



Documentation of changes implemented in the ecoinvent database v3.3 (2016.08.15)

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1 Introduction

This report covers the changes to the ecoinvent database between version 3.2, released in 2015 and version 3.3, released in 2016. It describes both the database-wide changes that affect the whole database as well as the specific changes in the different sectors. These changes consist in the addition of new datasets, in the deletion of outdated ones, and in the re-modelling or corrections of others.

All changes described in this report potentially affect or modify impact assessment results, even when they seem as minor as changing an activity link. The description of the changes has been provided to help the users with the interpretation and understanding of the possible changes in results they might encounter.

For a full comparison between the versions of the database, consisting of a listing of all flows affected by changes and the actual amounts changed, the Change Report Annex¹ can be downloaded as an excel file from the ecoinvent website² by license holders only.

The Correspondence File³ between ecoinvent version 3.2 and ecoinvent version 3.3, which is freely available on the ecoinvent website, can be used when transferring projects to the newest ecoinvent version 3.3 database.

¹ File name: ecoinvent 3.3_Change Report_including Annex.zip

² <https://v32.ecoquery.ecoinvent.org/File/Files>

³ File name: ecoinvent_correspondence_file_eiv3.2_to_eiv3.3_FINAL

2 Database-wide changes

For version 3.2, a few aspects have been corrected throughout the whole database. They are covered in this chapter of the report.

2.1 Renamed exchanges and activities

Some activities or products were renamed for version 3.3. The changes are listed in the following tables, and also treated in the following chapters if associated to a change in the modelling.

Table 1. Intermediate exchanges renamed for version 3.3. Most of the changes aim to improve the product name.

Name of exchange in version 3.2	Name of exchange in version 3.3
ash, from combustion of bagasse from sugar cane	ash, from combustion of bagasse from sugarcane
coconut, husked	coconut, dehusked
harvesting, by complete harvester, potatoes	harvesting, by complete harvester, ground crops
rock wool	stone wool
rock wool factory	stone wool factory
rock wool, packed	stone wool, packed
tree seedling	tree seedling, for planting

Table 2. Activities renamed for v3.3. Most of the changes aim to improve or harmonize the activity name. Some of the new names reflect a change in the modelling (ie. biogas), that will be explained as well in the corresponding chapters.

Activity name in v3.2	Activity name in v3.3
coconut production, husked	coconut production, dehusked
diesel-electric generating set production 10MW production	diesel-electric generating set production, 10MW
ethanol production from sugar cane	ethanol production from sugarcane
field application of ammonium chloride	nutrient supply from ammonium chloride
field application of ash, from combustion of bagasse from sugar cane	nutrient supply from ash, from combustion of bagasse from sugarcane
field application of calcium nitrate	nutrient supply from calcium nitrate
field application of compost	nutrient supply from compost
field application of potassium nitrate	nutrient supply from potassium nitrate
field application of poultry manure, dried	nutrient supply from poultry manure, dried
field application of poultry manure, fresh	nutrient supply from poultry manure, fresh
field application of vinasse, from fermentation of sugar beet	nutrient supply from vinasse, from fermentation of sugar beet
field application of vinasse, from fermentation of sugar beet molasses	nutrient supply from vinasse, from fermentation of sugar beet molasses
field application of vinasse, from fermentation of sugarcane	nutrient supply from vinasse, from fermentation of sugarcane
field application of vinasse, from fermentation of sugarcane molasses	nutrient supply from vinasse, from fermentation of sugarcane molasses
field application of vinasse, from fermentation of sweet sorghum	nutrient supply from vinasse, from fermentation of sweet sorghum
harvesting, by complete harvester, potatoes	harvesting, by complete harvester, ground crops
market for ash, from combustion of bagasse from sugar cane	market for ash, from combustion of bagasse from sugarcane
market for coconut, husked	market for coconut, dehusked
market for diesel-electric generating set production 10MW	market for diesel-electric generating set, 10MW
market for harvesting, by complete harvester, potatoes	market for harvesting, by complete harvester, ground crops
market for rock wool	market for stone wool
market for rock wool factory	market for stone wool factory
market for rock wool, packed	market for stone wool, packed
rock wool factory construction	stone wool factory construction
rock wool production	stone wool production
rock wool production, packed	stone wool production, packed
treatment of biogas, burned in micro gas turbine 100kWe	biogas, burned in micro gas turbine 100kWe
treatment of biogas, burned in polymer electrolyte membrane fuel cell 2kWe, future	biogas, burned in polymer electrolyte membrane fuel cell 2kWe, future
treatment of biogas, burned in solid oxide fuel cell 125kWe, future	biogas, burned in solid oxide fuel cell 125kWe, future
treatment of biogas, burned in solid oxide fuel cell, with micro gas turbine, 180kWe, future	biogas, burned in solid oxide fuel cell, with micro gas turbine, 180kWe, future
treatment of biogas, purification to methane 96 vol-%	biogas purification to methane 96 vol-%

2.2 Product classification

2.2.1 New product classification added: CPC

Until now, every product present in the ecoinvent database had two types of classification for the two attributional system models. Now, we have introduced a classification valid for any system model: the CPC classification.

With the release of ecoinvent v3.3, all products were assigned a CPC code. The United Nations Statistical Division publishes a number of product and activity classifications, among which are the International Standard Industrial Classification (ISIC) and the Central Product Classification (CPC). In the previous versions of the database, as well as in version 3.3, all activities were assigned an ISIC code⁴. The latest available version of ISIC, ISIC Revision 4 (released August 2008), is used.

In version 3.3 the CPC version 2.1 classification, released August 2015, has been added to all products. All information regarding CPC, its structure, and more details can be found on the UNSTATS website⁵. ISIC and CPC classifications are reported in the activity overview file, which can be downloaded from the ecoinvent website under the documents and files section; moreover, a product's classification is also visible accessing the ecoinvent database online searching for the relevant activity and, once the activity page is open, clicking on the desired product.

2.2.2 Product classification changed

Every product present in the ecoinvent database has to have two types of classification for the two attributional system models:

- Allocation, cut-off by classification (recyclable, waste, allocatable)
- Allocation, allocation at the point of substitution (APOS) (MFT or non-MFT)

The classification of the product is essential to determine how allocation will happen in those two system models, so changes in this regard can strongly affect the impact results.

⁴ Read more about the use of ISIC in ecoinvent in the relevant FAQ "What is the ISIC classification field for? To which ISIC classification code does my dataset belong?" on our website.

⁵ <http://unstats.un.org/unsd/cr/registry/cpc-21.asp>

Table 3. Products which had their classification changed from v3.2 to v3.3. If the products that were reclassified from MFT to non-MFT in APOS were also remodelled in the consequential system model with the introduction of a constrained market, this is marked with an asterisk * (see also the respective chapters for full information).

Product name	APOS classification		cut-off classification	
	V3.2	V3.3	V3.2	V3.3
blast furnace slag	MFT	MFT	Waste	Recyclable
biogas	MFT	Non-MFT	Allocatable	Allocatable
compost	MFT	Non-MFT*	Allocatable	Allocatable
cotton-seed meal	MFT	Non-MFT*	Allocatable	Allocatable
manure, liquid, cattle	MFT	Non-MFT*	Recyclable	Recyclable
manure, liquid, swine	MFT	Non-MFT*	Recyclable	Recyclable
manure, solid, cattle	MFT	Non-MFT*	Recyclable	Recyclable
palm kernel meal	MFT	Non-MFT*	Allocatable	Allocatable
poultry manure, dried	MFT	Non-MFT	Recyclable	Recyclable
poultry manure, fresh	MFT	Non-MFT*	Recyclable	Recyclable

2.3 Prices

The prices currently present as a “price” property in the ecoinvent database should represent the “basic price” (Data Quality Guidelines for ecoinvent v3, chapter 5.6.5). The prices for products are needed if economic allocation is to be used in at least one system model; they can also provide additional information on balances (economic balance of inputs and outputs), or can be used by the users for monetary purposes or to further matching ecoinvent data with data on social impacts.

For this release, an effort has been made to ensure that all products that are neither wastes nor MFT have a price. Also, they have been used to perform economic balances of inputs and outputs, to increase consistency of both the undefined Unit Processes, and the prices themselves. Prices have been collected following 2 approaches:

1. Collection of prices from various literature sources or industrial contacts. Typically, FAOSTAT for agricultural products, USGC for minerals and metals, and UN Comtrade for many different products. In quite a few cases - especially chemicals - to find a basic price is extremely hard. In those cases, the second approach is extremely useful.
2. Calculation of price based on the value of the products entering the production. An activity has always at least one reference product and usually many different inputs from technosphere and from the environment. Once the price of the products being used in a certain production is known the (minimal) price of the reference product can be calculated. This is an iterative process that becomes very powerful in terms of ensuring consistency within the activities, and of finding accurate prices.

This minimal price for all the products in the database based on the value of the products entering the production has been calculated based on the value of the inputs entering the production. Labour costs, profit of the producer or expenses for waste treatment are not included. The price calculated like this is thus underestimated - lower than the basic price.

Equation 1 Calculation of the price of the reference product based on input of materials

$$price_{RP} * pa_{RP} = \sum_i pa_{IN_i} * price_{IN_i}$$

$price_{RP}$	price of the reference product
pa_{RP}	reference product amount
pa_{IN}	amount of an input of a product From Technosphere
$price_{IN}$	price of the product input From Technosphere

The price change is an important factor to consider. If a product has had its price modified, this will affect the allocation results (if price was used as allocation factor), and consequently, the impact assessment results. As the whole database is interconnected, changes in the price of one product will influence the price of many other products.

2.3.1 New and updates prices

All the existing prices of products have been re-evaluated. The most common changes include: rounding, correction of errors, and the use of calculated prices instead of price from a source.

There are 2792 products being produced in more than 12'000 undefined (multi- and single- output) activities in ecoinvent v3.3. Out of the 2792 products, 2480 (89%) have a price now. 1331 products had a price already in v3.2. Out of that, 368 (27.6%) have an updated price which is different by more than 5%. 1149 prices are new.

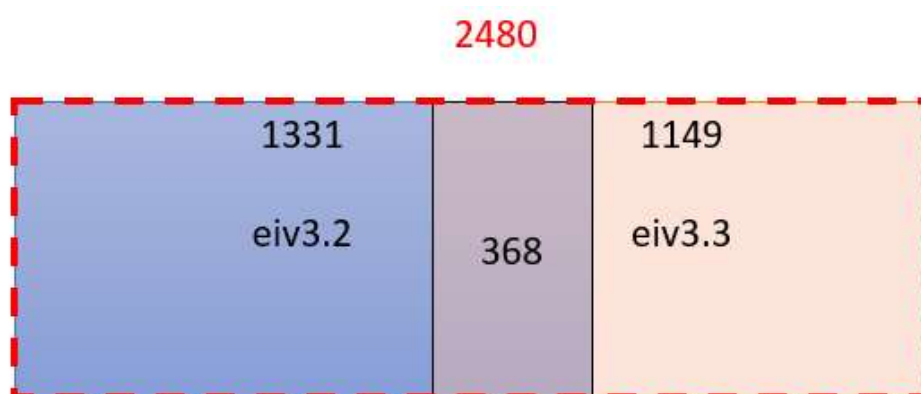


Figure 1 Number of products which have a price in eiv3.2 and eiv3.3

Out of the 2480 products having price in v3.2, 1246 (50.2%) prices are calculated using the economic balance calculation. The exhaustive lists of products where the price was added or updated can be checked in the Annex 1: price change.

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Annex 1: price change.

2.4 True value allocation and “true value relation”

In the ecoinvent attributional system models, the allocation is done using price, unless the property “true value relation” is specifically provided in the original dataset. One important example is the use of exergy to allocate between electricity and heat. Unfortunately, many co-generation activities were lacking the property “true value relation” (exergy) in the heat and electricity exchanges until now. This property has been added for v3.3.

The “true value relation” triggers then in those datasets a true value allocation, using the exergy and the price of the products. This allocation was also been computed incorrectly. This has been corrected now, to follow the description in the data Quality Guidelines, chapter 14.7.4. (see equation 2 below).

Equation 2 True value property calculation

$$\text{True Value} = \frac{tvrp * pa_{out} * \sum p_{rev}}{\sum_i tvrp_i * pa_{out_i}}$$

True Value	true value property of an exchange
tvrp	true value relation property of an exchange
pa _{out}	product output amount
p _{rev}	product revenue

Revenue (p_{rev}) is calculated by multiplying the price with the amount of the exchange.

The activity “heat and power co-generation, natural gas, combined cycle power plant, 400MW electrical /PL” produces both electricity and heat. See the inventory, and calculated allocation factors using true value property below in the following table.

Table 4. Practical example on how true value allocation is executed.

	heat, district or industrial, other than natural gas	electricity, high voltage
Type	Reference product	By product / waste
Unit	MJ	kWh
Amount	2.48	1.00
Price	0.0106	0.0977
Revenue (amount*price)	0.0263	0.0977
True value relation (exergy)	0.184	3.600
True value	0.01396	0.11003
Allocation	11%	89%

This correction, together with the addition of the exergy information to many activities has changed the results in the co-generation activities. Mostly, the impacts will be shared differently between heat and electricity, but overall stay similar. While more than 700 exchanges in approximately 400 activities were missing the “true value” properties its influence on the results of the entire database is rather small, because these activities have small production volumes, thus contribute to the markets much less than other supplying activities. The activities with the true relation property newly added are listed in the following table.

Table 5. List of activities with the property “true value relation” (exergy) newly added in the relevant products. More details can be obtained in the excel file Change Report Annex.

Activity name	Geography	Time period
fluting medium production, semichemical	GLO; RER	2008 - 2008
heat and power co-generation, hard coal	AT; CZ; DE; DK; FI; GLO; KR; NL; NO; PL; RU; SE; SK;	1980 - 2015
heat and power co-generation, lignite	CZ; DE; GLO; GR; PL; RU; SI; SK	1980 - 2015
heat and power co-generation, oil	ASCC; AT; AU; BE; BG; BR; CZ; DE; DK; ES; FI; FR; FRCC; GB; GLO; GR; HICC; HR; IE; IT; KR; LT; LU; LV; MRO, US only; NL; NPCC, US only; PL; PT; RFC; RO; RS; RU; SE; SERC; SK; SPP; TR; TRE; TW; UA; WECC, US only	1980 - 2015
linerboard production, kraftliner	CA-QC; GLO; RER	2008 - 2008
treatment of biowaste, municipal incineration	GLO	2006 - 2012
treatment of biowaste, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of blast furnace gas, in power plant	AT; AU; BA; BE; BG; BR; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CN-AH; CN-BJ; CN-CQ; CN-FJ; CN-GD; CN-GS; CN-GX; CN-GZ; CN-HA; CN-HB; CN-HE; CN-HL; CN-HN; CN-HU; CN-JL; CN-JS; CN-JX; CN-LN; CN-NM; CN-NX; CN-QH; CN-SA; CN-SC; CN-SD; CN-SH; CN-SX; CN-TJ; CN-XJ; CN-XZ; CN-YN; CN-ZJ; CZ; DE; EE; ES; FI; FR; GB; GLO; HR; HU; IE; IR; IT; JP; KR; MX; NL; NO; PL; RO; RS; RU; SE; SK; TR; TW; UA	1980 - 2015
treatment of coal gas, in power plant	AT; BA; BE; BG; BR; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CZ; DE; ES; FI; FR; GB; GLO; HR; HU; IN; IR; IT; JP; KR; MX; NL; PL; RO; RS; RU; SE; SK; TR; TW; UA;	1990 - 2015
treatment of digester sludge, municipal incineration	GLO	2006 - 2012
treatment of digester sludge, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of digester sludge, municipal incineration, future	CH; GLO	2010 - 2020
treatment of liquid crystal display, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of liquid crystal display, municipal waste incineration	GLO	2006 - 2012
treatment of municipal solid waste, incineration	AT; BE; BG; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CA-QC; CH; CZ; DE; DK; ES; FI; FR; GB; GLO; HU; IT; JP; KR; LU; NL; NO; PL; PT; RU; SE; SK; TR; TW	2006 - 2012
treatment of municipal solid waste, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012

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Activity name	Geography	Time period
treatment of raw sewage sludge, municipal incineration	GLO	2006 - 2012
treatment of raw sewage sludge, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of recovered paper to fluting medium, wellenstoff	GLO; RER	2008 - 2008
treatment of recovered paper to linerboard, testliner	GLO; RER	2008 - 2008
treatment of residue from mechanical treatment, cathode ray tube display, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, cathode ray tube display, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, desktop computer, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, desktop computer, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, industrial device, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, industrial device, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, IT accessory, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, IT accessory, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, laptop computer, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, laptop computer, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, laser printer, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, laser printer, municipal waste incineration	GLO	2006 - 2012
treatment of residue from mechanical treatment, liquid crystal display, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from mechanical treatment, liquid crystal display, municipal waste incineration	GLO	2006 - 2012
treatment of residue from shredder fraction from manual dismantling, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of residue from shredder fraction from manual dismantling, municipal waste incineration	GLO	2006 - 2012
treatment of spent anion exchange resin from potable water production, municipal incineration	GLO	2006 - 2012

