

Life cycle inventory modelling in the Swiss national LCI database ECOINVENT 2000

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Project Management: ESU-services

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Content

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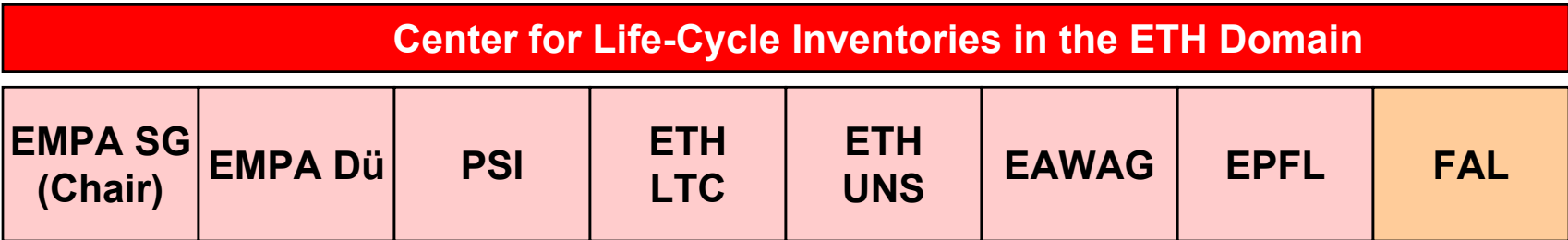
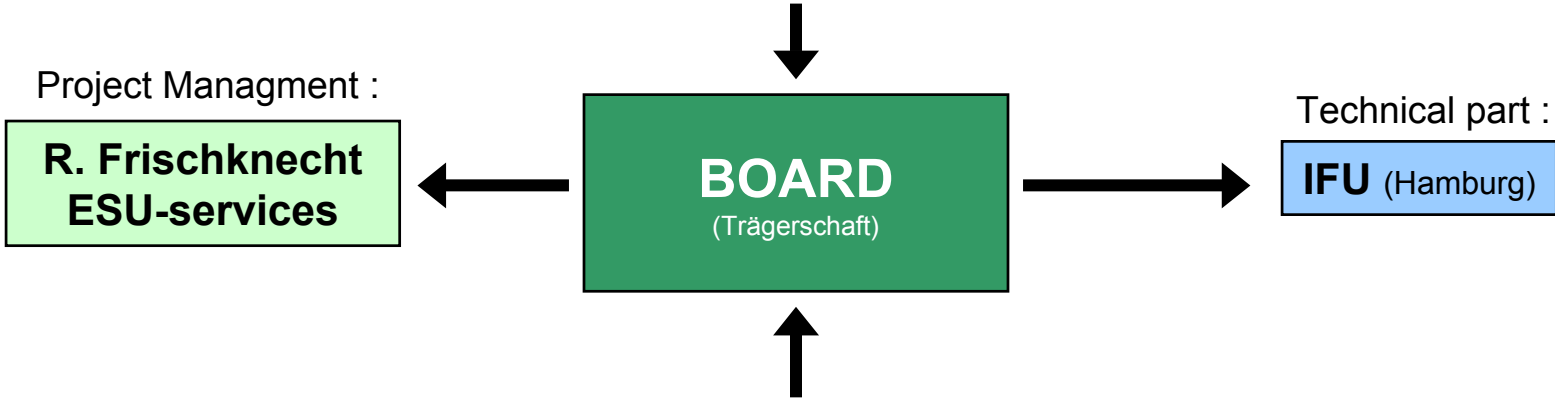
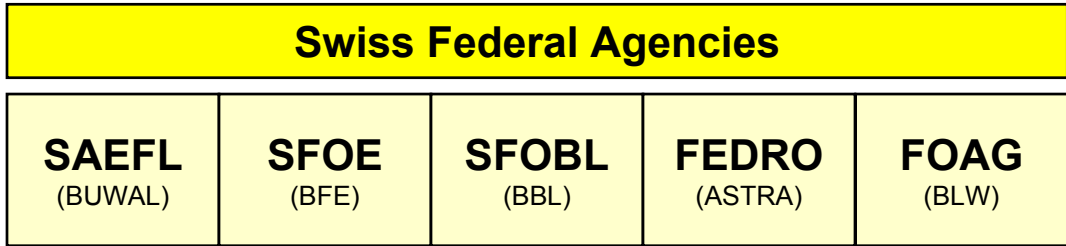
Problem Setting

- Various LCI databases in Switzerland
- Diversity in approaches
- Database maintenance beyond expertise
- Incompatibility between various LCI datasets
- No linkage between LCI data, e.g. energy <-> agriculture

