3905	Water, unspecified natural origin		no	0.0027	m3	lognormal	1.11	
From Technosphere								steel, converter, low-alloyed, at plant, RER, [kg]
Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%	
chemicals/ inorganics								
301	oxygen, liquid, at plant	RER	no	0.0714	kg	lognormal	1.11	
construction materials/ additives								
474	quicklime, in pieces, loose, at plant	CH	no	0.0425	kg	lognormal	1.11	
construction materials/ others								
523	dolomite, at plant	RER	no	0.00275	kg	lognormal	1.11	
electricity/ production mix								
664	electricity, medium voltage, production UCTE, at grid	UCTE	no	0.0219	kWh	lognormal	1.11	
hard coal/ fuels								
832	hard coal coke, at plant	RER	no	0.00025	MJ	lognormal	1.11	
metals/ extraction								
1065	blast oxygen furnace converter	RER	yes	1.33E-11	unit	lognormal	3.23	
1095	ferrochromium, high-carbon, 68% Cr, at plant	GLO	no	0.0147	kg	lognormal	1.07	



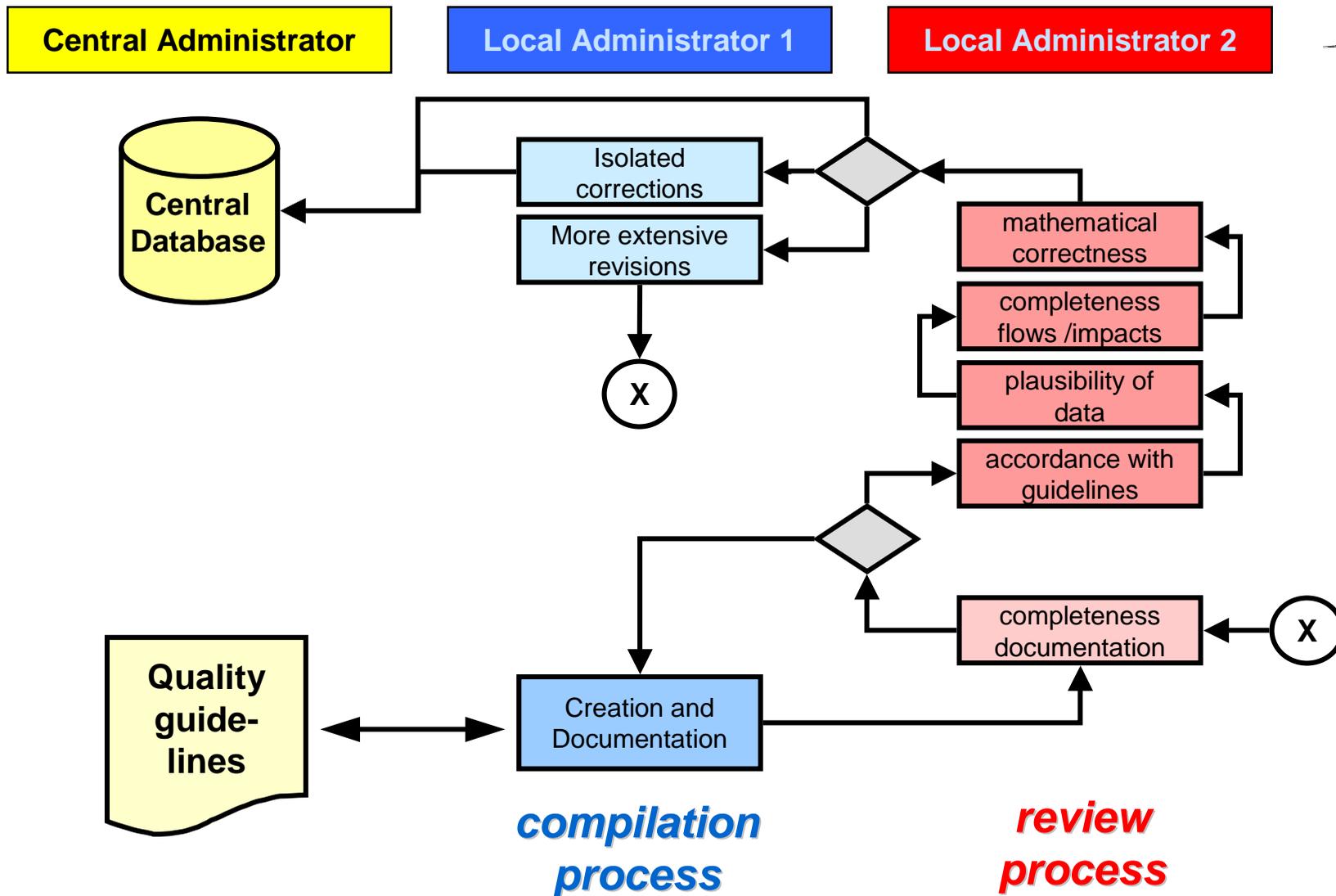
ecoinvent tool for conversion to MS Excel files available