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Activity name	Geography	Time period
treatment of spent anion exchange resin from potable water production, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste bitumen sheet, municipal incineration	GLO	2006 - 2012
treatment of waste bitumen sheet, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste building wood, chrome preserved, municipal incineration	GLO	2006 - 2012
treatment of waste building wood, chrome preserved, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste cement-fibre slab, dismantled, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste cement-fibre slab, municipal incineration	GLO	2006 - 2012
treatment of waste emulsion paint, municipal incineration	GLO	2006 - 2012
treatment of waste emulsion paint, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste expanded polystyrene, municipal incineration	GLO	2006 - 2012
treatment of waste expanded polystyrene, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste graphical paper, municipal incineration	GLO	2006 - 2012
treatment of waste graphical paper, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste newspaper, municipal incineration	GLO	2006 - 2012
treatment of waste newspaper, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste packaging paper, municipal incineration	GLO	2006 - 2012
treatment of waste packaging paper, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste paint, municipal incineration	GLO	2006 - 2012
treatment of waste paint, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste paperboard, municipal incineration	GLO	2006 - 2012
treatment of waste paperboard, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste plastic, consumer electronics, municipal incineration	GLO	2006 - 2012
treatment of waste plastic, consumer electronics, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste plastic, industrial electronics, municipal incineration	GLO	2006 - 2012
treatment of waste plastic, industrial electronics, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012

Activity name	Geography	Time period
treatment of waste plastic, mixture, municipal incineration	GLO	2006 - 2012
treatment of waste plastic, mixture, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polyethylene terephthalate, municipal incineration	GLO	2006 - 2012
treatment of waste polyethylene terephthalate, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polyethylene, municipal incineration	GLO	2006 - 2012
treatment of waste polyethylene, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polypropylene, municipal incineration	GLO	2006 - 2012
treatment of waste polypropylene, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polystyrene, municipal incineration	GLO	2006 - 2012
treatment of waste polystyrene, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polyurethane, municipal incineration	GLO	2006 - 2012
treatment of waste polyurethane, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polyvinylchloride, municipal incineration	GLO	2006 - 2012
treatment of waste polyvinylchloride, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste polyvinylfluoride, municipal incineration	GLO	2006 - 2012
treatment of waste polyvinylfluoride, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste rubber, unspecified, municipal incineration	GLO	2006 - 2012
treatment of waste rubber, unspecified, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste sealing sheet, polyethylene, municipal incineration	GLO	2006 - 2012
treatment of waste sealing sheet, polyethylene, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste sealing sheet, polyvinylchloride, municipal incineration	GLO	2006 - 2012
treatment of waste sealing sheet, polyvinylchloride, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste textile, soiled, municipal incineration	GLO	2006 - 2012
treatment of waste textile, soiled, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste vapour barrier, flame-retarded, municipal incineration	GLO	2006 - 2012

Activity name	Geography	Time period
treatment of waste vapour barrier, flame-retarded, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste wire plastic, municipal incineration	GLO	2006 - 2012
treatment of waste wire plastic, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste wood pole, chrome preserved, municipal incineration	GLO	2006 - 2012
treatment of waste wood pole, chrome preserved, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012
treatment of waste wood, untreated, municipal incineration	GLO	2006 - 2012
treatment of waste wood, untreated, municipal incineration with fly ash extraction	CH; GLO	2006 - 2012

2.5 Market groups for RoW activities

A technical error in the generation of the market groups after internal testing had been completed resulted in Rest-of-the-World datasets using inputs from market groups to be linked incorrectly. Instead of the correct linking to all markets and market groups within their geographical scope, these activities were linked to market groups with the geography GLO if these were available. Such market groups exist for only a few products, but electricity is one of them, so many datasets were affected. The error has been corrected by our software partner and Rest-of-the-World datasets are linked correctly in version 3.3.

2.6 Impact assessment changes

2.6.1 Introduction

The ecoinvent implements selected life cycle impact assessment (LCIA) methods. The choices made during this process only affect the LCIA scores when consulted through the ecoQuery web interface or as distributed for eco design tools. When conducting an LCA with a third party software, the LCIA methods may have been implemented differently. This section is therefore not relevant to the reader using LCIA results through a third party software.

2.6.2 Detailed list of changes

This section of the report is a general discussion of the causes for the changes in the characterization factors (CFs). Each individual modification is listed in the Change Report Annex spreadsheet, under the tab “LCIA changes”. The full implementation is also available through the ecoQuery file section. More thorough explanations around LCIA implementation are available for IPCC 2007, IPCC 2013, ILCD 1.0.8 and Ecological scarcity 2013 via the ecoQuery file section.

IPCC 2007

Fluorine

A CF was mis-attributed to the gas “Fluorine”. It was removed.

IPCC 2007 and IPCC 2013

Carbon dioxide capture

The introduction of the World Food Database was an opportunity to introduce a better modelling of the land use change. This model includes the exchange “Carbon dioxide, to soil or biomass stock”, which represents long term carbon capture. Its CF is therefore -1 kg CO₂-eq per kg.

Ecological scarcity 2013

New exchanges

New pesticides, fertilizers and land occupation types were introduced by the World Food Database. Many had corresponding CFs in Ecological scarcity 2013 and were added.

Metal resource extraction

Mistakes were brought to our attention by users concerning metal resources. Metal extractions represented by more than one exchange, such as gold, copper, and many others, had a missing CF for some of their exchanges. The missing CFs were added.

Water Use Impact Assessment

Following instructions by the method developer, water resources should be assessed by applying the CF only to the water evaporated to air (i.e. “Water” in the air compartment), representing consumptive use. The CF recommended by the method developers is “Water, OECD & BRIC”, equal to 610 UBP/m³. In the 3.2 implementation, CFs had been implemented inconsistently.

Carbon sinks and sources

The CFs for the different sources and sinks of carbon dioxide are consistent with what is described in the IPCC section above.

Miscellaneous

Finally, different mismatch that have escaped our attention in the release of ecoinvent 3.2 have been corrected.

3 Swiss Supply chains

Several changes have been made in the database in order to improve the definition of the Swiss supply chains between ecoinvent v3.2 (2015) and ecoinvent v3.3 (2016).

While for a majority of goods, the trade scale is global, and therefore they are correctly supplied through global markets (consumption mixes) within the frame of the ecoinvent database, there are some products which are not really traded globally for various reasons;

1. The size versus price ratio does not make it profitable enough for global trade - e.g. tap water
2. It is technically not possible to trade the product globally - e.g. electricity, agricultural services, infrastructure (buildings)
3. It is legally not possible to export the products outside the boundaries of the country - e.g. some types of waste

The Swiss supply chains have been evaluated in that regard, and several changes have been made to improve their geographic location.

3.1 Procedure of the update of Swiss supply chains

There are two modelling approaches compliant with ecoinvent v3 methodology which have been used to update the Swiss supply chains by improving their geographic location: the creation of Swiss (local) markets, or the introduction of activity links to Swiss activities.

The Data Quality Guidelines for ecoinvent v3 specify the cases, when regional markets are justified (Data Quality Guidelines for ecoinvent v3, chapter 4.3 and 4.4.). The introduction of regional markets for certain products means that the consumers of this product in the same geography will be supplied the product from the regional market instead of the global one. For example, “gravel, crushed” was supplied to the Swiss activities by the global market. Now a Swiss “market for gravel, crushed” has been introduced, and it supplies all the activities located in Switzerland demanding “gravel, crushed”. In general the new Swiss markets were created for products which are usually both produced and consumed within Switzerland, such as waste materials (is usually treated in Switzerland), building and construction materials (as those produced in Switzerland are too expensive for other countries) and some infrastructures. Already in ecoinvent v3.2, 63 Swiss markets existed. In v3.3, 130 Swiss markets have been added. The new Swiss markets created for ecoinvent version 3.3 are listed in Table 6 and the Change Report Annex.

If the supplier of a specific input for an activity is known, a direct link with the producer can be established, instead of using the default consumption mix (market) supply. An exact definition of direct links and when shall they be used, can be read in the Data Quality Guidelines for ecoinvent v3 (chapter 4.4.1). In total 972 activity links between Swiss production activities and their supplying activities have been introduced for ecoinvent v3.3. Those activities will be listed in the different chapters, depending on the sector they belong to.

3.2 A default transport model for Switzerland

Market activities contain, among other exchanges, transport distances between producers and consumers. Whenever possible market specific information are reported, otherwise, version 3 default transport distances are used (see the ecoinvent version 3 Data quality guidelines, chapter 4.6). Default distances are assigned to an activity based on its ISIC code (Borken-Kleefeld 2012). The global model is based on the 2007 US Commodity Flow Survey (US BTS 2009) and Eurostat data; the average distances therefore represent an estimate at continental level. The model identifies the share of weight, distances by transport mode, and multi-modal transport for categories of commodities. In the case of local markets, they must better represent the local trade of products within their geographical boundaries, and the transport distances need, therefore, to be adjusted.

In the framework of the update of the Swiss supply chains, a model on transport distances specific for the Swiss markets is developed and the results calculated by this model included in the Swiss markets. The main sources used for the compilation of the model are Swiss statistical data and Eurostat. The provided information is, as for the global model, the share of weight transported and the distances by mode of transport. The only means of transport included for Switzerland are road and rail, while multi-modal transport is not included as, given the size of the Swiss territory, single transport modes are the most feasible choice (Fries et al. 2008). Commodities are divided in 20 classes, following the European NST 2007 classification, which is also used in the global model to determine the global default distance for the EU and it is used by the Swiss statistical entities. To read in details about how the model was created see the PDF document Default transport data per commodity group for Switzerland (Valsasina 2016).

The following table lists all market activities for the geography of Switzerland. For the existing markets transport distances have been updated using the Default transport data per commodity group for Switzerland. The new markets generated in the framework of the update of the Swiss supply chains are included as well.

Table 6. List of Swiss (CH) markets that have been created new for v3.3, or updated with new transport distances. All markets listed in the table use the new Swiss transport model, except when no transport is needed for the specific product. In the column v3.3, “N” stands for “New”, “U” stands for “Updated”.

Activity name	Time period	V3.3
market for anhydrite rock	2011 - 2011	N
market for application of plant protection product, by field sprayer	2011 - 2011	N
market for ash from paper production sludge	2011 - 2011	N
market for barley seed, Swiss integrated production, for sowing	2011 - 2011	N
market for bilge oil	2011 - 2011	N
market for brass	2011 - 2011	N
market for cement mortar	2011 - 2011	N
market for cement, alternative constituents 21-35%	2005 - 2009	U
market for cement, alternative constituents 6-20%	2005 - 2009	U
market for cement, blast furnace slag 18-30% and 18-30% other alternative constituents	2005 - 2009	U
market for cement, blast furnace slag 31-50% and 31-50% other alternative constituents	2005 - 2009	U
market for cement, blast furnace slag 36-65%	2005 - 2009	U
market for cement, blast furnace slag 66-80%	2005 - 2009	U
market for cement, blast furnace slag 81-95%	2005 - 2009	U
market for cement, Portland	2005 - 2009	U
market for cement, pozzolana and fly ash 11-35%	2005 - 2009	U
market for cement, pozzolana and fly ash 36-55%	2005 - 2009	U
market for cement, unspecified	2013 - 2013	N
market for clay	2011 - 2011	N
market for clinker	2011 - 2011	N
market for coating from waste cathode ray tube display	2011 - 2011	U
market for concrete, for de-icing salt contact	2011 - 2011	U
market for concrete, high exacting requirements	2011 - 2011	U
market for concrete, normal	2011 - 2011	U
market for concrete, sole plate and foundation	2011 - 2011	U
market for conditioned spent nuclear fuel	2011 - 2011	N
market for diesel	1989 - 2000	U
market for diesel, low-sulfur	2000 - 2005	U
market for ethanol, without water, in 99.7% solution state, from fermentation, at service station	2000 - 2005	U
market for fly ash and scrubber sludge	2011 - 2011	N
market for grass seed, Swiss integrated production, for sowing	2011 - 2011	N
market for grass, Swiss integrated production	2011 - 2011	N
market for gravel, crushed	2011 - 2011	N
market for gravel, round	2011 - 2011	N
market for green manure, organic, until April	2011 - 2011	N
market for green manure, organic, until February	2011 - 2011	N
market for green manure, organic, until January	2011 - 2011	N
market for green manure, organic, until March	2011 - 2011	N

Documentation of changes implemented in ecoinvent 3.3

Activity name	Time period	V3.3
market for green manure, Swiss integrated production, until April	2011 - 2011	N
market for green manure, Swiss integrated production, until February	2011 - 2011	N
market for green manure, Swiss integrated production, until January	2011 - 2011	N
market for green manure, Swiss integrated production, until March	2011 - 2011	N
market for hazardous waste, for incineration	2011 - 2011	N
market for heat carrier liquid, 40% C3H8O2	2011 - 2011	N
market for heat, central or small-scale, Jakobsberg	2011 - 2011	N
market for heavy fuel oil	1989 - 2000	U
market for heavy fuel oil, burned in refinery furnace	2011 - 2011	N
market for high level radioactive waste for final repository	2011 - 2011	N
market for inert waste	2011 - 2011	N
market for inert waste, for final disposal	2011 - 2011	N
market for kerosene	1989 - 2000	U
market for land tenure, arable land, measured as carbon net primary productivity, annual crop	2010 - 2015	N
market for land use change, annual crop	2010 - 2015	N
market for lean concrete	2011 - 2011	U
market for light fuel oil	1989 - 2000	U
market for lightweight concrete block, expanded clay	2011 - 2016	N
market for lightweight concrete block, expanded perlite	2011 - 2011	N
market for lightweight concrete block, expanded vermiculite	2011 - 2011	N
market for lightweight concrete block, polystyrene	2011 - 2011	N
market for lime, hydrated, loose weight	2011 - 2011	N
market for lime, packed	2011 - 2011	N
market for limestone, crushed, for mill	2011 - 2011	N
market for limestone, crushed, washed	2011 - 2011	N
market for limestone, unprocessed	2011 - 2011	N
market for methanol, from biomass	1995 - 2006	U
market for municipal waste collection service by 21 metric ton lorry	2011 - 2011	N
market for municipal waste incineration facility	2011 - 2011	N
market for petrol, low-sulfur	1989 - 2005	U
market for pitch	2011 - 2016	N
market for process-specific burden, sanitary landfill	2011 - 2011	N
market for process-specific burdens, hazardous waste incineration plant	2011 - 2011	N
market for process-specific burdens, inert material landfill	2011 - 2011	N
market for process-specific burdens, municipal waste incineration	2011 - 2011	N
market for process-specific burdens, residual material landfill	2011 - 2011	N
market for process-specific burdens, slag landfill	2011 - 2011	N
market for quicklime, in pieces, loose	2011 - 2011	N
market for quicklime, milled, loose	2011 - 2011	N
market for rainwater mineral oil storage	2011 - 2011	N
market for rape seed, for sowing	2011 - 2011	N

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Activity name	Time period	V3.3
market for refinery sludge	2011 - 2011	N
market for residual material landfill	2011 - 2011	N
market for road	2011 - 2011	N
market for rye seed, Swiss integrated production, for sowing	2011 - 2011	N
market for scrap aluminium	2011 - 2011	N
market for scrap copper	2011 - 2011	N
market for scrap steel	2011 - 2011	N
market for sewer grid, 5E9l/year, 110 km	2011 - 2011	N
market for slag landfill	2011 - 2011	N
market for sludge from pulp and paper production	2011 - 2011	N
market for sludge, pig iron production	2011 - 2011	N
market for spent solvent mixture	2011 - 2011	N
market for sugar beet	2011 - 2011	N
market for used air distribution terminal panel steel, 120 m3/h	2011 - 2011	N
market for used air filter central unit, 600 m3/h	2011 - 2011	N
market for used air filter decentralized unit, 180-250 m3/h	2011 - 2011	N
market for used air filter in exhaust air valve	2011 - 2011	N
market for used blower and heat exchange unit central, 600-1200 m3/h	2011 - 2011	N
market for used blower and heat exchange unit decentralized, 180-250 m3/h	2011 - 2011	N
market for used exhaust air roof hood steel, DN 400	2011 - 2011	N
market for used exhaust air valve in-wall housing, plastic/steel	2011 - 2011	N
market for used flexible duct aluminium/PET, DN of 125	2011 - 2011	N
market for used industrial electronic device, WEEE collection	2005 - 2005	U
market for used insulation spiral-seam duct rockwool, DN 400	2011 - 2011	N
market for used outside air intake stainless steel, DN 370	2011 - 2011	N
market for used railway track	2011 - 2011	N
market for used room-connecting overflow element steel, approx. 40 m3/h	2011 - 2011	N
market for used sealing tape aluminium/PE, 50 mm wide	2011 - 2011	N
market for used silencer steel, DN 125	2011 - 2011	N
market for used silencer steel, DN 315	2011 - 2011	N
market for used ventilation control and wiring central unit	2011 - 2011	N
market for used ventilation control and wiring decentralized unit	2011 - 2011	N
market for waste bitumen	2011 - 2011	N
market for waste bitumen sheet	1994 - 2002	U
market for waste brick	2011 - 2011	N
market for waste building wood, chrome preserved	1994 - 2002	U
market for waste bulk iron, excluding reinforcement	2011 - 2011	N
market for waste cement in concrete and mortar	2011 - 2011	N
market for waste cement, hydrated	2011 - 2011	N
market for waste concrete	2011 - 2011	N
market for waste concrete, not reinforced	2011 - 2011	N