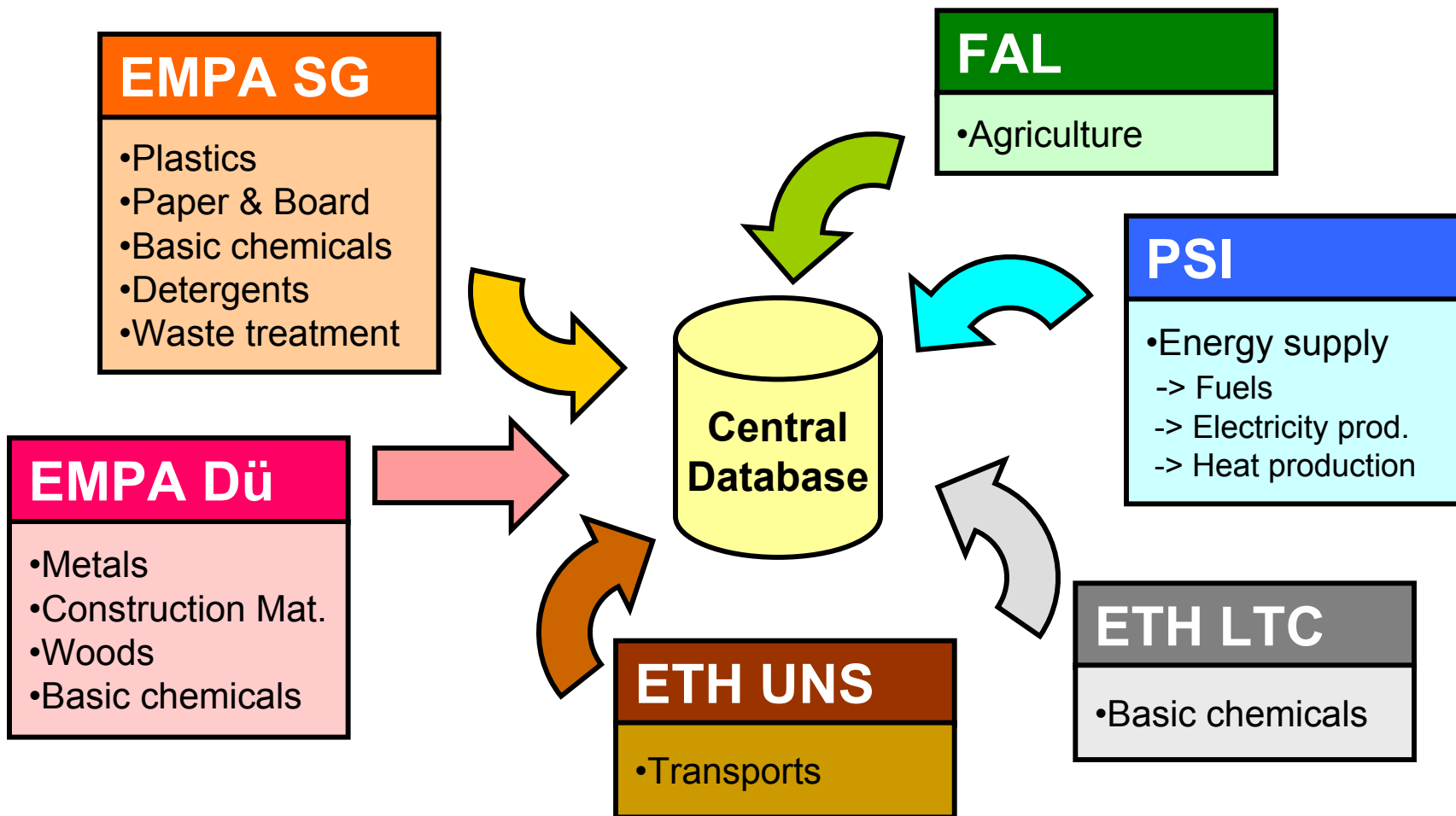
Aims of Ecoinvent 2000

- Centralised, web-based LCI database
- Up-to-date harmonised LCI and LCIA data for Swiss / European LCA applications
- New benchmark setting in area of LCI database