Data Compilation & Quality Control



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LCIA Implementation: State of the Art Impact Assessment Methods



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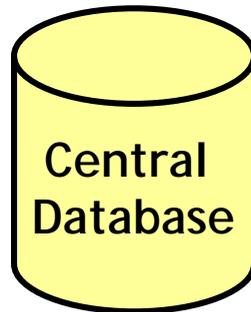
- Ecological scarcity (UBP'97) (CH)
- EDIP-Method (DK)

EPFL

- Impact 2002+ (CH)

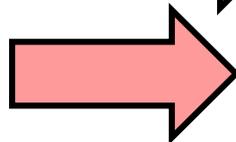
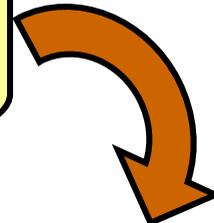
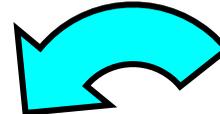
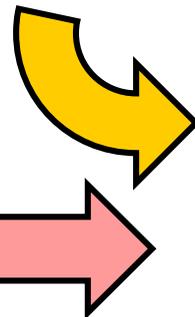
PSI

- External Costs (ExternE; EU)
- EPS 2000 (SE)



ETHZ UNS

- Eco-Indicator'99 (NL)
- CED (GLO)



EMPA Dü

- CML Method 2001 (NL)

Majorecoinvent Clients: Software Makers (resellers)

- Carbotech AG (Emis, CH), client
- ecobilan / PWC (Team, FR), in discussion
- ifu / ifeu (Umberto, DE), client
- KCL (KCL, FI), in discussion
- PE Europe (GaBi, DE), in discussion
- Pira (PEMPS, GB), in discussion
- PRé Consultants (SimaPro, NL), client
- Sinum (Regis, CH), in discussion

will (likely) implementecoinvent data into their software



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The logo for EMPA (Empa - Swiss Federal Laboratories for Materials Science and Technology), consisting of a red shield-like shape followed by the letters "EMPA" in a bold, black sans-serif font.

The logo for EMSL (Environmental Monitoring Systems Laboratory), consisting of a stylized blue and white circular graphic followed by the letters "EMSL" in a black sans-serif font.

The logo for E.ON, consisting of a stylized black and white graphic followed by the letters "E.ON" in a black sans-serif font.

Other Cooperation Activities

- Germany:
LCI network (Karlsruhe University, Germany)
 - United States of America:
National LCI database (G. Norris, Boston, USA)
 - European Union:
LCA database initiative (European Commission, Ispra)
 - International: Life Cycle Initiative (UNEP/SETAC,
Paris/Brussels)
- Not yet established:
- Asia: LCI database activities



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Database Access



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- www.ecoinvent.ch
- Registration required
 - Guest
 - Member
- Access rights **Guest**:
 - Meta information of all processes and impact assessment methods
- Access rights **Member**:
 - access rights Guest +
 - Inventory raw data and -results of all processes
 - Download of all data sets
 - extensive final reports (documentation, on CD-ROM, 1st quarter 2004)
- Cost: 1200 € per license

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Current State and Outlook



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- ecoinvent data v1.0 online since September, 2003
- Ecoinvent data v1.0 contains data on more than 2500 processes
- Regular updates planned (every 2-3 years)
- Extension to other economic sectors planned, e.g.
 - Mechanical industry
 - Electronics industry
 - Food industry

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The logo for the Swiss Federal Office of Statistics (FSO), featuring the letters "FSO" in a stylized, black, sans-serif font.

The logo for the Swiss Federal Laboratories for Materials Science and Technology (EMPA), featuring a red shield-like shape with the letters "EMPA" in white.

The logo for the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), featuring a stylized blue and white circular graphic with the letters "EAWAG" in black.

The logo for the Swiss Federal Laboratories for Agricultural and Fisheries Research (FAL), featuring a stylized black and white graphic with the letters "FAL" in black.

Summary



- ecoinvent Centre builds on Swiss LCA capacity (institutionalized)
 - Fully harmonized LCA methodology
 - Ecoinvent database provides fully consistent and quality controlled LCI data
 - No limitations in terms of impact assessment
 - Major software makers implement ecoinvent data v1.0
 - Lower costs and higher efficiency for LCA studies (focusing on specific processes of interest is facilitated)
- ➔ Preconditions fulfilled to promote/enable wide-spread application of LCA

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The logo for FHNW (Fachhochschule Nordwestschweiz), consisting of a grey square with a white cross-like graphic and the letters "FHNW" in a bold, black, sans-serif font.

Ecoinvent data Version 1.0 online

- Database accessible at:

www.ecoinvent.ch



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