Documentation of changes implemented in ecoinvent 3.3

Activity name	Time period	V3.3
market for waste emulsion paint	2011 - 2011	N
market for waste fibreboard	2011 - 2011	N
market for waste glass	2011 - 2011	N
market for waste glass sheet	2011 - 2011	N
market for waste graphical paper	2011 - 2011	N
market for waste gypsum	2011 - 2011	N
market for waste mineral oil	2011 - 2011	N
market for waste mineral wool	2011 - 2011	N
market for waste mineral wool, final disposal	2011 - 2011	N
market for waste paint	2011 - 2011	N
market for waste paint on metal	2011 - 2011	N
market for waste paperboard	2011 - 2011	N
market for waste plastic, consumer electronics	2011 - 2011	N
market for waste plastic, mixture	2011 - 2011	N
market for waste polyethylene	2011 - 2011	N
market for waste polyethylene terephthalate	2011 - 2011	N
market for waste polyethylene/polypropylene product	2011 - 2011	N
market for waste polypropylene	2011 - 2011	N
market for waste polystyrene	2011 - 2011	N
market for waste polystyrene isolation, flame-retardant	2011 - 2011	N
market for waste polyurethane	2011 - 2011	N
market for waste polyurethane foam	2011 - 2011	N
market for waste polyvinylchloride	2011 - 2011	N
market for waste polyvinylchloride product	2011 - 2011	N
market for waste reinforced concrete	2011 - 2011	N
market for waste reinforcement steel	2011 - 2011	N
market for waste rubber, unspecified	2011 - 2011	N
market for waste sealing sheet, polyvinylchloride	1994 - 2002	U
market for waste vapour barrier, flame-retarded	1994 - 2002	U
market for waste wood, untreated	2011 - 2011	N
market for wastewater from concrete production	2011 - 2011	N
market for wastewater from pig iron production	2011 - 2011	N
market for wastewater treatment facility, capacity 5E9l/year	2011 - 2011	N
market for wastewater, average	2011 - 2011	N
market for wastewater, from residence	2011 - 2011	N
market for wastewater, unpolluted	2011 - 2011	N
market for water, deionised, from tap water, at user	2011 - 2011	N
market for wheat seed, Swiss integrated production, for sowing	2011 - 2011	N
market for wood ash mixture, pure	2011 - 2011	N

Activity name	Time period	V3.3
market for zinc in car shredder residue	2011 - 2011	N

3.3 New activities generated for Europe without Switzerland

In order to maintain geographical consistency in the European activities, the creation of Swiss activities and markets has led to the introduction of several markets and treatment activities with the geography Europe without Switzerland. These activities are created so that the European activities present in the database are being supplied the geographically appropriate mix of treatment activities.

The different activities are listed in the chapter for the respective sectors (waste treatment and Building materials mainly). The markets are listed here, in the following table. The global transport distances has been used in the Europe without Switzerland markets.

Table 7. List of all new markets generated in the geography “Europe without Switzerland”.

Activity name	Time period
market for fly ash and scrubber sludge	2011 - 2011
market for wood ash mixture, pure	2011 - 2011
market for waste gypsum	2011 - 2011
market for waste polyvinylchloride product	2011 - 2011
market for waste mineral wool	2011 - 2011
market for cement, unspecified	2013 - 2013
market for waste mineral oil	2011 - 2011
market for wastewater from pig iron production	2011 - 2011
market for waste plastic, mixture	2011 - 2011
market for scrap copper	2011 - 2011
market for waste polyethylene	2011 - 2011
market for waste reinforced concrete	2011 - 2011
market for water, deionised, from tap water, at user	2011 - 2011
market for waste paint	2011 - 2011
market for ash from paper production sludge	2011 - 2011
market for waste cement in concrete and mortar	2011 - 2011
market for wastewater, average	2011 - 2011
market for inert waste	2011 - 2011
market for waste paperboard	2011 - 2011
market for waste wood, untreated	2011 - 2011
market for waste polystyrene isolation, flame-retardant	2011 - 2011
market for process-specific burdens, municipal waste incineration	2011 - 2011
market for scrap steel	2011 - 2011
market for sludge, pig iron production	2011 - 2011

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Activity name	Time period
market for waste glass sheet	2011 - 2011
market for waste concrete, not reinforced	2011 - 2011
market for rainwater mineral oil storage	2011 - 2011
market for waste cement, hydrated	2011 - 2011
market for waste graphical paper	2011 - 2011
market for waste polystyrene	2011 - 2011
market for waste bulk iron, excluding reinforcement	2011 - 2011
market for waste bitumen	2011 - 2011
market for waste polyurethane	2011 - 2011
market for waste polyethylene/polypropylene product	2011 - 2011
market for bilge oil	2011 - 2011
market for hazardous waste, for incineration	2011 - 2011
market for conditioned spent nuclear fuel	2011 - 2011
market for sludge from pulp and paper production	2011 - 2011
market for waste brick	2011 - 2011
market for waste concrete	2011 - 2011
market for process-specific burdens, slag landfill	2011 - 2011
market for waste rubber, unspecified	2011 - 2011
market for waste polyvinylchloride	2011 - 2011
market for process-specific burdens, residual material landfill	2011 - 2011
market for waste polyethylene terephthalate	2011 - 2011
market for waste mineral wool, final disposal	2011 - 2011
market for spent solvent mixture	2011 - 2011
market for scrap aluminium	2011 - 2011
market for waste emulsion paint	2011 - 2011
market for waste glass	2011 - 2011
market for refinery sludge	2011 - 2011

4 Agriculture

Many new transforming and market activities have been added in this sector, both to improve the geographical coverage of the database, and to model the production and supply of products new to the database.

4.1 New data on agriculture: WFLDB

One of the main changes between v3.2 and v3.3 is the addition of data from the World Food LCA Database (WFLDB) (Nemecek, 2015; Mouron, 2016). This includes the adoption of a new model for land use change (LUC).

4.1.1 LUC model: application in new and some existing crops

In v3.2 land use change (LUC) was considered by some crops only: sugarcane, soybean and palm fruit bunch. This was done with two cultivation activities per crop, one considering LUC (100%), the other not considering LUC. Both were then supplying the market generating an averaged consumption mix. In v3.3 a simpler and yet more complete in terms of geographical and crop coverage LUC model has been implemented. This is the LUC mode implemented in the WFLDB, a modified version of the Blonk tool⁷.

The following table list the new activities generated in the framework of this update. All in all, the new activities generate five new products: “land tenure, arable land, measured as carbon net primary productivity, annual crop”, “land tenure, arable land, measured as carbon net primary productivity, perennial crop”, “land use change, annual crop”, “land use change, paddy rice”, “land use change, perennial crop”. The table reflects which activity produces which product.

⁷ Latest edition is “WDLDB-adapted Blonk 2014 direct-land use change-assessment-tool_2016-06-09a.xlsx”.

Table 8. New activities added to the v3.3 database, related to LUC modelling. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column. Column v3.3 stands for the product names: “A”: “land tenure, arable land, measured as carbon net primary productivity, annual crop”; “P”: “land tenure, arable land, measured as carbon net primary productivity, perennial crop”; “S”: name of the product is the same as the activity.

Activity name	Geography	Time period	V3.3
clear-cutting, grassland to arable land, annual crop	AU, GLO, IN	2010 - 2015	A
clear-cutting, grassland to arable land, perennial crop	BE, CR, EC, GH, GLO, ID, IN	2010 - 2015	P
clear-cutting, primary forest to arable land, annual crop	AR, AU, BR, GLO, PE, TH, UA	2010 - 2015	A
clear-cutting, primary forest to arable land, perennial crop	AR, BR, CI, EC, GH, GLO, HN, ID, KE, MY, PE, PH, VN	2010 - 2015	P
clear-cutting, secondary forest to arable land, annual crop	AR, AU, BR, GLO, PE, TH, UA	2010 - 2015	A
clear-cutting, secondary forest to arable land, perennial crop	AR, BR, CI, EC, GH, GLO, HN, ID, KE, MY, PE, PH, VN	2010 - 2015	P
land already in use, annual cropland to annual crop	AR, AU, BR, CA, CH, CN, DE, ES, FI, FR, GLO, HU, IL, IN, IT, MX, NL, NZ, PE, RU, TH, UA, US	2010 - 2015	A
land already in use, annual cropland to perennial crop	AR, BE, BR, CI, CL, CN, CO, CR, EC, ES, FR, GLO, HN, ID, IT, KE, LK, MG, MX, MY, PE, PH, TR, US, VN, ZA	2010 - 2015	P
land already in use, perennial cropland to annual crop	AR, AU, BR, CA, CH, CN, DE, ES, FI, FR, GLO, HU, IL, IT, MX, NL, NZ, PE, RU, TH, UA, US	2010 - 2015	A
land already in use, perennial cropland to perennial crop	AR, BE, BR, CI, CL, CO, CR, EC, ES, FR, GLO, HN, ID, IT, KE, LK, MG, MX, MY, PE, PH, TR, US, VN, ZA	2010 - 2015	P
land use change, annual crop	AR, AU, BR, CA, CH, CN, DE, ES, FI, FR, GLO, HU, IL, IN, IT, MX, NL, NZ, PE, RU, TH, UA, US	2010 - 2015	S
land use change, paddy rice	CN, GLO, IN	2010 - 2015	S

Activity name	Geography	Time period	V3.3
land use change, perennial crop	AR, BE, BR, CI, CL, CN, CO, CR, EC, ES, FR, GH, GLO, HN, ID, IN, IT, KE, LK, MG, MX, MY, PE, PH, TR, US, VN, ZA	2010 - 2015	S

An important aspect of the LUC modelling is the geographical coverage. The addition of many local markets ensures the right supply of land tenure or land use change.

Table 9. Markets that ensure the local supply of all new products related to the new LUC modelling. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column

Activity name	Geography	Time period
market for land tenure, arable land, measured as carbon net primary productivity, annual crop	AR, AU, BR, CA, CH, CN, DE, ES, FI, FR, GLO, HU, IL, IN, IT, MX, NL, NZ, PE, RU, TH, UA, US,	2010 - 2015
market for land tenure, arable land, measured as carbon net primary productivity, perennial crop	AR, BE, BR, CI, CL, CN, CO, CR, EC, ES, FR, GH, GLO, HN, ID, IN, IT, KE, LK, MG, MX, MY, PE, PH, TR, US, VN, ZA,	2010 - 2015
market for land use change, annual crop	AR, AU, BR, CA, CH, CN, DE, ES, FI, FR, GLO, HU, IL, IN, IT, MX, NL, NZ, PE, RU, TH, UA, US,	2010 - 2015
market for land use change, perennial crop	AR, BE, BR, CI, CL, CN, CO, CR, EC, ES, FR, GH, GLO, HN, ID, IN, IT, KE, LK, MG, MX, MY, PE, PH, TR, US, VN, ZA	2010 - 2015
market for land use change, paddy rice	CN, GLO, IN	2010 - 2015

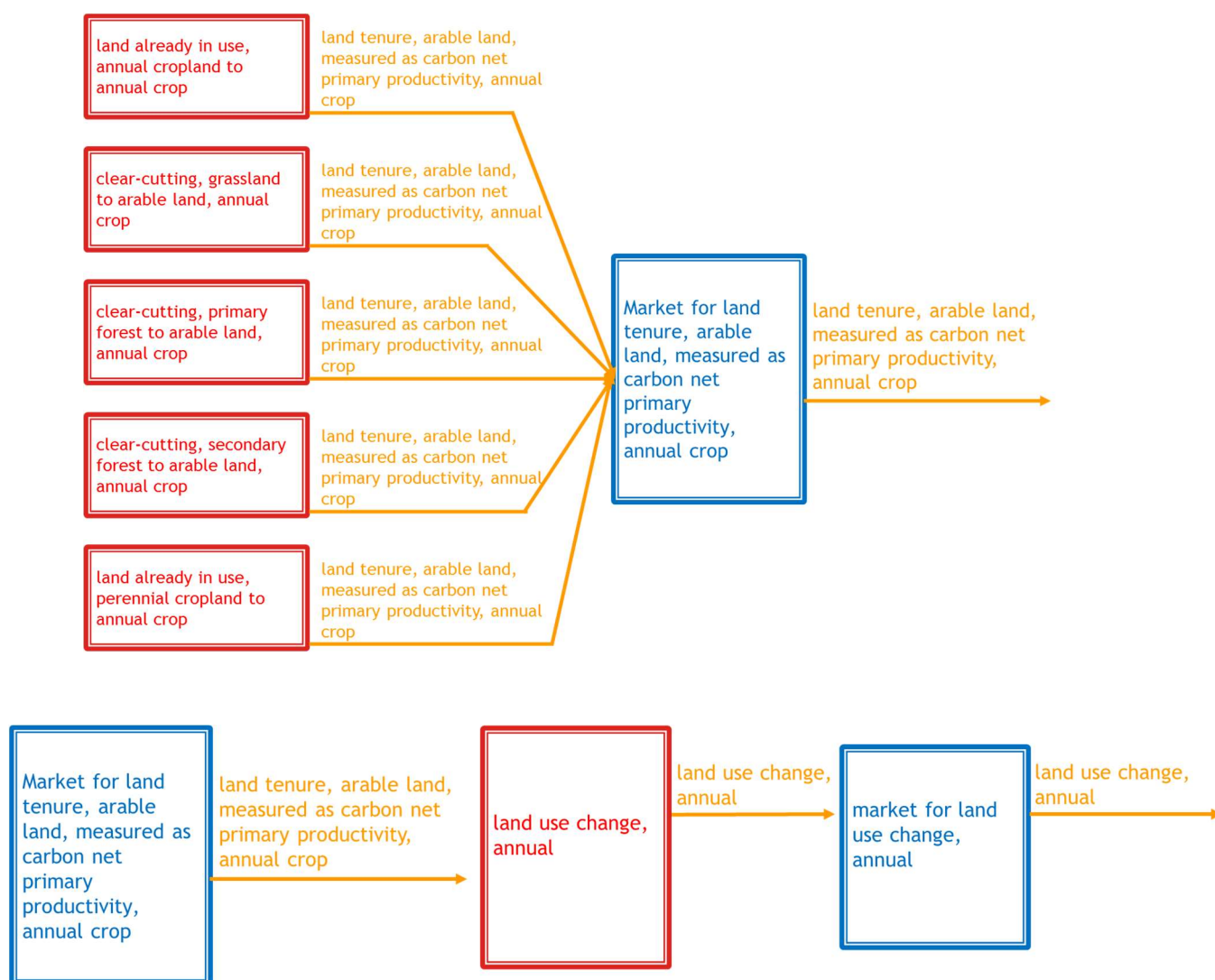


Figure 2. Example on how land transformation and land use change activities for annual crops are represented in ecoinvent v3.3. The same structure can be found for perennial crops. Each activity and market can be found in as many geographies as the demanding activities of land use change (crop production) have.

4.1.1.1 LUC in existing crops

Similarly as before, not all crops consider LUC in their modelling. The new crops listed in the following tables (Table 12, Table 18), of course do, but from the existing crops it has been a case by case update, reviewed and decided by the original data provider. In order to facilitate the discrimination of the results obtained now with v3.3, we have compiled the crops that have been updated to include the new LUC in the following tables.

Table 10. Existing activities in v3.2 that have been modified to include the new LUC modelling in v3.3. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column

Activity name	Geography	Time period
alfalfa/grass silage production	CA-QC	2010 - 2012
aubergine production	GLO	2010 - 2010
avocado production	GLO	2010 - 2010
barley production	CA-QC	2010 - 2012
broccoli production	GLO	2010 - 2010
cabbage red production	GLO	2010 - 2010
cabbage white production	GLO	2010 - 2010
cauliflower production	GLO	2010 - 2010
cucumber production	GLO	2010 - 2010
fennel production	GLO	2010 - 2010
grape production	GLO	2010 - 2010
green asparagus production	GLO	2010 - 2010
green bell pepper production	GLO	2010 - 2010
hay production	CA-QC	2010 - 2012
iceberg lettuce production	GLO	2010 - 2010
lettuce360 production	GLO	2010 - 2010
lettuce361 production	GLO	2010 - 2010
maize grain production	CA-QC	2010 - 2012
maize silage production	CA-QC, GLO	2010 - 2012
melon production	GLO	2010 - 2010
oat production	CA-QC, GLO	2010 - 2012
palm fruit bunch production	GLO, MY	2002 - 2006
palm fruit bunch production	CO	2001 - 2011
papaya production	GLO	2010 - 2010
paris market carrot production	GLO	2010 - 2010
pineapple production	GLO	2010 - 2010
potato production	CA-QC	2010 - 2012
rape seed production	CA-QC	2010 - 2012
soybean production	BR	2001 - 2006
soybean production	CA-QC	2010 - 2012
soybean production	GLO	2004 - 2006
soybean production	US	2004 - 2007
spinach production	GLO	2010 - 2010
sugarcane production	BR, GLO	1996 - 2006
wheat production	CA-QC	2010 - 2012
zucchini production	GLO	2010 - 2010

Please consider that this case by case implementation means that, in 7 cases, the same market is supplied by producers which consider LUC (with the new modelling) and producers which simply do not consider LUC. Those cases are listed in the next table.