Project Partners



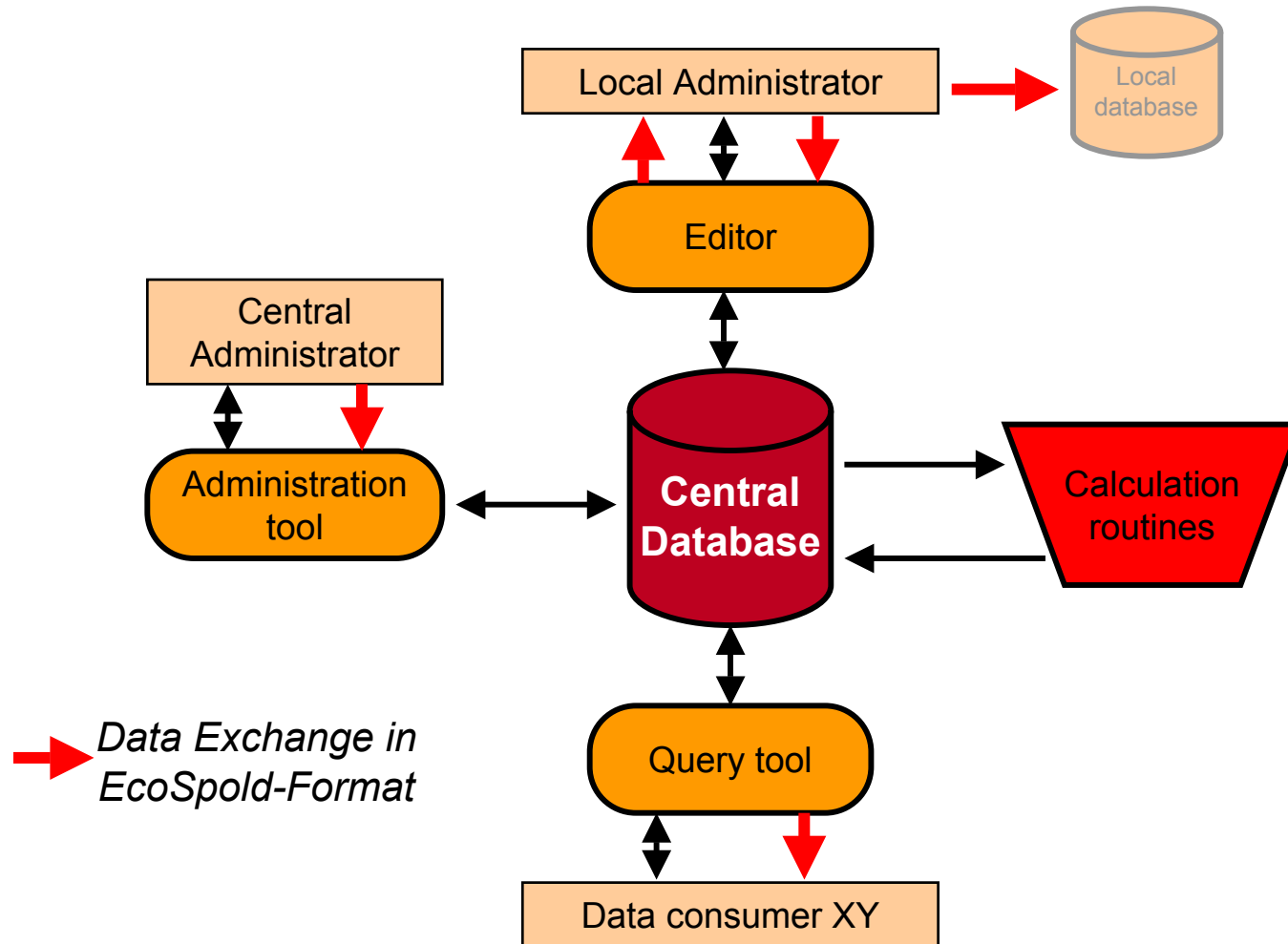
Database Content



Database Content (II)

Energy	oil	Materials
	natural gas	
	lignite	
	hard coal	
	wood energy	
	nuclear power	
	hydro power	
	wind power	
	photovoltaic	
	solar collector	
electricity	construction materials	
heat pumps	insulation materials	
district heating	construction processes	
cooling	metals	
transport systems	wooden materials	
waste management	chemicals	
water supply	paintings	
	washing agents	
	plastics	
	glass	
	paper & cardboard	
	biomass	Agriculture
	agricultural production	
	agricultural means of production	
	food industry	Cons.
	private consumption	
	others	

Architecture of Ecoinvent 2000



Data (Exchange) Format: EcoSpold Format

- Derived from Spold'99 format
- XML (Extended Markup Language):
 - adjustable to different requirements
 - downward compatibility
 - using XML schemes instead of Document Type Definitions (DTD)

Data (Exchange) Format: Content

- Meta information
 - process information (geography, time period, etc.)
 - modelling and validation
 - administrative information
- Flow data
 - Exchanges
 - From nature: resource extraction
 - To nature: emissions
 - From technosphere: electricity
 - To technosphere: products
 - Allocation

Basic information		magnesium, at new production plant, RER, [kg]
<i>Process information</i>		<i>magnesium, at new production plant, RER, [kg]</i>
Reference function		magnesium, at new production plant, RER, [kg]
assetRelatesToProduct	yes	
name	magnesium, at new production plant	
displayName	Magnesium, ab Neuanlage	
structureProcess	no	
quantity	1	
unit	kg	
category	metals	
subCategory	extraction	
parentCategory	Metalle	
parentSubCategory	Gewinnung	
includedProcesses	Ressource extraction until gate of the factory	
generalComment	Large uncertainties exist for data on energy use and SF6 emissions during magnesium production. This inventory describes the production of magnesium in a state of the art or a new production facility.	
UNNumber	7439-95-4	
structureIncluded	0	
aliases		
Geography		magnesium, at new production plant, RER, [kg]
location	RER	
description	Data for 1 producer	
Technology		magnesium, at new production plant, RER, [kg]
technology	Extraction from seawater	
Time period		magnesium, at new production plant, RER, [kg]
validForEntirePeriod	yes	
publicationDate	Date of publications	
startYear	1998	
endYear	1998	
Asset information		magnesium, at new production plant, RER, [kg]

Raw data **magnesium, at new production plant, RER, [kg]**

exchanges *magnesium, at new production plant, RER, [kg]*

From Nature **magnesium, at new production plant, RER, [kg]**

Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%
<i>resource/in water</i>							
23	Magnesium, 0.13% in water		no	1	kg	lognormal	1.05
<i>resource/land</i>							
18	Occupation, industrial area		no	9.46969696969697E-03	m2a	lognormal	1.63274993714415
20	Transformation, from industrial area		no	0.189393939393939	m2	lognormal	2.10840122873172
19	Transformation, from unknown		no	0.189393939393939	m2	lognormal	2.10840122873172
22	Transformation, to industrial area		no	0.189393939393939	m2	lognormal	2.10840122873172
21	Transformation, to unknown		no	0.189393939393939	m2	lognormal	2.10840122873172