Table 11. Markets with suppliers that do consider land use change and suppliers that don't.

Activity name	Geography	Time period
market for maize grain	GLO	2011 - 2011
market for potato	GLO	2011 - 2011
market for rape seed	GLO	2011 - 2011
market for rice	GLO	2011 - 2011
market for sugar beet	GLO	2011 - 2011
market for sunflower seed	GLO	2011 - 2011
market for wheat grain	GLO	2011 - 2011

4.1.1.2 LUC differences: case study with crops that switched LUC model from v3.2 to v3.3

The following analysis compares LUC impacts of selected crops across ecoinvent versions in order to highlight and discuss the detailed reasons for differences. We have compared soybean, sugarcane and palm fruit bunch cultivation in version 2.2 (EI2.2), version 3.0-3.2 (EI3.2) and version 3.3 (EI3.3). We assess environmental impacts using IPCC 2007 GWP100a.

Figure 3 shows the climate impacts per hectare of soybean across version 2.2, version 3.2 and version 3.3 of the ecoinvent database.

Ecoinvent v2.2: In EI2.2, a 5 year period (1999-2004) was used to assess the LUC impacts associated with soybean (Jungbluth et al., 2007, p. 131). During this time period, the area cultivated with soybeans expanded by more than 8 million hectares. This represents the largest annual increment recorded to date. The corresponding LUC was calculated with 32% transformed from tropical rain forest, 52% transformed from shrubland and 16% transformed for annual cropland (Jungbluth et al., 2007, p. 131). Nevertheless, the LUC impacts are rather low in comparison with EI3.2 and 3.3, respectively. The reasons are twofold. First, the impacts associated with the transformation of shrubland were not considered, i.e. accounted for with zero. Second, the transformation of rainforest modeled by the activity “provision, stubbed land” did not consider BGB and DOM which typically contributes about half of the total carbon pool associated with primary forests.

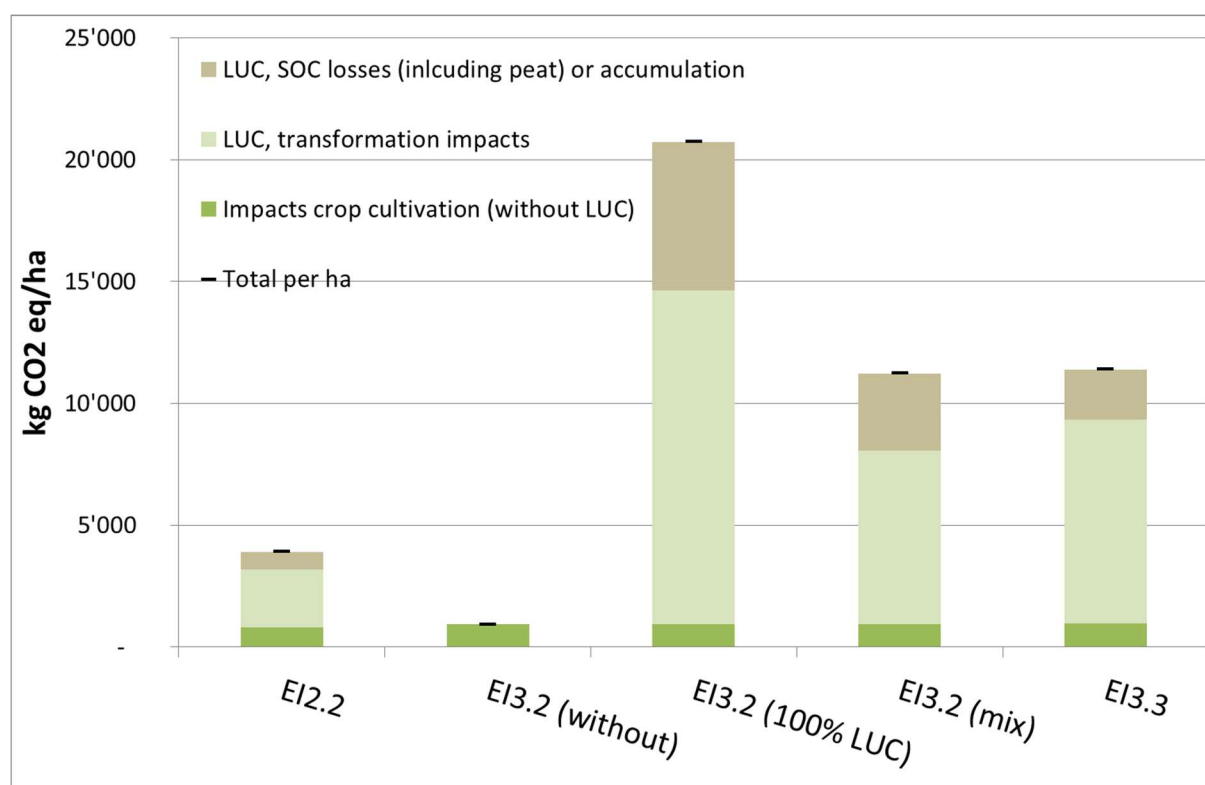


Figure 3. Climate impacts (kg CO₂ eq/ha) of soybean cultivation in Brazil throughout different versions of ecoinvent. The increase in crop cultivation impacts from EI2.2 to EI3.2 is a result of updated emissions models.

Ecoinvent v3.2: In EI3.2, the average LUC was modelled by the market-based integration of two activities: soybean production without (without LUC) and soybean production with LUC (100% LUC). The former represents soybean production already cultivated 20 years ago, i.e. without LUC, while the latter activity represents soybean production on recently transformed land which was transformed during the last 20 years. 50% of the soybean area was already cultivated in 1990, whereas 50 % were added in the following 20 years, 12% at the expense of rain forest and 38 % at the expense of shrubland (Nemecek et al., 2014). The corresponding average (EI3.2 (mix)) impacts associated with soybean cultivation in Brazil can be calculated with 11'000 kg CO₂ eq. The main reason for this increase in comparison with EI2.2, is the consistent inclusion of all carbon pools, i.e. the amount of C stored in AGB, BGB, DOM and SOC.

Ecoinvent v3.3: In EI3.3, the impact of soybean cultivation amount to roughly 11'000 kg CO₂ eq. The application of the WFLDB LUC methodology does not cause large changes even though the land transformations considered are different. In the present case, soybean production increased by 52% during the last 20 years. According to FAOSTAT statistics, the expansion of annual crops affected mainly forest areas (65%), and already cultivated perennial land (6%). This causes large land transformation impacts of 8'300 kg CO₂ eq. per hectare but also losses in soil organic carbon stocks (2'000 kg CO₂ eq. per hectare).

Figure 4 shows the climate impacts per hectare of sugarcane cultivated across version 2.2, version 3.2 and version 3.3 of the ecoinvent database.

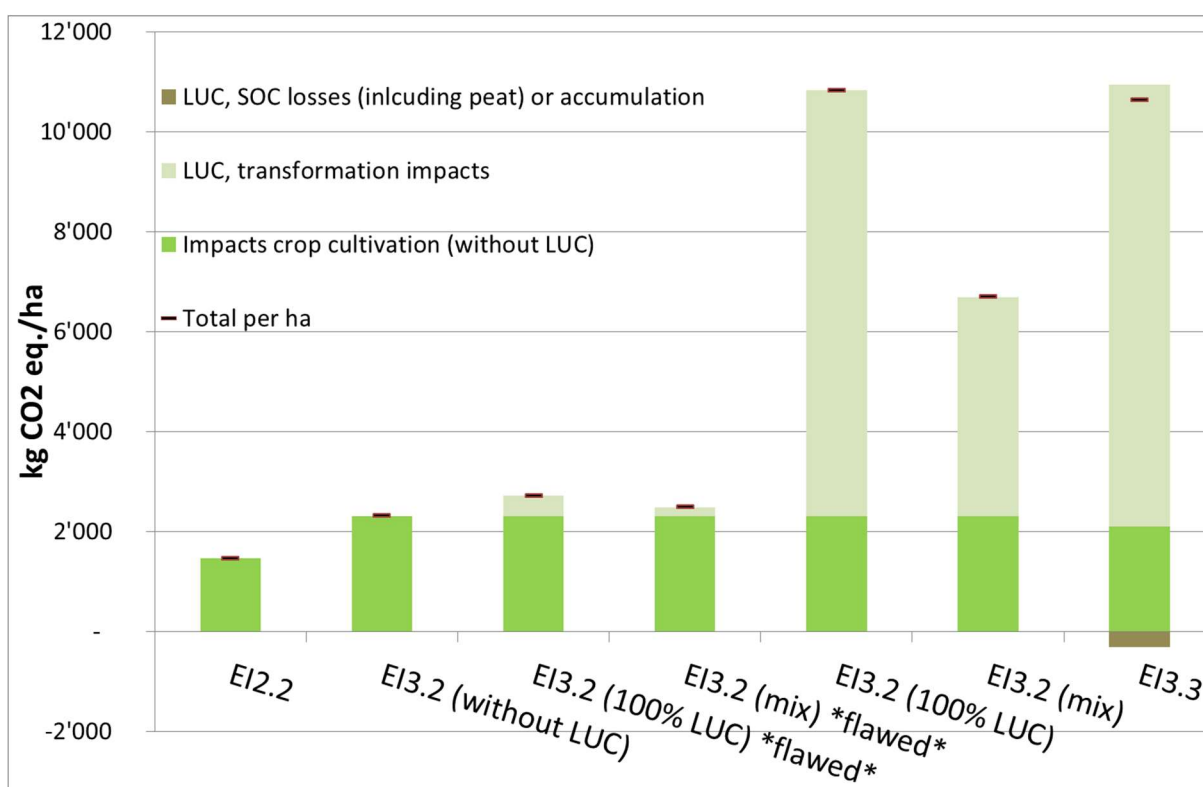


Figure 4. Climate impacts (kg CO₂ eq/ha) of sugarcane cultivation in Brazil throughout different versions of ecoinvent. The increase in crop cultivation impacts from EI2.2 to EI3.2 is a result of updated emissions models.

Ecoinvent v2.2: In EI2.2, 0.97% of the used land is calculated as transformed from shrubland (Jungbluth et al., 2007, p. 150) while the remainder is transformed from land already in use. Since no transformation impacts were assigned to shrubland, the LUC impacts of sugarcane cultivation in EI2.2 are zero.

Ecoinvent v3.2: In EI3.2, the average LUC is modelled by the market-based integration of two activities: sugarcane production without LUC and sugarcane production with 100% LUC. The latter activity models the LUC caused by the expansion of sugarcane cultivation of 51% during the last 20 years. In the absence of causal studies, this increase was assumed to be cultivated fully at the expense of shrubland (Nemecek et al., 2014). The appropriate integration of both activities via the local sugarcane market in Brazil represents the average (mix) of sugarcane production in Brazil. The annual production of sugar-cane production in Brazil and the expansion of sugarcane during the last 20 years was used to determine the proportion from each sugarcane activity. However, the allocation of LUC was a factor 20 too low because the amortization was applied twice. Consequently, the LUC impacts of sugarcane were too low (EI3.2 (100% LUC) *flawed*) and likewise was the average mix representing sugarcane production in Brazil (EI3.2 (mix) *flawed*). When correcting for this error, the average (mix) impacts of sugarcane production in Brazil amount to 7'000 kg CO₂ eq (EI3.2 (mix)). As mentioned above, this results from the assumption that the full increase in sugarcane cultivation during the last 20 years occurred at the expense of shrubland.

Ecoinvent v3.3: In EI3.3, the average impact of sugarcane production in Brazil increases to 10'600 kg CO₂ eq. per hectare. In general, the reason for this increase can be attributed to the fact that the applied WFLDB LUC methodology is more conclusive than the former approach. Basically, it assigns LUC emissions on the basis of the (perennial) crop specific change in area and the country specific land transformations recorded during a 20 year time period. In the present case of Brazil, sugarcane production increased by 54% during the last 20 years. The expansion of perennial crops affected mainly forest areas (primary and secondary, 83%) but also already cultivated annual cropland (15%) (FAOSTAT 2013). The former causes a large land transformation impact (8'800 kg CO₂ eq) while the latter causes a minor increase in SOC stocks, i.e. is responsible for the accumulation of SOC (-300 kg CO₂ eq). The re-lease of SOC associated with the land transformation of forest areas is zero because the perennial land use will not affect the mineral SOC.

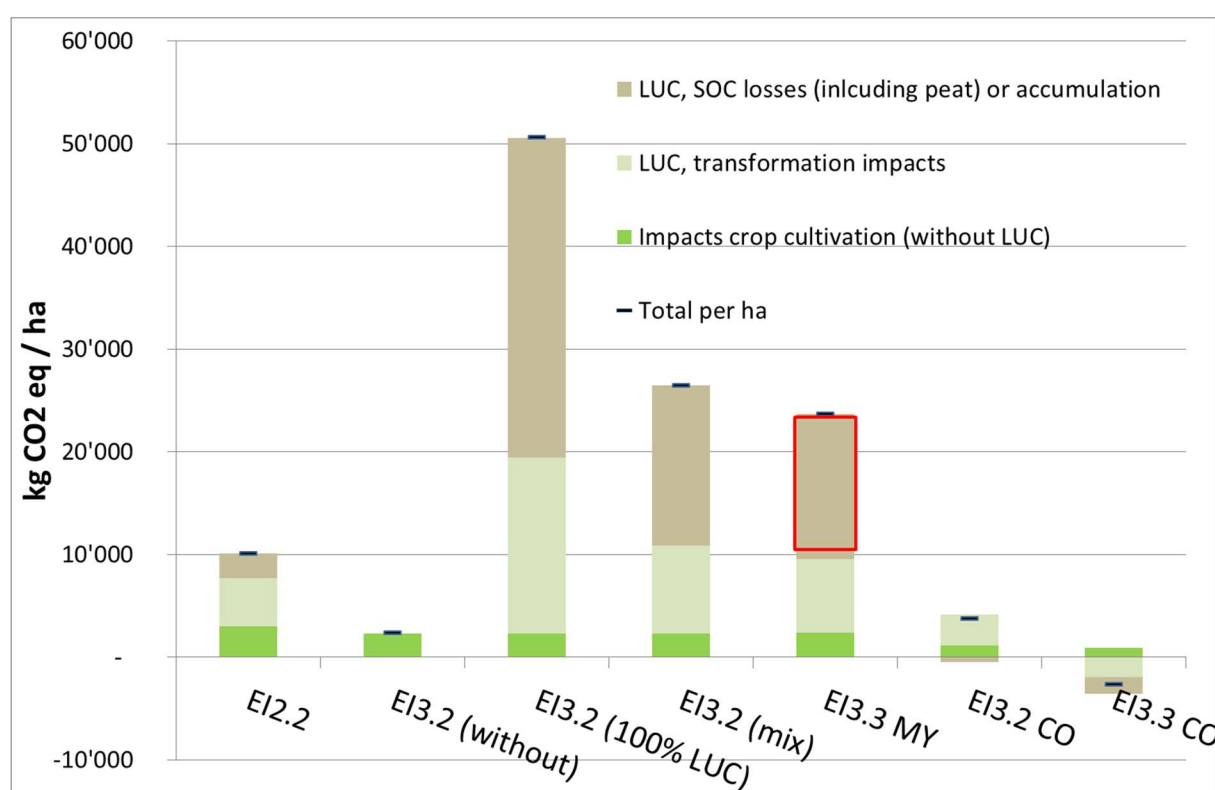


Figure 5. Climate impacts (kg CO₂ eq/ha) of palm fruit bunch cultivation in Malaysia throughout different versions of ecoinvent. The red square shows the emissions from peat oxidation which are added.

Figure 5 shows the climate impacts per hectare of palm fruit cultivated in Malaysia across version 2.2, version 3.2 and version 3.3 of the ecoinvent database. It also shows the impacts of palm fruit cultivation in Indonesia and Colombia for version 3.3.

Ecoinvent v2.2 MY: In EI2.2, due to the large increase in palm fruit cultivation, 100% of the area cultivated with palm fruit in Malaysia was assumed to be transformed from tropical rain forest (Jungbluth et al., 2007, p. 88). The transformation from tropical rainforest is calculated with the process “provision, stubbed land, MY” which accounts for

119'000 kg CO₂ eq per hectare. The corresponding loss of SOC is calculated with 59'000 kg CO₂ emissions (Jungbluth et al., 2007, p. 88). The emissions from LUC are allocated over a time period of 25 years. The annualized emission from the transformation of primary forest amount to 4'800 kg, the annualized emissions from SOC to 2'400 kg CO₂ eq. per hectare. The total LUC impacts are rather low given the worst case assumption of 100% LUC from rain forest. The reason is mainly that emissions from peat oxidation were not considered. In addition, the transforming activity (provision, stubbed land, MY) did not consider BGB and DOM which typically holds about half of the total carbon stored in a primary forests.