From Technosphere **magnesium, at new production plant, RER, [kg]**

Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%
8	charcoal, at plant	RER	no	0.45	kg	lognormal	1.2620910621938
7	disposal, decarbonising waste, 30% water, to residual material landfill	CH	no	0.186	kg	lognormal	1.5688282451057
5	disposal, separator sludge, 90% water, to hazardous waste incineration	CH	no	0.0574	kg	lognormal	1.5688282451057
1	electricity, hydropower, at power plant	UCTE	no	21.5384615384615	kWh	lognormal	1.1046951289859
2	natural gas, burned in industrial furnace >100kW	RER	no	38.7	MJ	lognormal	1.5681449998445
9	sulphur hexafluoride, liquid, at plant	RER	no	0.0007	kg	lognormal	1.2164594125584
10	tap water, at user	RER	no	248	kg	lognormal	1.2164594125584
4	transport, freight, rail	RER	no	0.27042	tkm	lognormal	2.0477151450930
3	transport, truck, 40t	RER	no	0.04507	tkm	lognormal	2.0477151450930
6	treatment, sewage, from residence, to wastewater treatment, Class 2	CH	no	0.248	m3	lognormal	1.3068869189023

Reference Product **magnesium, at new production plant, RER, [kg]**

Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%
24	magnesium, at new production plant	RER	no	1	kg	lognormal	1.0

Nature						magnesium, at new production plant, RER, [m		
Number	Name	Location	Infra	Mean value	Unit	Uncertainty type	SD95%	
low population density								
2	Carbon dioxide, biogenic		no	1.32	kg	lognormal	1.24233591712	
6	Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin		no	0.0000000000232	kg	lognormal	3.00703658191	
1	Heat, waste, from non-renewable resource		no	49.7	MJ	lognormal	1.21523964940	
3	Hydrogen chloride		no	0.002	kg	lognormal	2.00742829068	
5	Sulfur dioxide		no	0.00241	kg	lognormal	2.00742829068	
4	Sulfur hexafluoride		no	0.0007	kg	lognormal	2.00742829068	

er/river							
7	Chlorinated solvents, unspecified		no	0.0000000246	kg	lognormal	2.00742829068

ailed Exchanges

m Nature

magnesium, at new production plant, RER, [m							
Occupation, industrial area (18)							
Item Name				mean Value	9.46969696969697E		
Item Category				min Value			
Item Subcategory				max Value			
Item Number				mostlikely Value			
Formula				reference to Source			
General Comment	(4,4,1,3,1,5); Estimatisation from map and photo			page Numbers			
Transformation, from unknown (19)							
Item Name				mean Value	0.189393939393		
Item Category				min Value			
Item Subcategory				max Value			
Item Number				mostlikely Value			
Formula				reference to Source			
General Comment	(4,4,1,3,1,5); Application of standard procedure			page Numbers			

Procedure Data Compilation

- Data supply by individual institutes on a unit process level
- Only direct (in situ) Emissions and requirements
 - => Maximum transparency
 - => Full compatibility