Ecoinvent v3.2 MY: In EI3.2, the average LUC was modelled by the market-based integration of two activities: palm fruit production without (without LUC) and palm fruit production on land transformed within the past 20 years (100% LUC). 50% of the palm fruit area was already cultivated in 1990, whereas 50 % were added in the following 20 years, 56% at the expense of primary forest (of which half is on peat land) and 44 % at the expense of perennial land which cause no LUC impacts (Nemecek et al., 2014). These land transformation were modeled according to Reinhard et al. (2007). The corresponding average (EI3.2 (mix)) impacts associated with palm fruit cultivation in Malaysia can be calculated with 26'400 kg CO₂ eq. The main reason for this increase in comparison with EI2.2, is the consistent inclusion of all transformation impacts, i.e. the loss of C stored in rain forests in the form of AGB, BGB, DOM which contributes with almost 8'500 kg CO₂ eq. per hectare, and all losses in SOC, i.e. particularly the oxidation of peat which contributes with almost 15'500 kg CO₂ eq. per hectare and year.

Ecoinvent v3.3 MY: In EI3.3, the impact of palm fruit cultivation in Malaysia amounts to roughly 24'000 kg CO₂ eq. per hectare. The area cultivated with palm fruits in Malaysia increased by 56% . With regard to land transformation, this expansion affected mainly perennial land (45%), secondary forest (42%), primary forest (11%) and annual cropland (2%). The average transformation impacts decrease to 7'200 kg CO₂ eq. per hectare, mainly because of the large proportion of secondary forest that wasn't considered in EI3.2. With regard to land occupation, the sole application of the WFLDB LUC methodology would cause a large decrease of LUC climate impacts to roughly 10'000 kg. The LUC emission from SOC, i.e. mainly peat oxidation, would decrease significantly from almost 15'500 kg to 600 kg. This has two main reasons. First, the annual emission factor for wetlands used in the WFLDB adapted version of the Blonk tool is roughly 5 times lower than the emission factor given by Page et al. (2011). Secondly, peat emissions are computed as a country-average and not specifically for palm fruit. Therefore, less than 3.5% of the overall land transformation affects peat land. However, Page et al. (2011, p. 18) indicates that the total area of palm fruit plantations on peatland in Malaysia cover 0.53 million ha in 2010. Assuming that all of the peat drainage happened during the focused time period, this means that roughly 23% of the overall land transformation in Malaysia affects peatland. As both, annual emission factor and the proportion of peatland affected by land transformations are specifically reflecting on palm fruit cultivation in Malaysia, we use this information to complement the LUC impacts associated with the WFLDB approach. Considering the annual emission factor of 106'000 kg CO₂ eq per ha and the expansion of palm fruit during the last 20 years (56%) the annual peat emissions amount 14'000 kg CO₂ eq per ha. (see red square in Figure 5).

Ecoinvent v3.3 CO: The palm fruit plantation in Colombia shows a negative climate impact, i.e., -2'700 kg CO₂ eq. Both, emissions from land transformation and emissions from SOC are negative. Although this might appear counterintuitive, other studies show the same result pattern (Castanheira et al., 2014; Castanheira and Freire, 2016). Palm fruit cultivation in Colombia increased by 46% from 1991-2010. The land transformations are dominated by the transformation of annual to perennial cropland (72%) while the remainder (28%) represents transformation from perennial to perennial cropland which is accounted for with zero impacts. This land transformation pattern causes negative emissions because carbon stocks of palm fruit plantation are generally higher than the carbon stock of the former, annual cropland. In addition, SOC impacts are negative because the mentioned transformation pattern increases SOC. However, it has to be kept in mind that replacing agricultural crops might cause indirect land use changes, which can increase the pressure on natural ecosystems indirectly.

4.1.2 New crops, new technologies

The integration of data from the WFLDB has added several new crops to the database. The production is modelled in the geographies representing the biggest exporters per crop, and different technologies are represented when relevant (greenhouse, open field).

Table 12. New crop producing activities added to the database from WFLDB for the v3.3 release. This table lists all new activities related to crop production added to the ecoinvent database in the framework of the integration of the WFLDB. If several geographies of the same activity with the same time period exist, all of them are listed in the "Geography" column. When "P" appears in the "v3.3" column, this means that the product is also new.

Activity Name	geography	time period	V3.3
almond production	CN, GLO, US	2009 - 2012	P
apple production	CL, CN, GLO, IT, US	2009 - 2012	
apricot production	ES, FR, GLO, IT, TR	2009 - 2012	P
white asparagus production	CN, FR, GLO, PE	2009 - 2012	
asparagus seedling production, for planting	FR, GLO	2009 - 2012	P
banana production	CO, CR, EC, GLO, IN	2009 - 2012	
carrot production	CN, GLO, IL, NL	2009 - 2012	
carrot seed production, for sowing	CH, GLO	1999 - 2012	P
carrot seed production, Swiss integrated production, at farm	CH, GLO	2000 - 2012	P
cocoa bean production, sun-dried	CI, GH, GLO, ID	2009 - 2012	P
coconut production, dehusked	GLO, ID, IN, PH	2009 - 2012	P
coffee green bean production, arabica	BR, CO, GLO, HN, IN	2001 - 2012	P
coffee green bean production, robusta	BR, GLO, ID, IN, VN	2012 - 2014	P
fruit tree seedling production, for plating	CH, GLO	2000 - 2012	P
lemon production	ES, GLO, MX, TR	2009 - 2012	P
linseed production	CA, GLO, RU	2003 - 2012	P
linseed seed production, at farm	CH, GLO	1996 - 2012	P
linseed seed production, for sowing	CH, GLO	1999 - 2012	P
maize grain production	AR	2009 - 2012	
mandarin production	CN, ES, GLO	2009 - 2012	P
mint production	GLO, IN, US	1999 - 2012	P
mint seedling production, for planting	GLO, US	2009 - 2012	P
oat production	Canada without Quebec, FI, GLO	2009 - 2012	
oat seed production, for sowing	CH, GLO	1999 - 2012	P
oat seed production, Swiss integrated production, at farm	CH, GLO	1996 - 2012	P
olive production	ES, GLO, IT	2009 - 2012	P
onion production	CN, GLO, IN, NL, NZ	2009 - 2010	
onion seedling production, for planting	GLO, NZ	2009 - 2012	P
orange production, fresh grade	ES, GLO, US, ZA	2000 - 2012	P
orange production, processing grade	BR, GLO, US	2000 - 2012	P

Documentation of changes implemented in ecoinvent 3.3

Activity Name	geography	time period	V3.3
palm fruit bunch production	ID	2009 - 2012	
peach production	CN, ES, GLO, IT	2009 - 2012	P
peanut production	AR, CN, GLO, IN	2009 - 2012	P
peanut seed production, at farm	GLO, IN	1996 - 2012	P
peanut seed production, for sowing	GLO, IN	1999 - 2012	P
pear production	AR, BE, CN, GLO	2009 - 2012	P
potato production	CN, GLO, IN, RU, UA	2003 - 2013	
rape seed production	Canada without Quebec, GLO	2009 - 2012	
rice production	CN, GLO, IN	2009 - 2012	
soybean production	AR, CH	2009 - 2012	
strawberry production, in heated greenhouse	CH, GLO	2009 - 2012	
strawberry production, in unheated greenhouse	CH, GLO	2009 - 2012	
strawberry production, open field, macro tunnel	ES, GLO, US	2006 - 2012	
strawberry seedling production, in heated greenhouse, for planting	GLO, NL	2009 - 2012	P
strawberry seedling production, in unheated greenhouse, for planting	ES, GLO, US	2009 - 2012	P
sugar beet production	DE, FR, GLO, RU, US	2009 - 2012	
sugarcane production	IN	2009 - 2009	
sunflower production	FR, GLO, HU, RU, UA	2006 - 2012	
sweet corn production	GLO, HU, TH, US	2006 - 2012	P
tea production, dried	CN, GLO, KE, LK	2009 - 2012	P
tomato production, fresh grade, in heated greenhouse	GLO, NL	2009 - 2012	P
tomato production, fresh grade, in unheated greenhouse	ES, GLO	2006 - 2012	P
tomato production, fresh grade, open field	GLO, MX	2009 - 2012	P
tomato production, processing grade, open field	GLO, IT	2007 - 2011	P
tomato seedling production, in heated greenhouse, for planting	GLO, NL	2009 - 2012	P
tomato seedling production, in unheated greenhouse, for planting	ES, GLO, IT, MX	2009 - 2012	P
vanilla production	GLO, MG	2013 - 2013	P
vanilla seedling production, for planting	GLO, MG	2009 - 2012	P
wheat production	AU, Canada without Quebec	2009 - 2012	

Table 13. New support activities added to the database from WFLDB for the v3.3 release. This table lists all new activities modelling support activities for crop production added to the ecoinvent database in the framework of the integration of the WFLDB. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column. All products produced in those activities are new.

Activity name	Geography	Time period
diesel, burned in agricultural machinery	GLO	1999 - 2012
establishing orchard	CH, GLO	2011 - 2011
garage construction, wood, non-insulated, fire-protected	CH, GLO	2009 - 2012
greenhouse construction, glass walls and roof, metal tubes	FR, GLO	2005 - 2012
greenhouse construction, glass walls and roof, plastic tubes	FR, GLO	2005 - 2012
greenhouse construction, plastic walls and roof, metal tubes	FR, GLO	2005 - 2012
greenhouse construction, plastic walls and roof, plastic tubes	FR, GLO	2005 - 2012
horticultural fleece production	CH, GLO	2009 - 2012
packaging production for liquid fertiliser or pesticide, per kilogram of packed product	GLO	2009 - 2015
packaging production for solid fertiliser or pesticide, per kilogram of packed product	GLO	2009 - 2015
petrol, unleaded, burned in machinery	GLO	2009 - 2012
planting tree	CH, GLO	2009 - 2009
plastic tunnel construction	FR, GLO	2005 - 2012
shed construction, large, wood, non-insulated, fire-unprotected	CH, GLO	2009 - 2012
trellis system construction, wooden poles, soft wood, tar impregnated	CH, GLO	2010 - 2010

Table 14. New crops (products) added to the v3.3 of the database. The table lists the new markets that have been generated, with the time period, as the product name can always be read after “market for”. Geography of those markets is GLO.

Market (and product) name	Time period
market for almond	2009 - 2012
market for apricot	2009 - 2012
market for asparagus seedling, for planting	2009 - 2012
market for carrot seed, for sowing	1999 - 2012
market for carrot seed, Swiss integrated production, at farm	2000 - 2012
market for cocoa bean	2009 - 2012
market for coconut husk	2010 - 2012
market for coffee, green bean	2012 - 2014
market for fruit tree seedling, for planting	2000 - 2012
market for lemon	2009 - 2012
market for linseed	2003 - 2012
market for linseed seed, at farm	1996 - 2012
market for linseed seed, for sowing	1999 - 2012
market for mandarin	2009 - 2012
market for mint	1999 - 2012
market for mint seedling, for planting	2009 - 2012
market for oat grain, feed	1996 - 1999
market for oat seed, for sowing	1999 - 2012
market for oat seed, Swiss integrated production, at farm	1996 - 2012
market for olive	2009 - 2012
market for onion seedling, for planting	2009 - 2012
market for orange, fresh grade	2000 - 2012
market for orange, processing grade	2000 - 2014
market for peach	2009 - 2012
market for peanut	2009 - 2012
market for peanut seed, for sowing	1999 - 2012
market for peanut seed, at farm	1996 - 2012
market for strawberry seedling, for planting	2009 - 2012
market for sweet corn	2006 - 2012
market for tea, dried	2009 - 2012
market for tomato seedling, for planting	2009 - 2012
market for tomato, fresh grade	2009 - 2012
market for tomato, processing grade	2007 - 2007
market for vanilla	2013 - 2013
market for vanilla seedling, for planting	2009 - 2012

Table 15. New products added to the v3.3 of the database, related to support activities for crop production. The table lists the new markets that have been generated, with the time period, as the product name can always be read after “market for”. Geography of those markets is GLO.

Market (and product) name	Time period
market for diesel, burned in agricultural machinery	1999 - 2012
market for establishing orchard	2011 - 2011
market for garage, wood, non-insulated, fire-protected	2009 - 2012
market for greenhouse, glass walls and roof	2015 - 2015
market for greenhouse, plastic walls and roof	2015 - 2015
market for horticultural fleece	2009 - 2012
market for packaging, for fertilisers and pesticides	2009 - 2015
market for petrol, unleaded, burned in machinery	2009 - 2012
market for planting tree	2009 - 2009
market for plastic tunnel	2005 - 2012
market for shed, large, wood, non-insulated, fire-unprotected	2009 - 2012
market for trellis system, wooden poles, soft wood, tar impregnated	2010 - 2010

4.1.3 Deleted activities as result of the WFLDB update

Most of the deletions were done in order to ensure the consistent implementation of the LUC model into the database. This includes the deletion of the old activities “on land recently transformed” for sugar, soybean and palm fruit bunch, as explained in 0.

Other activities or products (tomato, strawberry, citrus) have been deleted as more specific products were introduced in the database, and more technologies are represented.

Table 16. Activities deleted or replaced from the database as a result of the updates from the WFLDB. For recommended replacements please see the correspondence file present for download on the ecoinvent website.

Activity name	Geography	Time period
carrot335 production	GLO	2010 - 2010
citrus production	GLO	2010 - 2010
clear-cutting, grassland to arable land	CO, GLO, IN, RAF	1990 - 2009
clear-cutting, primary forest to arable land	BR, CO, GLO, IN, MY	1990 - 2009
clear-cutting, secondary forest to arable land	GLO, IN	1990 - 2009
clear-cutting, shrubland to arable land	BR, CO, GLO, RAF	1990 - 2009
intensification, arable land	GLO	1990 - 2009
land already in use, arable land	GLO	1990 - 2009
onion855 production	GLO	2010 - 2010
palm fruit bunch production, on land recently transformed	GLO, MY	2002 - 2006
soybean production, on land recently transformed	BR, GLO	2001 - 2006
strawberry production	GLO	2010 - 2010
sugarcane production, on land recently transformed	BR, GLO	1996 - 2006
tomato production	GLO	2010 - 2010
unknown land use, on arable land recently transformed from shrubland	BR, CO, Glo	1990 - 2009
unkown land use, on arable land recently transformed from grassland	CO, GLO	1990 - 2009
unkown land use, on arable land recently transformed from primary forest	BR, CO, GLO, MY	1990 - 2009
unkown land use, on arable land recently transformed from secondary forest	GLO	1990 - 2009
vine tomato production	GLO	2010 - 2010

Table 17. Markets and the corresponding products deleted or replaced from the database as a result of the updates from the WFLDB. All the markets were GLO. For recommended replacements please see the correspondence file present for download on the ecoinvent website.

Market (and product) name	Time period
market for citrus	2010 - 2010
market for land tenure, arable land	1990 - 2009
market for tomato	2010 - 2010
market for unknown land use	1990 - 2009
market for vine tomato	2010 - 2010

4.2 Other new data on agriculture

Some new crops and feeds were introduced in the v3.3, outside of the WFLDB integration. Those are considered here.

Table 18. *New data in the agriculture sector unrelated to WFLDB. The geography of all datasets is GLO, except “oat grain, feed production”, where it’s GLO and CA-QC.*

Activity name	Time period	Reference product
market for palm date, conditioned and dried	2012 - 2012	palm date, conditioned and dried
market for palm date, conditioned and dried, organic	2012 - 2012	palm date, conditioned and dried, organic
oat grain, feed production	1996 - 1999	oat grain, feed
palm date production	2012 - 2012	palm date
palm date production, organic	2012 - 2012	palm date, organic
palm date production, conditioned and dried	2012 - 2012	palm date, conditioned and dried
palm date production, conditioned and dried, organic	2012 - 2012	palm date, conditioned and dried, organic

4.3 Other updates and corrections

Many activities are affected by the update in the Swiss Supply chains, as direct links have been added to connect the inputs of agricultural services or infrastructures to the corresponding Swiss providing activity, as described in Chapter 3.

In the same optic, the CA-QC activities maize grain, feed production, and soybean, feed production have added direct Activity Links to the maize grain and soybean CA-QC inputs respectively.

In v3.2, the input amounts of some organic fertilizers (manures) was set to 0 as the modelling couldn’t be done properly, now they can (see 0). The original amounts have been restored, and those datasets are also listed in the table below.

Table 19. Updated activities in the agriculture sector. The activities listed below have had activity links added, original amounts of manure inputs restored or Production Volumes adjusted. If an activity is present in several geographies, with the same time period, all of them are listed under "Geography". The Reference product from each activity is listed as well.