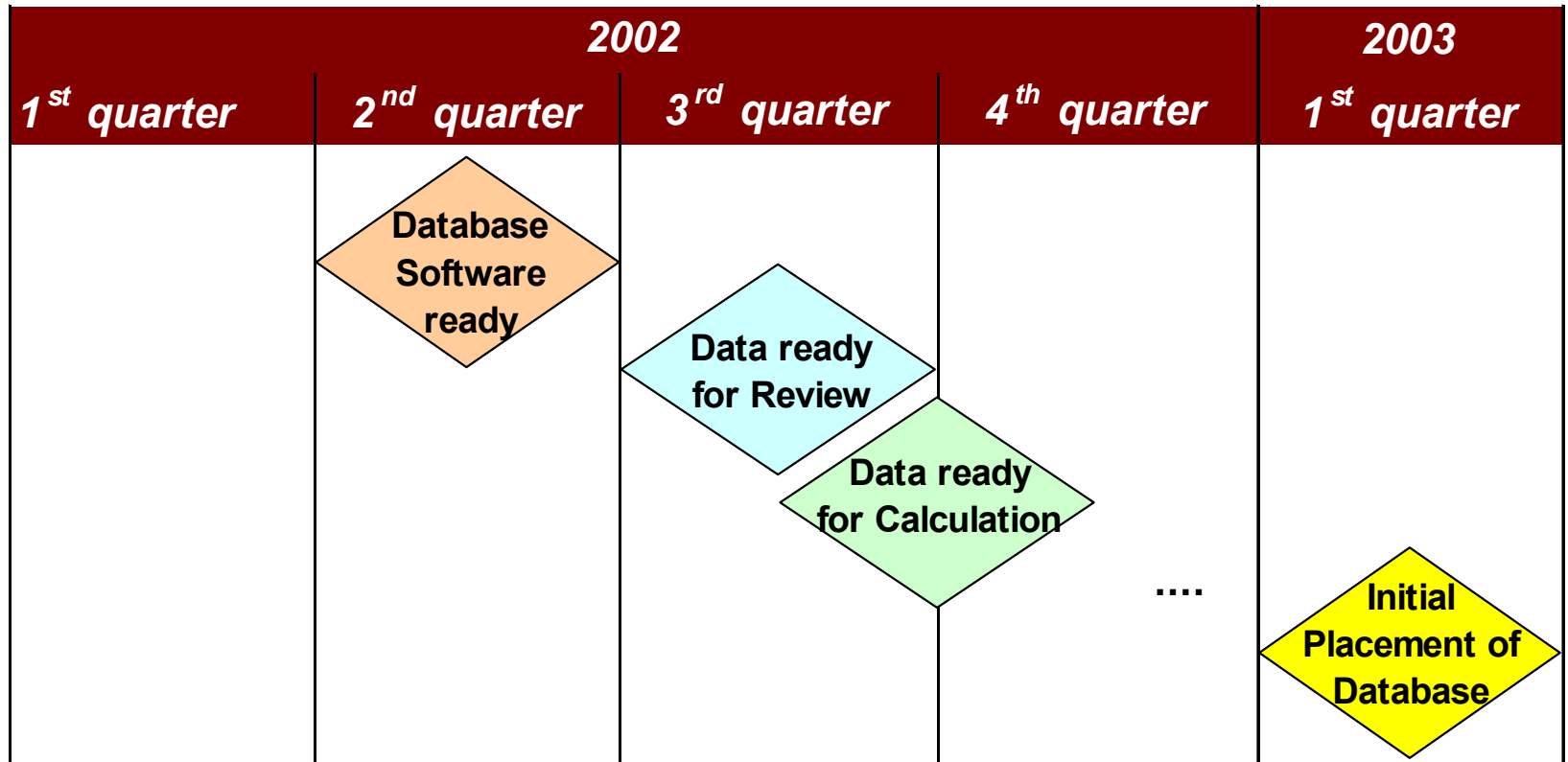
Outlook I

- XML to facilitate LCI data exchange between LCA software
- Efficient inversion routines for large sparse matrices
- Compatibility with international standards

Outlook II

- Regular update of database content
- Continuous improvement of database
- Include additional economic sectors
- Establish Swiss competence center on Life Cycle Assessment

Schedule

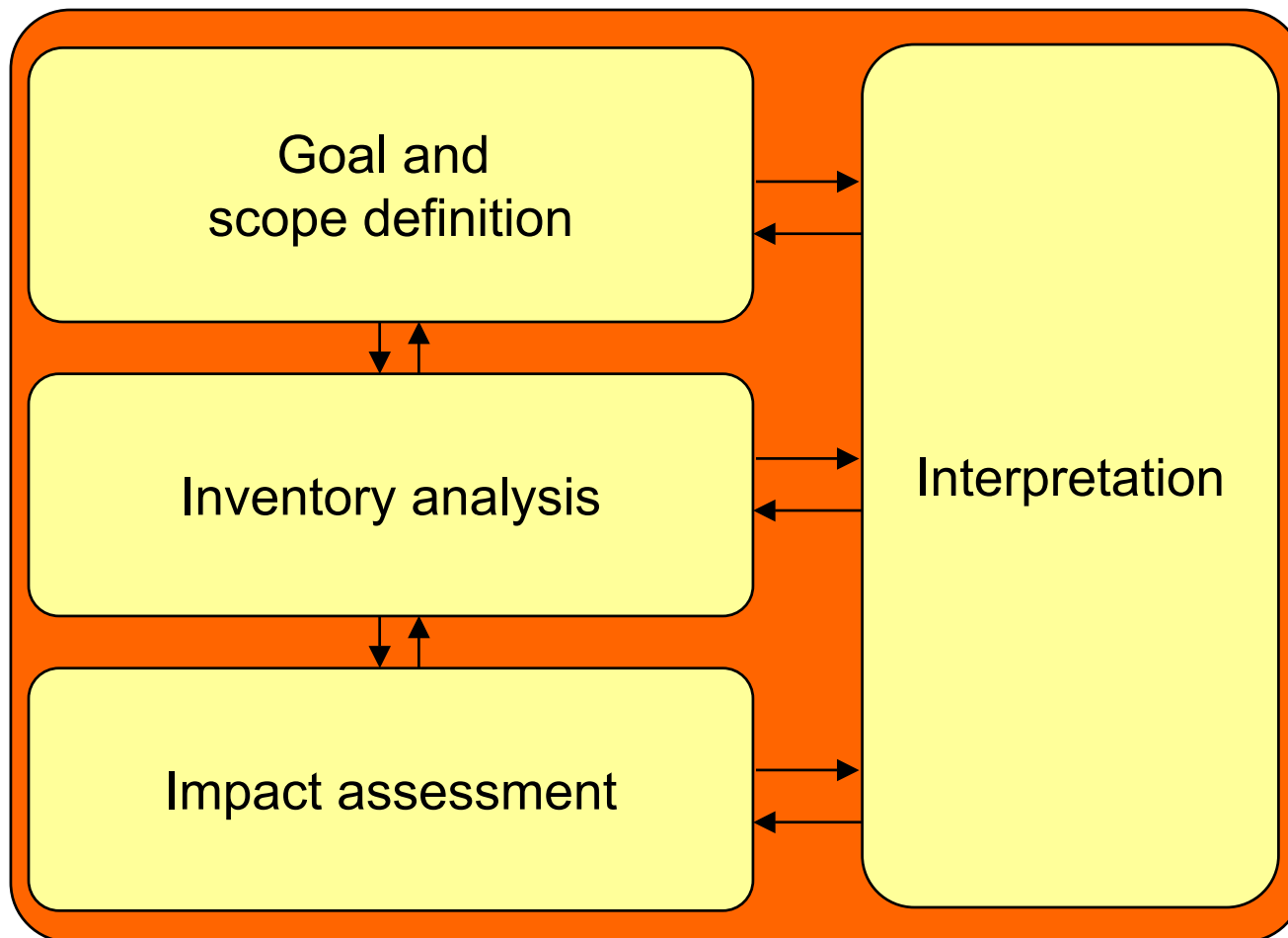


Further Information on:

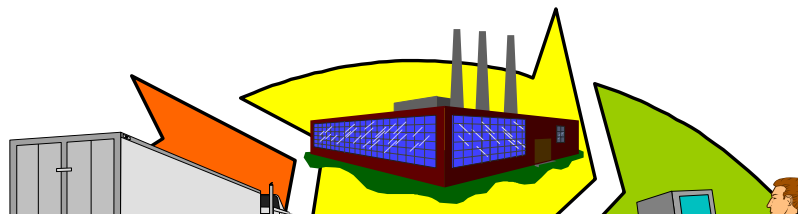
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Further Information

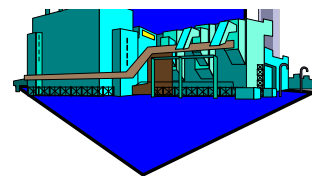
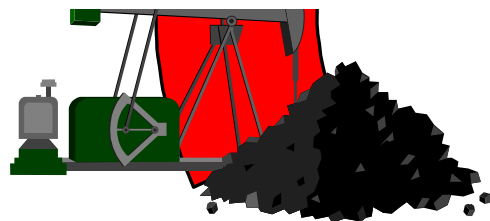
Life Cycle Assessment



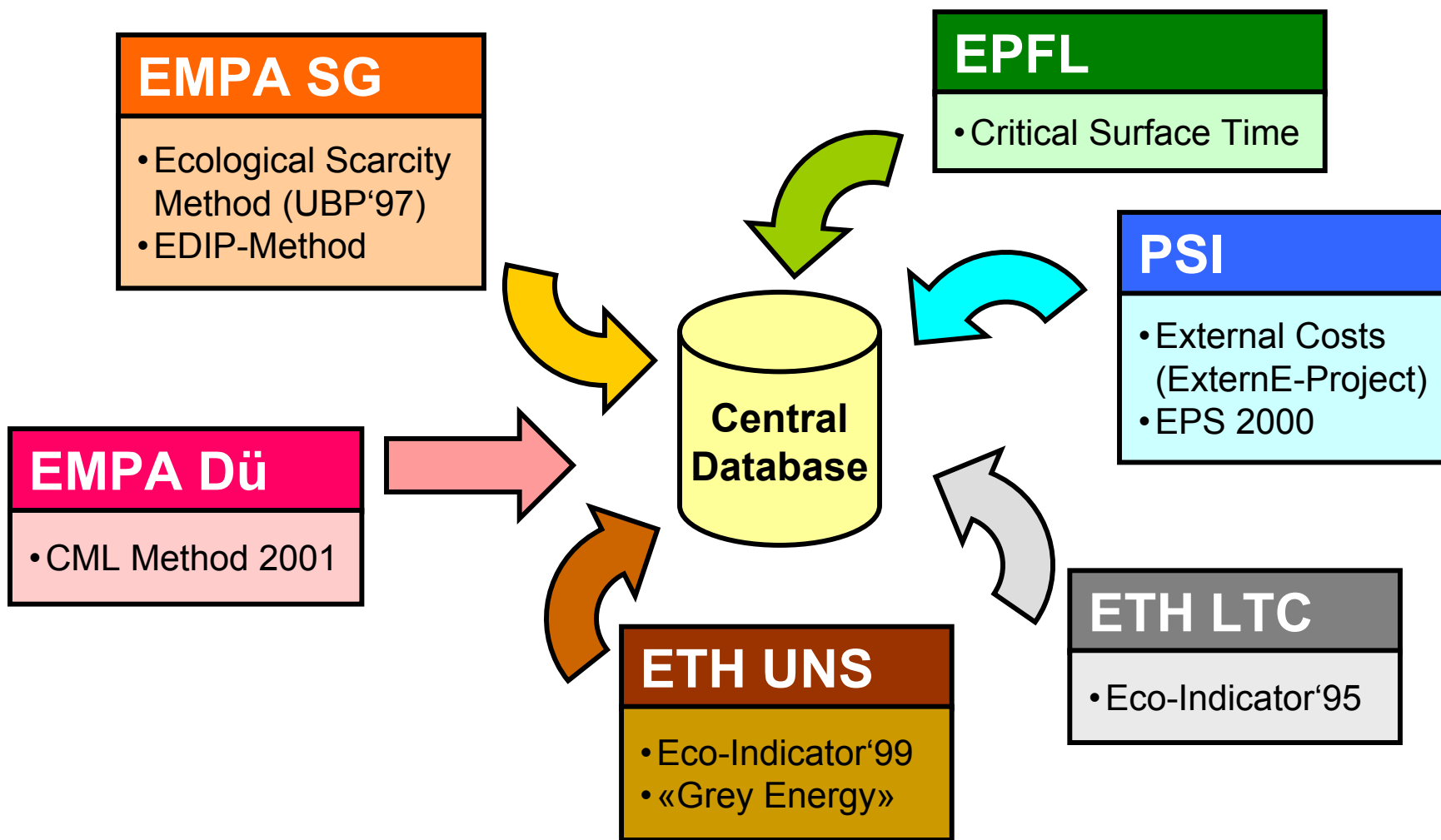
Your Benefit



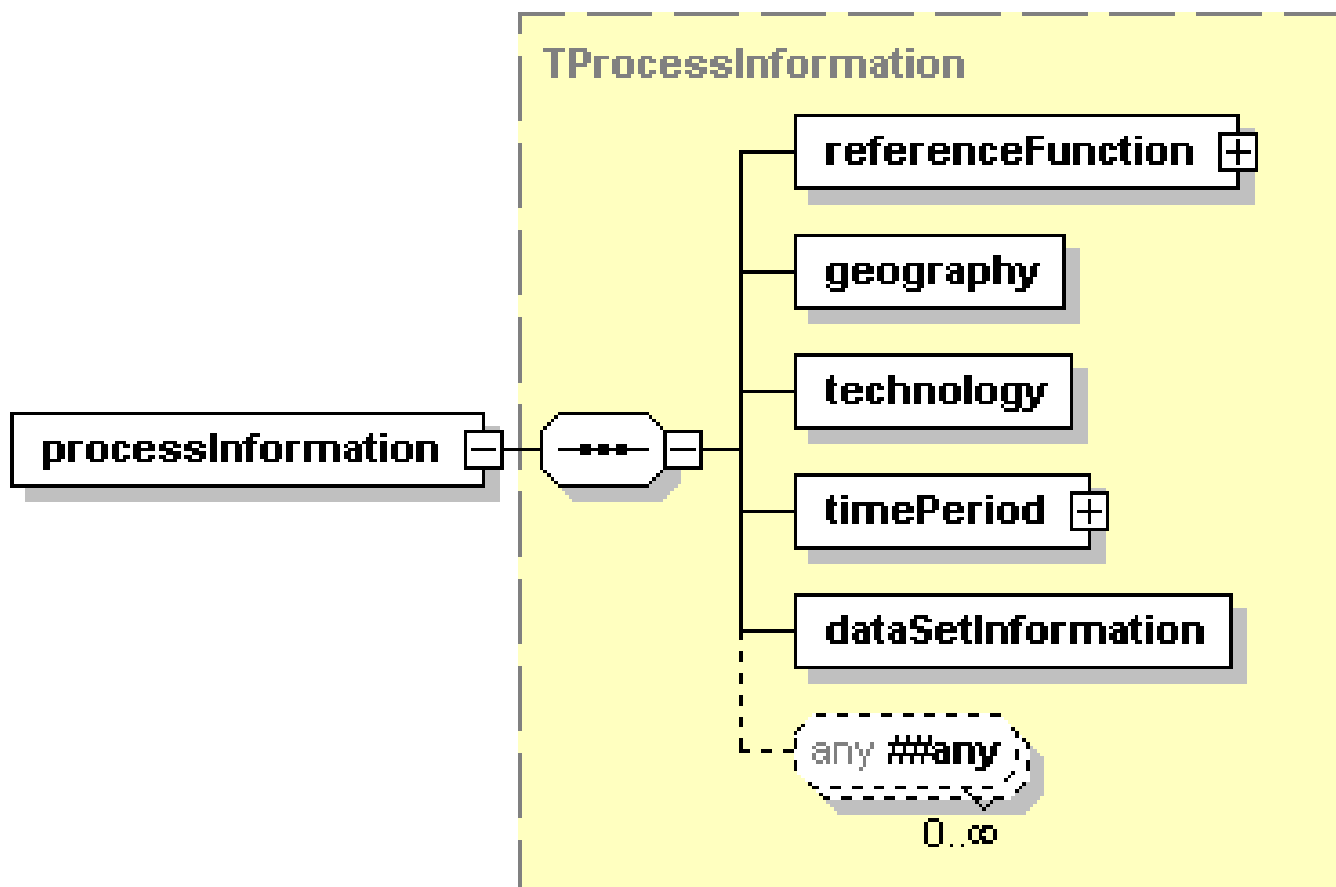
Ecoinvent allows **for the first time**
to calculate **complete value added chains**
from Cradle to Grave !