Activity Name	Geography	Time period	Reference product
alfalfa/grass silage production	CA-QC, GLO	2010 - 2012	alfalfa-grass silage
alfalfa-grass mixture production, Swiss integrated production	CH	2001 - 2001	alfalfa-grass mixture, Swiss integrated production
application of plant protection product, by field sprayer	CH	1991 - 2002	application of plant protection product, by field sprayer
bale loading	CH	1991 - 2002	bale loading
baling	CH	1991 - 2002	baling
barley production	CA-QC	2010 - 2012	barley grain
barley production, organic	CH	1996 - 2003	barley grain, organic
barley production, Swiss integrated production, extensive	CH	1996 - 2003	barley grain, Swiss integrated production
barley production, Swiss integrated production, intensive	CH	1996 - 2003	barley grain, Swiss integrated production
biogas production from grass	CH	2000 - 2003	biogas, from grass
catch crop growing, phacelia, September-October, organic fertiliser 60 kg N	CH	2011 - 2011	phacelia silage
catch crop growing, ryegrass, August-April, organic fertiliser 60 kg N, three cuts	CH	2011 - 2011	ryegrass silage
catch crop growing, ryegrass, August-April, organic fertiliser 80 kg N, three cuts	CH	2011 - 2011	ryegrass silage
catch crop growing, ryegrass, September-April, organic fertiliser 40 kg N, one cut	CH	2011 - 2011	ryegrass silage
catch crop growing, ryegrass, September-April, organic fertiliser 60 kg N, one cut	CH	2011 - 2011	ryegrass silage
catch crop growing, ryegrass-Egyptian&Persian clover-mixture, August-October, not fertilised, one cut	CH	2011 - 2011	ryegrass-Egyptian&Persian clover-mixture silage
catch crop growing, ryegrass-Egyptian&Persian clover-mixture, August-October, organic fertiliser 30 kg N, one cut	CH	2011 - 2011	ryegrass-Egyptian&Persian clover-mixture silage
catch crop growing, ryegrass-Egyptian&Persian clover-mixture, August-October, organic fertiliser 30 kg N, two cuts	CH	2011 - 2011	ryegrass-Egyptian&Persian clover-mixture silage
catch crop growing, ryegrass-Egyptian&Persian clover-mixture, August-October, organic fertiliser 60 kg N, two cuts	CH	2011 - 2011	ryegrass-Egyptian&Persian clover-mixture silage
catch crop growing, ryegrass-red&Egyptian clover-mixture, August-April, organic fertiliser 60 kg N, three cuts	CH	2011 - 2011	ryegrass-red&Egyptian clover-mixture silage

Activity Name	Geography	Time period	Reference product
catch crop growing, ryegrass-red&Egyptian clover-mixture, August-April, organic fertiliser 80 kg N, three cuts	CH	2011 - 2011	ryegrass-red&Egyptian clover-mixture silage
catch crop growing, ryegrass-red&Egyptian clover-mixture, September-April, organic fertiliser 40 kg N, one cut	CH	2011 - 2011	ryegrass-red&Egyptian clover-mixture silage
catch crop growing, ryegrass-red&Egyptian clover-mixture, September-April, organic fertiliser 60 kg N, one cut	CH	2011 - 2011	ryegrass-red&Egyptian clover-mixture silage
catch crop growing, sunflower, August-October, organic fertiliser 20 kg N	CH	2011 - 2011	sunflower silage
catch crop growing, sunflower, August-October, organic fertiliser 30 kg N	CH	2011 - 2011	sunflower silage
chopping, maize	CH	1991 - 2002	chopping, maize
clover seed production, Swiss integrated production, at farm	CH	2000 - 2000	clover seed, Swiss integrated production, at farm
coconut oil production, crude	GLO, PH	1995 - 1995	coconut oil, crude
combine harvesting	CH	1991 - 2002	combine harvesting
drying of bread grain, seed and legumes	CH	1985 - 2002	drying of bread grain, seed and legumes
drying of feed grain	CH	1985 - 2002	drying of feed grain
drying of grass	CH	1985 - 2002	drying of grass
drying of maize straw and whole-plant	CH	1985 - 2002	drying of maize straw and whole-plant
esterification of rape oil	CH	1998 - 2006	vegetable oil methyl ester
ethanol production from grass	CH	2000 - 2004	ethanol, without water, in 95% solution state, from fermentation
ethanol production from potatoes	CH	2002 - 2006	ethanol, without water, in 95% solution state, from fermentation
ethanol production from sugar beet	CH	2000 - 2004	ethanol, without water, in 95% solution state, from fermentation
ethanol production from whey	CH	2000 - 2004	ethanol, without water, in 95% solution state, from fermentation
ethanol production from wood	CH	1999 - 2006	ethanol, without water, in 95% solution state, from fermentation
fava bean production, organic	CH	1996 - 2003	fava bean, organic
fava bean production, Swiss integrated production, at farm	CH	1996 - 2003	fava bean, Swiss integrated production

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Activity Name	Geography	Time period	Reference product
fertilising, by broadcaster	CH	1991 - 2002	fertilising, by broadcaster
fodder beet production, Swiss integrated production, intensive	CH	1996 - 2003	fodder beet, Swiss integrated production
fodder loading, by self-loading trailer	CH	1991 - 2002	fodder loading, by self-loading trailer
grass production, organic, intensive	CH	1995 - 2005	grass, organic
grass production, permanent grassland, organic, extensive	CH	2000 - 2005	grass, organic
grass production, permanent grassland, organic, intensive	CH	1995 - 2005	grass, organic
grass production, permanent grassland, Swiss integrated production, extensive	CH	1995 - 2005	grass, Swiss integrated production
grass production, permanent grassland, Swiss integrated production, intensive	CH	2000 - 2005	grass, Swiss integrated production
grass production, Swiss integrated production, intensive	CH	1995 - 2005	grass, Swiss integrated production
grass seed production, organic, for sowing	CH	1995 - 2005	grass seed, organic, for sowing
grass seed production, Swiss integrated production, at farm	CH	2000 - 2000	grass seed, Swiss integrated production, at farm
grass silage production, organic	CH	1995 - 2005	grass silage, organic
grass silage production, Swiss integrated production, intensive	CH	1995 - 2005	grass silage, Swiss integrated production
green asparagus production	GLO	2010 - 2010	green asparagus
green manure growing, organic, until April	CH	1996 - 2003	green manure, organic, until April
green manure growing, organic, until February	CH	1996 - 2003	green manure, organic, until February
green manure growing, organic, until January	CH	1996 - 2003	green manure, organic, until January
green manure growing, organic, until March	CH	1996 - 2003	green manure, organic, until March
green manure growing, Swiss integrated production, until April	CH	1996 - 2003	green manure, Swiss integrated production, until April
green manure growing, Swiss integrated production, until February	CH	1996 - 2003	green manure, Swiss integrated production, until February
green manure growing, Swiss integrated production, until January	CH	1996 - 2003	green manure, Swiss integrated production, until January
green manure growing, Swiss integrated production, until March	CH	1996 - 2003	green manure, Swiss integrated production, until March
harvesting, by complete harvester, beets	CH	1991 - 2002	harvesting, by complete harvester, beets

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Activity Name	Geography	Time period	Reference product
harvesting, by complete harvester, ground crops	CH	1991 - 2002	harvesting, by complete harvester, ground crops
hay production	CA-QC, GLO	2010 - 2012	hay
hay production, organic, intensive	CH	2005 - 2005	hay, organic, intensive
hay production, Swiss integrated production, extensive	CH	2005 - 2005	hay, Swiss integrated production, extensive
hay production, Swiss integrated production, intensive	CH	2005 - 2005	hay, Swiss integrated production, intensive
haying, by rotary tedder	CH	1991 - 2002	haying, by rotary tedder
hoeing	CH	1991 - 2002	hoeing
horn meal production	CH	1993 - 1993	horn meal
horn meal production	CH	1993 - 1993	horn meal
irrigation	CH	1991 - 2002	irrigation
liquid manure spreading, by vacuum tanker	CH	1991 - 2002	liquid manure spreading, by vacuum tanker
maize grain production	CA-QC	2010 - 2012	maize grain
maize grain production, organic	CH	1996 - 2003	maize grain, organic
maize grain production, Swiss integrated production	CH	1996 - 2003	maize grain, Swiss integrated production
maize grain, feed production	CA-QC	1996 - 1999	maize grain, feed
maize seed production, organic, at farm	CH	2000 - 2000	maize seed, organic, at farm
maize seed production, Swiss integrated production, at farm	CH	2000 - 2000	maize seed, Swiss integrated production, at farm
maize seed production, Swiss integrated production, for sowing	CH	1999 - 2002	maize seed, Swiss integrated production, for sowing
maize silage production	CA-QC, GLO	2010 - 2012	maize silage
maize silage production, organic	CH	1996 - 2003	maize silage, organic
maize silage production, Swiss integrated production, intensive	CH	1996 - 2003	maize silage, Swiss integrated production
mowing, by motor mower	CH	1991 - 2002	mowing, by motor mower
mowing, by rotary mower	CH	1991 - 2002	mowing, by rotary mower
mulching	CH	1991 - 2002	mulching
oat production	CA-QC	2010 - 2012	oat grain

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Activity Name	Geography	Time period	Reference product
oil mill construction	CH	2004 - 2008	oil mill
planting	CH	1991 - 2002	planting
potato haulm cutting	CH	1991 - 2002	potato haulm cutting
potato planting	CH	1991 - 2002	potato planting
potato production	CA-QC	2010 - 2012	potato
potato production, organic	CH	1996 - 2003	potato, organic
potato production, Swiss integrated production, intensive	CH	1996 - 2003	potato, Swiss integrated production
potato seed production, organic, at farm	CH	1996 - 2003	potato seed, organic, at farm
potato seed production, Swiss integrated production, at farm	CH	1996 - 2003	potato seed, Swiss integrated production, at farm
protein pea production, organic	CH	1996 - 2003	protein pea, organic
protein pea production, Swiss integrated production, intensive	CH	1996 - 2003	protein pea, Swiss integrated production
rape seed production	CA-QC	2010 - 2012	rape seed
rape seed production, organic	CH	2000 - 2005	rape seed, organic
rape seed production, Swiss integrated production, extensive	CH	1996 - 2003	rape seed, Swiss integrated production
rape seed production, Swiss integrated production, intensive	CH	1996 - 2003	rape seed, Swiss integrated production
rice production	GLO	2001-2006	rice
rye production, organic	CH	1996 - 2003	rye grain, organic
rye production, Swiss integrated production, extensive	CH	1996 - 2003	rye grain, Swiss integrated production
rye production, Swiss integrated production, intensive	CH	1996 - 2003	rye grain, Swiss integrated production
solid manure loading and spreading, by hydraulic loader and spreader	CH	1991 - 2002	solid manure loading and spreading, by hydraulic loader and spreader
sowing	CH	1991 - 2002	sowing
soybean meal and crude oil production, mechanical extraction	CA-QC	2010 - 2013	soybean meal
soybean production	CA-QC	2010 - 2012	soybean
soybean production, organic	CH	1996 - 2003	soybean, organic
soybean production, Swiss integrated production, intensive	CH	1996 - 2003	soybean, Swiss integrated production

Activity Name	Geography	Time period	Reference product
soybean, feed production	CA-QC	1996 - 1999	soybean, feed
straw production, stand-alone production	CH	1995 - 2005	straw, stand-alone production
sugar beet production	CH	1996 - 2003	sugar beet
sunflower production, Swiss integrated production, intensive	CH	1996 - 2003	sunflower seed, Swiss integrated production
swath, by rotary windrower	CH	1991 - 2002	swath, by rotary windrower
tillage, cultivating, chiselling	CH	1991 - 2002	tillage, cultivating, chiselling
tillage, currying, by weeder	CH	1991 - 2002	tillage, currying, by weeder
tillage, harrowing, by rotary harrow	CH	1991 - 2002	tillage, harrowing, by rotary harrow
tillage, harrowing, by spring tine harrow	CH	1991 - 2002	tillage, harrowing, by spring tine harrow
tillage, hoeing and earthing-up, potatoes	CH	1991 - 2002	tillage, hoeing and earthing-up, potatoes
tillage, ploughing	CH	1991 - 2002	tillage, ploughing
tillage, rolling	CH	1991 - 2002	tillage, rolling
tillage, rotary cultivator	CH	1991 - 2002	tillage, rotary cultivator
transport, tractor and trailer, agricultural	CH	1991 - 2002	transport, tractor and trailer, agricultural
vegetable oil esterification facility construction	CH	2004 - 2008	vegetable oil esterification facility
wheat production	GLO	2010 - 2012	wheat grain
wheat production	CA-QC	2010 - 2012	wheat grain
wheat production, organic	CH	1996 - 2003	wheat grain, organic
wheat production, Swiss integrated production, extensive	CH	1996 - 2003	wheat grain, Swiss integrated production
wheat production, Swiss integrated production, intensive	CH	1996 - 2003	wheat grain, Swiss integrated production

4.3.1 Organic fertilizers and meal

The modelling of organic fertilizers has been improved still in v3.3, and will continue to improve in future versions. Since v3.3 all types of manure can be used as inputs for crop production, for that, the classification of the products was changed in allocation (Table 3) and consequential system models (with constrained markets).

The three activities “treatment of used vegetable cooking oil by anaerobic digestion”; “treatment of biowaste by anaerobic digestion”; and “anaerobic digestion of manure” are a disaggregation of the activity present in v3.2 “treatment of manure and biowaste by anaerobic digestion”, this activity have been deleted. This was needed in order to allow the change in the modelling of manure.

Similarly, some meals have been remodelled to be consistent with all other meals, and are also considered here.

Table 20. Activities related to organic fertilizers or meals that have been added or modified for the v3.3 release. All activities are listed with their respective Reference products. The geography of all activities is GLO, except in **, located in CH and GLO. In column v3.3: “C” stands for constrained market; “U” for updated activity; “N” for new activity to the database.

Activity name	Time period	Reference product	V3.3
anaerobic digestion of manure**	2009 - 2009	biogas	N
cottonseed meal to generic market for protein feed	2012 - 2012	protein feed, 100% crude	U
market for compost	2012 - 2012	compost	C
market for cottonseed meal	2012 - 2012	cottonseed meal	C
market for manure, liquid, cattle	2009 - 2009	manure, liquid, cattle	C
market for manure, liquid, swine	2009 - 2009	manure, liquid, swine	C
market for manure, solid, cattle	2009 - 2009	manure, solid, cattle	C
market for palm kernel meal	2012 - 2012	palm kernel meal	C
market for poultry manure, dried	2012 - 2012	poultry manure, dried	U
market for poultry manure, fresh	2011 - 2011	poultry manure, fresh	C
nutrient supply from coconut husk	2010 - 2012	coconut husk	N
nutrient supply from compost	1999 - 1999	nitrogen fertiliser, as N	U
nutrient supply from manure, liquid, cattle	2009 - 2016	nitrogen fertiliser, as N	N
nutrient supply from manure, liquid, swine	2009 - 2016	nitrogen fertiliser, as N	N
nutrient supply from manure, solid, cattle	2009 - 2016	nitrogen fertiliser, as N	N
nutrient supply from poultry manure, dried	2001 - 2002	nitrogen fertiliser, as N	U
nutrient supply from poultry manure, dried	2001 - 2002	nitrogen fertiliser, as N	U
nutrient supply from poultry manure, fresh	2009 - 2016	nitrogen fertiliser, as N	N
palm kernel meal to generic market for protein feed	2012 - 2012	protein feed, 100% crude	U
treatment of biowaste by anaerobic digestion**	2009 - 2009	biowaste	N
treatment of poultry manure, drying, pelleting**	2001 - 2002	poultry manure, dried	U
treatment of used vegetable cooking oil by anaerobic digestion**	2009 - 2009	used vegetable cooking oil	N

5 Building materials

5.1 Cement: adjustment of “cement, unspecified”

One of the big restructuring actions in this sector has been the remodelling of the generic product “cement, unspecified”. Until v3.2, this product was generated by the activities “cement production, unspecified” (GLO, US, CH, RER without CH). These activities averaged the different cement types to generate the product “cement, unspecified”. The limitation of this modelling is the fact that no specific cement type can be distinguished from the others in terms of constraints to supply the generic market.

These activities “cement production, unspecified” have then been deleted (all geographies), and replaced by several others, that connect specifically each cement type with the generic market for “cement, unspecified”.

Table 21. New activities producing the generic product “cement, unspecified” in the v3.3 database.

Activity Name	Geography	Time Period
cement, alternative constituents 21-35% to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, alternative constituents 6-20% to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, blast furnace slag 18-30% and 18-30% other alternative constituents to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, blast furnace slag 25-70%, US only to generic market for cement, unspecified	GLO; US	2013 - 2013
cement, blast furnace slag 31-50% and 31-50% other alternative constituents to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, blast furnace slag 36-65%, non-US to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, blast furnace slag 5-25%, US only to generic market for cement, unspecified	GLO; US	2013 - 2013
cement, blast furnace slag 70-100%, non-US to generic market for cement, unspecified	GLO; US	2013 - 2013
cement, blast furnace slag 81-95%, non-US to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, blast furnace slag, 66-80%, non-US to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, Portland to generic market for cement, unspecified	CH; Europe without Switzerland; GLO; US	2013 - 2013
cement, pozzolana and fly ash 11-35%, non-US to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, pozzolana and fly ash 15-40%, US only to generic market for cement, unspecified	GLO; US	2013 - 2013
cement, pozzolana and fly ash 36-55%, non-US to generic market for cement, unspecified	CH; Europe without Switzerland; GLO	2013 - 2013
cement, pozzolana and fly ash 5-15%, US only to generic market for cement, unspecified	GLO; US	2013 - 2013
market for cement, unspecified	CH; Europe without Switzerland	2013 - 2013

The activity “**cement, unspecified, import from Europe**” was also generated to model the imports into the CH market of this generic product.