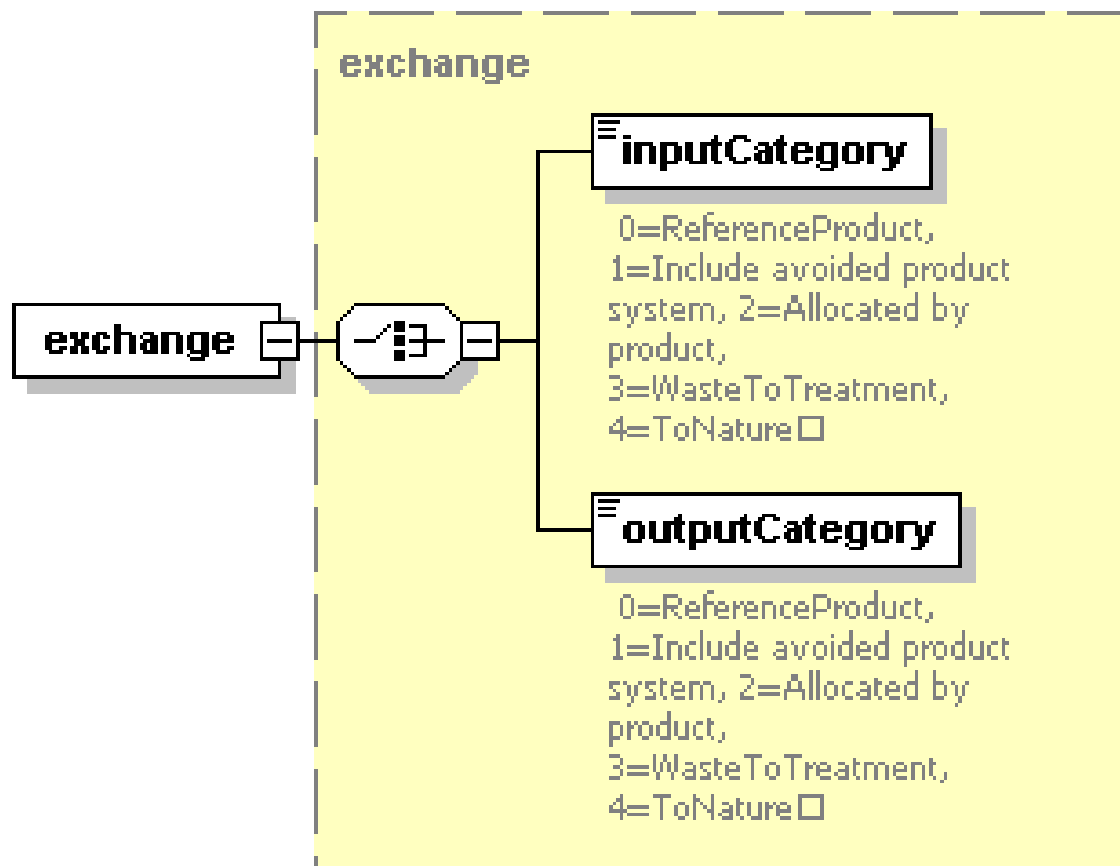
Database Content (III)



Data (Exchange) Format: Details for Process Information



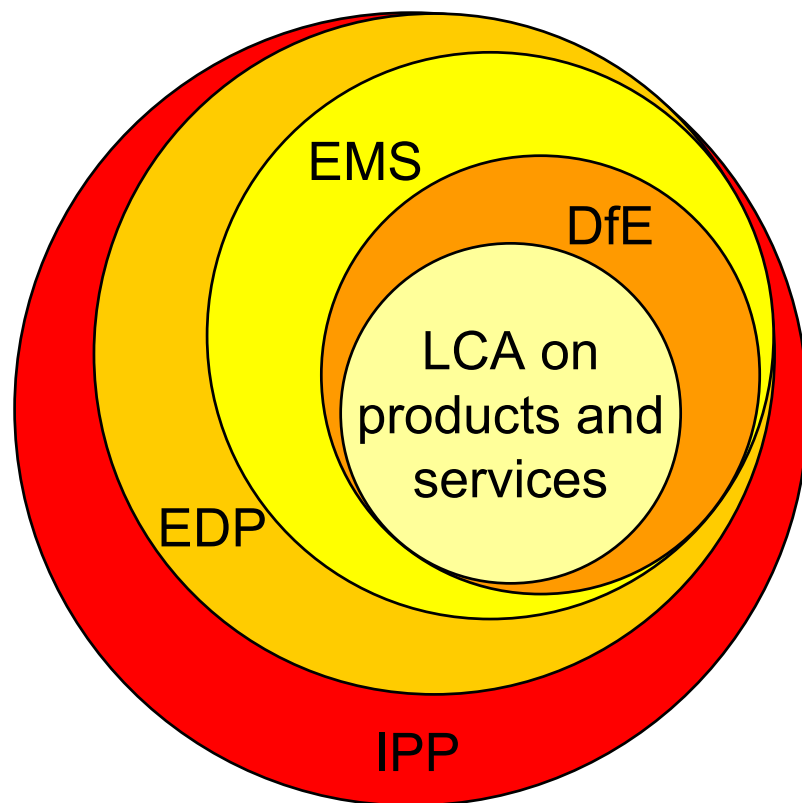
Data (Exchange) Format: Details for Exchange



Unit Process Data

		Unit Processes	
		Transport by Crude Oil Carrier	Heavy Fuel Oil from Refinery
unit		tkm	t
<i>(i) From / To Technosphere</i>			
Transport by Crude Oil Carrier	tkm	1	-10'000
Heavy Fuel Oil from Refinery	t	-1.80E-06	1
<i>(ii) To Nature:</i>			
CO2, Carbon dioxide	g	5.5	180000
SOX, Sulphur oxides	g	0.13	1000
NMVOC	g	8.30E-04	500

Application of Ecoinvent 2000 Database



DfE - Design for Environment

EMS - Environmental Management
Systems

EDP - Environmental Product
Declaration

IPP - Integrated Product Policy