5.2 Corrections and updates

Most of the corrections are related to the improvement of the Swiss supply chains modelling (read chapter 0). Otherwise, corrections in exchange amounts, production volumes or emissions have benefit this sector.

Table 22. Updated activities in the building material and construction sector. *If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column. The Reference product from each activity is listed as well.*

Activity Name	Geography	Time Period	Reference product
adhesive mortar production	CH	2000 - 2004	adhesive mortar
anhydrite floor production	CH	2000 - 2004	anhydrite floor
autoclaved aerated concrete block production	CH	1995 - 2000	autoclaved aerated concrete block
base plaster production	CH	1995 - 2001	base plaster
building construction, hall	CH	2000 - 2001	building, hall
burnt shale production	DE; GLO	2010 - 2010	burnt shale
cement cast plaster floor production	CH	1997 - 2001	cement cast plaster floor
cement factory construction	CH	1998 - 2001	cement factory
cement mortar production	CH	1994 - 2001	cement mortar
cement production, alternative constituents 21-35%	CH	2009 - 2010	cement, alternative constituents 21-35%
cement production, alternative constituents 6-20%	CA-QC; GLO	2005 - 2009	cement, alternative constituents 6-20%
cement production, alternative constituents 6-20%	CH	2009 - 2010	cement, alternative constituents 6-20%
cement production, blast furnace slag 18-30% and 18-30% other alternative constituents	CH	2005 - 2009	cement, blast furnace slag 18-30% and 18-30% other alternative constituents
cement production, blast furnace slag 31-50% and 31-50% other alternative constituents	CH	2005 - 2009	cement, blast furnace slag 31-50% and 31-50% other alternative constituents
cement production, blast furnace slag 36-65%, non-US	CH	2005 - 2009	cement, blast furnace slag 36-65%, non-US

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Activity Name	Geography	Time Period	Reference product
cement production, blast furnace slag 66-80%, non-US	CH	2005 - 2009	cement, blast furnace slag, 66-80%, non-US
cement production, blast furnace slag 81-95%, non-US	CH	2005 - 2009	cement, blast furnace slag 81-95%, non-US
cement production, Portland	CH	2009 - 2010	cement, Portland
cement production, pozzolana and fly ash 11-35%, non-US	CH	2005 - 2009	cement, pozzolana and fly ash 11-35%, non-US
cement production, pozzolana and fly ash 36-55%, non-US	CH	2005 - 2009	cement, pozzolana and fly ash 36-55%, non-US
cement tile production	CH	2004 - 2004	cement tile
ceramic factory construction	CH	2001 - 2002	ceramic factory
clay brick production	GLO; RER	1992 - 2002	clay brick
clay pit construction	CH	1992 - 2002	clay pit infrastructure
clay pit operation	CH; GLO	1992 - 2002	clay
clay plaster production	CA-QC; CH; GLO	1995 - 2001	clay plaster
concrete mixing factory construction	CH	1997 - 2001	concrete mixing factory
concrete production, for building construction, with cement CEM II/A	CH	2013 - 2013	concrete, high exacting requirements
concrete production, for building construction, with cement CEM II/B	CH	2013 - 2013	concrete, high exacting requirements
concrete production, for civil engineering, with cement CEM I	CH	2013 - 2013	concrete, sole plate and foundation
concrete production, for civil engineering, with cement CEM II/A	CH	2013 - 2013	concrete, sole plate and foundation
concrete production, for civil engineering, with cement CEM II/B	CH	2013 - 2013	concrete, sole plate and foundation
concrete production, for drilled piles, with cement CEM I	CH	2013 - 2013	concrete, for de-icing salt contact
concrete production, for drilled piles, with cement CEM II/A	CH	2013 - 2013	concrete, for de-icing salt contact
concrete production, for drilled piles, with cement CEM II/B	CH	2013 - 2013	concrete, for de-icing salt contact
concrete roof tile production	CH	2004 - 2004	concrete roof tile
cover plaster production, mineral	CH	1995 - 2001	cover plaster, mineral
expanded clay production	DE; GLO	1995 - 2000	expanded clay

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Activity Name	Geography	Time Period	Reference product
expanded perlite production	CH	1995 - 2000	expanded perlite
expanded vermiculite production	CH	1995 - 2000	expanded vermiculite
explosives factory construction	CH	2000 - 2001	explosives factory
fibre cement corrugated slab production	CH	1991 - 2001	fibre cement corrugated slab
fibre cement facing tile production, large format	CH	2007 - 2008	fibre cement facing tile, large format
fibre cement facing tile production, small format	CH	2007 - 2008	fibre cement facing tile, small format
fibre cement roof slate production	CH	1991 - 2001	fibre cement roof slate
glass wool mat production	CH	1993 - 2000	glass wool mat
gravel and sand quarry operation	CH	1997 - 2001	gravel, round
gravel production, crushed	CH	2013 - 2013	gravel, crushed
gravel/sand quarry construction	CH	1997 - 2001	gravel/sand quarry infrastructure
gypsum quarry operation	CH	1997 - 2003	gypsum, mineral
hot water tank factory construction	CH	2001 - 2001	hot water tank factory
kaolin production	GLO; RER	2000 - 2000	kaolin
light clay brick production	DE; GLO	1992 - 1995	light clay brick
light mortar production	CH	1995 - 2001	light mortar
lightweight concrete block production, expanded clay	CH; GLO	1995 - 2000	lightweight concrete block, expanded clay
lightweight concrete block production, expanded perlite	CH	1995 - 2000	lightweight concrete block, expanded perlite
lightweight concrete block production, expanded vermiculite	CH	1995 - 2000	lightweight concrete block, expanded vermiculite
lightweight concrete block production, polystyrene	CH	1995 - 2000	lightweight concrete block, polystyrene
lime mortar production	CH	1995 - 2001	lime mortar
lime production, hydrated, packed	CH	2000 - 2002	lime, hydrated, packed
lime production, hydraulic	CH; GLO	1997 - 2001	lime, hydraulic
lime production, milled, packed	CH	2000 - 2002	lime, packed
limestone quarry construction	CH	2000 - 2002	limestone quarry infrastructure

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Activity Name	Geography	Time Period	Reference product
limestone quarry operation	CH	1992 - 2002	limestone, unprocessed
natural stone plate production, cut	CH	2000 - 2004	natural stone plate, cut
quicklime production, milled, packed	CH	2000 - 2002	quicklime, milled, packed
refractory production, fireclay, packed	DE; GLO	1999 - 2001	refractory, fireclay, packed
sand-lime brick production	DE; GLO	1993 - 2001	sand-lime brick
stone wool factory construction	CH	2000 - 2002	stone wool factory
stone wool production	CH	2000 - 2007	stone wool
thermal plaster production, outdoor	CH	1995 - 2001	thermal plaster, outdoor
unreinforced concrete production, with cement CEM II/A	CH	2013 - 2013	concrete, normal
unreinforced concrete production, with cement CEM II/B	CH	2013 - 2013	concrete, normal

6 Chemicals

6.1 New activities and products: activated carbon

New activities producing activated carbon, and treating the spent activated carbon are published in the v3.3 of the database. The corresponding products “activated carbon, granular” and “spent activated carbon, granular” are also new products to the database.

Table 23. New activities supplying activated carbon and treating spent activated carbon. If an activity is present in several geographies, with the same time period, all of them are listed under “Geography”. The reference product from each activity is listed as well.

Activity name	Geography	Time period	Reference product
activated carbon production, granular from hard coal	GLO, RER	2005 - 2015	activated carbon, granular
market for activated carbon, granular	GLO	2005 - 2015	activated carbon, granular
market for spent activated carbon, granular	GLO	2005 - 2015	spent activated carbon, granular
treatment of spent activated carbon, granular from hard coal, reactivation	GLO, RER	2005 - 2015	spent activated carbon, granular

6.2 Updates and corrections

Minor corrections were made in some datasets, concerning the update of some exchanges, or the adjustment of production volumes (“ammonia, liquid” producing activities). In the case of CH activities, changes would also reflect the introduction of activity links to infrastructures or services, as described in chapter 3.

Changes in production volumes will affect the market composition for the corresponding products (ie. “ammonia, liquid”), and so potentially the impacts of consuming activities of this market mix.

Table 24. Activities where minor corrections have happened between v3.2 and v3.3. If an activity is present with the same time period in several geographies all of them are listed under “Geography”. The Reference product from each activity is listed as well.

Activity name	Geography	Time period	Reference Product
ammonia production, partial oxidation, liquid	GLO, RER	2000 - 2000	ammonia, liquid
ammonia production, steam reforming, liquid	GLO, RER	2000 - 2000	ammonia, liquid
air separation, cryogenic	CA-CH, GLO, RER	1997 - 2001	oxygen, liquid
air separation, xenon krypton purification	CA-QC, GLO	1998 - 2001	xenon, gaseous
polystyrene foam slab for perimeter insulation	CH	2009 - 2011	polystyrene foam slab for perimeter insulation
polystyrene foam slab production, 10% recycled	CH	2009 - 2011	polystyrene foam slab, 10% recycled
polystyrene foam slab with graphite, 6% recycled	CH	2009 - 2011	polystyrene foam slab with graphite, 6% recycled
storage building construction, chemicals, solid	CH	1998 - 1998	storage building, chemicals, solid
wood preservative production, creosote	GLO, RER	2000 - 2000	wood preservative, creosote

7 Energy

Most of the changes in this sector concern adjustment in existing data (efficiencies), introduction of activity links in the framework of the update of the Swiss supply chains (chapter 3 for more info), or correction of production volumes. Some activities have also been added, or largely updated (including the time period), they are then listed as new.

Table 25. Activities added or modified in the energy sector. If an activity is present with the same time period in several geographies all of them are listed under "Geography". The reference product is listed as well. In column v3.3, "N" stands for "New" and "U" for "Updated".

Activity name	Geography	Reference product	Time period	V3.3
absorption chiller production, 100kW	CH	absorption chiller, 100kW	2000 - 2005	U
auxiliary heating unit production, electric, 5kW	CH	auxiliary heating unit, electric, 5kW	1993 - 1993	U
deep well drilling, for deep geothermal power	AT; CH; DE; GLO; HICC; ID; IS; IT; JP; MX; PT; RU; TH; TR; WECC	deep well, drilled, for geothermal power	2015 - 2015	U
desulfurisation of hard coal flue gas	GLO; RER	SOx retained, in hard coal flue gas desulfurisation	1985 - 2000	U
desulfurisation of lignite flue gas	GLO	SOx retained, in lignite flue gas desulfurisation	1985 - 2000	U
distribution network construction, electricity, low voltage	GLO	distribution network, electricity, low voltage	1988 - 2000	U
distribution network construction, electricity, low voltage	CA-QC	distribution network, electricity, low voltage	2008 - 2014	N
distribution network construction, electricity, low voltage	CH	distribution network, electricity, low voltage	1988 - 2000	U
electricity production, coal, aluminium industry	IAI Area, EU27 & EFTA	electricity, high voltage, aluminium industry	2012 - 2012	U
electricity production, deep geothermal	AT; CH; DE; GLO; HICC; ID; IS; IT; JP; MX; PT; RU; TH; TR; WECC, US only	electricity, high voltage	2015 - 2015	U
electricity production, hydro, reservoir, non-alpine region	CA-QC	electricity, high voltage	1945 - 2015	U
electricity production, hydro, run-of-river	CA-QC	electricity, high voltage	1945 - 2015	U
electricity production, oil	CA-QC; LV	electricity, high voltage	1980 - 2015	U
electricity production, wind, <1MW turbine, onshore	CA-QC	electricity, high voltage	2000 - 2015	N
electricity production, wind, >3MW turbine, onshore	CA-QC	electricity, high voltage	2012 - 2015	N
electricity production, wind, 1-3MW turbine, onshore	CA-QC	electricity, high voltage	2005 - 2015	N
electricity production, wind, 2.3MW turbine, precast concrete tower, onshore	CA-QC; GLO	electricity, high voltage	2010 - 2015	U

Activity name	Geography	Reference product	Time period	V3.3
electricity voltage transformation from high to medium voltage	AU; BE; BG; CH; CSG; CY; CZ; DE; DK; ES; FI; FR; GB; GLO; GR; HICC; HU; IE; IN; IT; JP; KR; LU; MRO, US only; MT; MY; NL; NO; PT; RU; SE; SGCC; SI; SK; TW; TZ; UA; WECC, US only	electricity, medium voltage	2012 - 2012	U
electricity voltage transformation from high to medium voltage	CA-QC	electricity, medium voltage	2012 - 2015	N
electricity voltage transformation from medium to low voltage	AT; AU; BA; BE; BG; BR; CH; CSG; CY; CZ; DE; DK; ES; FI; FR; GB; GLO; GR; HR; HU; ID; IE; IN; IR; IT; JP; KR; LT; LU; LV; MRO, US only; MT; MY; NL; NO; PE; PL; PT; RFC; RO; RU; SA; SE; SGCC; SI; SK; TH; TW; TZ; WECC, US only	electricity, low voltage	2012 - 2012	U
electricity voltage transformation from medium to low voltage	CA-QC	electricity, low voltage	2012 - 2015	N
electricity, high voltage, hydro, import from CA-ON	CA-QC, GLO	electricity, high voltage	2014 - 2014	N
electricity, high voltage, import from CA-NB	CA-QC, GLO	electricity, high voltage	2014 - 2014	N
electricity, high voltage, import from CA-NF	CA-QC, GLO	electricity, high voltage	2014 - 2014	N
electricity, high voltage, import from CA-ON	CA-QC, GLO	electricity, high voltage	2014 - 2014	N
electricity, high voltage, import from NPCC, US only	CA-QC, GLO	electricity, high voltage	2014 - 2014	N
expansion vessel production, 25l	CH	expansion vessel, 25l	1993 - 1993	U
expansion vessel production, 80l	CH	expansion vessel, 80l	1993 - 1993	U
fuel cell production, polymer electrolyte membrane, 2kW electrical, future	CH	fuel cell, polymer electrolyte membrane, 2kW electrical, future	2000 - 2005	U
fuel cell production, solid oxide, 125kW electrical, future	CH	fuel cell, solid oxide, 125kW electrical, future	2000 - 2005	U
fuel cell production, solid oxide, with micro gas turbine, 180kW electrical, future	CH	fuel cell, solid oxide, with micro gas turbine, 180kW electrical, future	2000 - 2005	U
fuel cell production, stack polymer electrolyte membrane, 2kW electrical, future	CH	fuel cell, stack polymer electrolyte membrane, 2kW electrical, future	2000 - 2005	U

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Activity name	Geography	Reference product	Time period	V3.3
fuel cell production, stack solid oxide, 125kW electrical, future	CH	fuel cell, stack solid oxide, 125kW electrical, future	2000 - 2005	U
geothermal power plant construction	CH	geothermal power plant, 5.5MWel	2015 - 2015	U
geothermal power plant construction	GLO	geothermal power plant, 5.5MWel	2015 - 2015	U
heat and power co-generation unit construction, 1MWel	CH	heat and power cogeneration unit, organic Rankine cycle, 1MWe, 6.4 MWth	2015 - 2015	U
heat and power cogeneration unit construction, 1MWel, 6.4 MWth	CH	heat and power cogeneration unit, 1MWel, 6.4MWth	2016 - 2016	N
heat and power cogeneration unit construction, 1MWel, 6.4 MWth	GLO	heat and power cogeneration unit, 1MWel, 6.4MWth	2016 - 2016	N
heat and power co-generation, hard coal	CZ; DE; FI; GLO; KR; NL; NO; PL; SE; SK	heat, district or industrial, other than natural gas	1980 - 2015	U
heat and power co-generation, natural gas, conventional power plant, 100MW electrical	CA-QC	heat, district or industrial, natural gas	1990 - 2015	U
heat and power co-generation, natural gas, mini-plant 2KW electrical	CH	heat, central or small-scale, natural gas	2000 - 2000	U
heat and power co-generation, oil	ASCC; AT; AU; BE; BG; BR; DE; DK; ES; FI; FR; FRCC; GB; GLO; GR; HICC; HR; IE; IT; KR; LT; LU; LV; MRO, US only; NL; NPCC, US only; PT; RFC; RO; RS; RU; SE; SERC; SK; SPP; TR; TRE; TW; UA; WECC, US only	heat, district or industrial, other than natural gas	1980 - 2015	U
heat production, borehole heat exchanger, brine-water heat pump 10kW	CH	heat, borehole heat pump	1998 - 2000	U
heat production, heavy fuel oil, at industrial furnace 1MW	CH	heat, district or industrial, other than natural gas	1991 - 2000	U
heat production, light fuel oil, at boiler 100kW condensing, non-modulating	CH	heat, central or small-scale, other than natural gas	1991 - 2000	U
heat production, light fuel oil, at boiler 100kW, non-modulating	CH	heat, central or small-scale, other than natural gas	1991 - 2000	U
heat production, light fuel oil, at boiler 10kW condensing, non-modulating	CH	heat, central or small-scale, other than natural gas	1991 - 2000	U
heat production, light fuel oil, at boiler 10kW, non-modulating	CH	heat, central or small-scale, other than natural gas	1991 - 2000	U

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Activity name	Geography	Reference product	Time period	V3.3
heat production, light fuel oil, at industrial furnace 1MW	CH	heat, district or industrial, other than natural gas	1991 - 2000	U
heat production, natural gas, at diffusion absorption heat pump 4kW, future	CH	heat, future	2000 - 2005	U
heat pump production, diffusion absorption, 4kW, future	CH	heat pump, diffusion absorption, 4kW, future	2000 - 2005	U
heat storage production, 2000l	CH	heat storage, 2000l	2001 - 2002	U
hot water tank production, 600l	CH	hot water tank, 600l	1993 - 2001	U
hydropower plant construction, reservoir	CA-QC	hydropower plant, reservoir	1945 - 2045	U
maintenance, micro gas turbine, 100kW electrical	CH	maintenance, micro gas turbine, 100kW electrical	2000 - 2005	U
maintenance, solid oxide fuel cell, with micro gas turbine, 180kW electrical, future	CH	maintenance, solid oxide fuel cell, with micro gas turbine, 180kW electrical, future	2000 - 2005	U
market for electricity, high voltage	CA-QC	electricity, high voltage	2012 - 2015	U
market for electricity, high voltage	CH	electricity, high voltage	2012 - 2015	U
market for electricity, high voltage	CH	electricity, high voltage	2012 - 2015	U
market for electricity, high voltage, for Swiss Federal Railways	CH	electricity, high voltage, for Swiss Federal Railways	2011 - 2015	U
market for electricity, high voltage, for Swiss Federal Railways	CH	electricity, high voltage, for Swiss Federal Railways	2011 - 2015	U
market for electricity, high voltage, label-certified	CH	electricity, high voltage, label-certified	2011 - 2015	U
market for electricity, high voltage, label-certified	CH	electricity, high voltage, label-certified	2011 - 2015	U
market for electricity, low voltage	CH	electricity, low voltage	2012 - 2015	U
market for electricity, low voltage	CA-QC	electricity, low voltage	2012 - 2015	U
market for electricity, low voltage	CH	electricity, low voltage	2012 - 2015	U
market for electricity, low voltage, label-certified	CH	electricity, low voltage, label-certified	2011 - 2015	U
market for electricity, low voltage, label-certified	CH	electricity, low voltage, label-certified	2011 - 2015	U
market for electricity, medium voltage	CA-QC	electricity, medium voltage	2012 - 2015	U
market for electricity, medium voltage, label-certified	CH	electricity, medium voltage, label-certified	2011 - 2015	U
market for electricity, medium voltage, label-certified	CH	electricity, medium voltage, label-certified	2011 - 2015	U
market for heat and power cogeneration unit, 1MWel, 6.4MWth	GLO	heat and power cogeneration unit, 1MWel, 6.4MWth	2016 - 2016	N

Activity name	Geography	Reference product	Time period	V3.3
methane production, 96% by volume, from biogas, from high pressure network, at service station	CH	methane, 96% by volume, from biogas, from high pressure network, at service station	2001 - 2001	U
methane production, 96% by volume, from biogas, from low pressure network, at service station	CH	methane, 96% by volume, from biogas, from low pressure network, at service station	2001 - 2001	U
methane production, 96% by volume, from biogas, from medium pressure network, at service station	CH	methane, 96% by volume, from biogas, from medium pressure network, at service station	2001 - 2001	U
micro gas turbine production, 100kW electrical	CH	micro gas turbine, 100kW electrical	2000 - 2005	U
mini CHP plant production, components for heat only	CH	mini CHP plant, components for heat only	1997 - 2000	U
natural gas service station construction	CH	natural gas service station	2001 - 2001	U
natural gas, burned in micro gas turbine, 100kWe	GLO	heat, central or small-scale, natural gas	2000 - 2005	U
natural gas, burned in micro gas turbine, 100kWe	CH	heat, central or small-scale, natural gas	2000 - 2005	U
natural gas, burned in polymer electrolyte membrane fuel cell 2kWe, future	CH	heat, future	2000 - 2005	U
natural gas, burned in solid oxide fuel cell 125kWe, future	CH	heat, future	2000 - 2005	U
natural gas, burned in solid oxide fuel cell, with micro gas turbine, 180kWe, future	CH	heat, future	2000 - 2005	U
natural gas, from high pressure network (1-5 bar), at service station	CH	natural gas, from high pressure network (1-5 bar), at service station	2001 - 2001	U
natural gas, from low pressure network (<0.1 bar), at service station	CH	natural gas, from low pressure network (<0.1 bar), at service station	2001 - 2001	U
natural gas, from medium pressure network (0.1-1 bar), at service station	CH	natural gas, from medium pressure network (0.1-1 bar), at service station	2001 - 2001	U
photovoltaic facade installation, 3kWp, multi-Si, laminated, integrated, at building	CH	photovoltaic facade installation, 3kWp, multi-Si, laminated, integrated, at building	2000 - 2005	U
photovoltaic facade installation, 3kWp, multi-Si, panel, mounted, at building	CH	photovoltaic facade installation, 3kWp, multi-Si, panel, mounted, at building	2000 - 2005	U
photovoltaic facade installation, 3kWp, single-Si, laminated, integrated, at building	CH	photovoltaic facade installation, 3kWp, single-Si, laminated, integrated, at building	2000 - 2005	U

Activity name	Geography	Reference product	Time period	V3.3
photovoltaic facade installation, 3kWp, single-Si, panel, mounted, at building	CH	photovoltaic facade installation, 3kWp, single-Si, panel, mounted, at building	2000 - 2005	U
photovoltaic flat-roof installation, 3kWp, multi-Si, on roof	CH	photovoltaic flat-roof installation, 3kWp, multi-Si, on roof	2000 - 2005	U
photovoltaic flat-roof installation, 3kWp, single-Si, on roof	CH	photovoltaic flat-roof installation, 3kWp, single-Si, on roof	2000 - 2005	U
photovoltaic slanted-roof installation, 3kWp, a-Si, laminated, integrated, on roof	CH	photovoltaic slanted-roof installation, 3kWp, a-Si, laminated, integrated, on roof	2004 - 2005	U
photovoltaic slanted-roof installation, 3kWp, a-Si, panel, mounted, on roof	CH	photovoltaic slanted-roof installation, 3kWp, a-Si, panel, mounted, on roof	2004 - 2005	U
photovoltaic slanted-roof installation, 3kWp, CIS, panel, mounted, on roof	CH	photovoltaic slanted-roof installation, 3kWp, CIS, panel, mounted, on roof	2004 - 2005	U
photovoltaic slanted-roof installation, 3kWp, multi-Si, laminated, integrated, on roof	CH	photovoltaic slanted-roof installation, 3kWp, multi-Si, laminated, integrated, on roof	2000 - 2005	U
photovoltaic slanted-roof installation, 3kWp, multi-Si, panel, mounted, on roof	CH	photovoltaic slanted-roof installation, 3kWp, multi-Si, panel, mounted, on roof	2000 - 2005	U
photovoltaic slanted-roof installation, 3kWp, ribbon-Si, laminated, integrated, on roof	CH	photovoltaic slanted-roof installation, 3kWp, ribbon-Si, laminated, integrated, on roof	2004 - 2005	U
photovoltaic slanted-roof installation, 3kWp, ribbon-Si, panel, mounted, on roof	CH	photovoltaic slanted-roof installation, 3kWp, ribbon-Si, panel, mounted, on roof	2004 - 2005	U
pipeline construction, natural gas, high pressure distribution network	CH	pipeline, natural gas, high pressure distribution network	1990 - 2000	U
pump production, 40W	CH	pump, 40W	1994 - 1994	U
solar collector system installation, Cu flat plate collector, multiple dwelling, hot water	CH	solar collector system, Cu flat plate collector, multiple dwelling, hot water	2002 - 2002	U
solar collector system installation, Cu flat plate collector, one-family house, combined system	CH	solar collector system, Cu flat plate collector, one-family house, combined system	2002 - 2002	U
solar collector system installation, Cu flat plate collector, one-family house, hot water	CH	solar collector system, Cu flat plate collector, one-family house, hot water	2002 - 2002	U

Activity name	Geography	Reference product	Time period	V3.3
solar collector system installation, evacuated tube collector, one-family house, combined system	CH	solar collector system, with evacuated tube collector, one-family house, combined system	2002 - 2002	U
stimulation of deep well, for geothermal power	GLO	stimulation, deep well	2015 - 2015	U
stimulation of deep well, for geothermal power	CH	stimulation, deep well	2015 - 2015	U
stirling heat and power co-generation unit construction, 3kW electrical, future	CH	stirling heat and power co-generation unit, 3kW electrical, future	2000 - 2005	U
transmission network construction, electricity, high voltage	CA-QC	transmission network, electricity, high voltage	1983 - 2014	N
transmission network construction, electricity, high voltage	CH	transmission network, electricity, high voltage	1988 - 1994	U
transmission network construction, electricity, medium voltage	CH	transmission network, electricity, medium voltage	1988 - 2000	U
transmission network construction, electricity, medium voltage	CA-QC	transmission network, electricity, medium voltage	2008 - 2014	N
treatment of blast furnace gas, in power plant	AT; AU; BA; BE; BG; BR; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CN-AH; CN-BJ; CN-CQ; CN-FJ; CN-GD; CN-GS; CN-GX; CN-GZ; CN-HA; CN-HB; CN-HE; CN-HL; CN-HN; CN-HU; CN-JL; CN-JS; CN-JX; CN-LN; CN-NM; CN-NX; CN-QH; CN-SA; CN-SC; CN-SD; CN-SH; CN-SX; CN-TJ; CN-XJ; CN-XZ; CN-YN; CN-ZJ; CZ; DE; EE; ES; FI; FR; GB; GLO; HR; HU; IE; IR; IT; JP; KR; MX; NL; NO; PL; RO; RS; RU; SE; SK; TR; TW; UA	blast furnace gas	1980 - 2015	U
treatment of coal gas, in power plant	AT; BA; BE; BG; BR; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CZ; DE; ES; FI; FR; GB; GLO; HR; HU; IN; IR; IT; JP; KR; MX; NL; PL; RO; RS; RU; SE; SK; TR; TW; UA	coal gas	1990 - 2015	U

Activity name	Geography	Reference product	Time period	V3.3
wood pellets, burned in stirling heat and power co-generation unit, 3kW electrical, future	CH	heat, future	2000 - 2005	U

7.1 Biogas

Biogas has been reclassified as mentioned in Table 3, and some activities related to it, renamed (Table 2). These changes are the consequence of the remodelling in the manures (see Chapter 0) as now the fermentation of manure is modelled as a production route for biogas as Reference Product.

This change has affected the activities in the following table, where biogas has been moved from being the treated Reference Product to be an input from Technosphere. Electricity has been considered the Reference Product, and heat still a by-product. In those cases the values for electrical and thermal efficiency have also been adjusted.

Some activities in the following table have been further edited, by adding activity links in the framework of the improvement of the Swiss Supply chains (see Chapter 0).

Table 26. Activities updated related to biogas. The corresponding reference product is also listed in the table to facilitate the understanding of the change; if the reference product appears in *Italics*, it indicates that it is a New reference product, being before a negative biogas reference product. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column.

Activity name	Geography	Time period	Reference product
biogas, burned in micro gas turbine 100kWe	CH	2000 - 2005	electricity, low voltage
biogas, burned in polymer electrolyte membrane fuel cell 2kWe, future	CH	2000 - 2005	electricity, low voltage
biogas, burned in solid oxide fuel cell 125kWe, future	CH	2000 - 2005	electricity, low voltage
biogas, burned in solid oxide fuel cell, with micro gas turbine, 180kWe, future	CH	2000 - 2005	electricity, low voltage
biogas, purification to methane 96 vol-%	CH, GLO	2004 - 2005	<i>methane, 96% by volume</i>
heat and power co-generation, biogas, gas engine	AT; AU; BE; BR; CA-AB; CA-NB; CA-NS; CA-ON; CA-PE; CA-QC; CH; CZ; DE; DK; EE; ES; FI; FR; FRCC; GB; GLO; GR; HICC; HR; HU; IE; IN; IR; IT; KR; LT; LU; LV; MRO, US only; MX; MY; NL; NO; NPCC, US only; PE; PL; PT; RFC; RO; RS; SE; SERC; SI; SK; SPP; TH; TR; TRE; TW; WECC, US only	2007 - 2015	<i>electricity, high voltage</i>
heat and power co-generation, biogas, gas engine, label-certified	CH, GLO	2010 - 2015	<i>electricity, high voltage, label-certified</i>
heat production, biogas, at diffusion absorption heat pump 4kW, future	CH	2000 - 2005	heat, diffusion absorption heat pump
market for biogas	GLO	2016 - 2016	biogas

8 Metals

Some updates occurred in the aluminium activities, notably the CA-QC activities were heavily updated including a change in the Time period; they are therefore accounted as “New” activities.

Other large correction concerned ferro-related metals (ferrochromium, ferromanganese, ferronickel). They were wrongly accounting for the resource intake, since their creation in v2.2. They have now been corrected.

Table 27. New and updated activities in the transport sector. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column. In the column v3.3, “N” stands for “New”, “U” stands for “Updated”.

Activity Name	Geography	Time period	V3.3
aluminium production, primary, ingot	IAI Area, Asia, without China and GCC; IAI Area, EU27 & EFTA; IAI Area, North America, without Quebec; IAI Area, Russia & Europe outside EU & EFTA; IAI Area, South America	2010 - 2010	U
aluminium production, primary, ingot	CA-QC	2014 - 2014	N
aluminium production, primary, liquid, prebake	CA-QC	2014 - 2014	N
aluminium production, primary, liquid, Soderberg	CA-QC	2014 - 2014	N
anode production, prebake, for aluminium electrolysis	CA-QC	2014 - 2014	N
ferrochromium production, high-carbon, 68% Cr	GLO	1994 - 2003	U
ferromanganese production, high-coal, 74.5% Mn	GLO; RER	1994 - 2003	U
ferronickel production, 25% Ni	GLO	1994 - 2003	U

The copper market was distorted in v3.2, and it has been corrected in v3.3, by changing the name of the activity from “copper production, from imported concentrates”, to “process-specific burdens, import of copper to Switzerland”. Consistently with what the activity was modelling, the activity does not produce “copper” anymore, but “process-specific burdens, import of copper to Switzerland”. This new product generates a new market as well (GLO).

The geographies of the activities in the aluminium sector have been renamed. It is documented in the table below.

Table 28. Geography change in the aluminium sector.

IAI geography names in v3.2	IAI geography names in v3.3
IAI Area 1	IAI Area, Africa
IAI Area 2, without Quebec	IAI Area, North America, without Quebec
IAI Area 3	IAI Area, South America
IAI Area 4&5 without China	IAI Area, Asia, without China and GCC
IAI Area, EU27 & EFTA	IAI Area, EU27 & EFTA
IAI Area, Europe outside EU & EFTA	IAI Area, Russia & RER w/o EU27 & EFTA
IAI Area 8	IAI Area, Gulf Cooperation Council

9 Tap water

Only minor changes were done in this specific sector, they mostly concern the addition of activity links to specific suppliers, both in the framework of the update of the Swiss Supply chains (see Chapter 3), and as a general improvement of other activities.

Table 29. Modified activities related to tap water supply. All the listed activities produce “tap water” as reference product.

Activity name	Geography	Time period
market for tap water	CA-QC	2012 - 12012
tap water production, underground water with chemical treatment	CH	2012 - 12012
tap water production, underground water with disinfection	CH	2012 - 12012
tap water production, underground water without treatment	CH	2012 - 12012

A new copy of the activity “water production, deionised, from tap water, at user” has been generated with the location Europe without Switzerland, as explained in Chapter 0.

10 Transport

The only changes in v3.3 regarding this sector is an error correction in the charge load of lorries between 7.5-16, 16-32, and 32 metric ton, which used in some cases the wrong factor or mixed up the factor between classes. The load changes used now and the concerned activities by this change are listed in the following tables.

Table 30. Corrected change loads per lorry size.

Lorry size class	Average load factor		GVW	
	V3.2	V3.3	V3.2	V3.3
3.5-7.5t	0.98t	0.98t	4.98t	4.98t
7.5-16t	3.29t	3.29t	9.29t	9.29t
16-32t	5.79t	5.79t	15.79t	15.79t
>32t	19.20t	15.96t	33.20t	29.96t

Table 31. Updated activities in the transport sector. If several geographies of the same activity with the same time period exist, all of them are listed in the "Geography" column. In the column v3.3, "U" stands for "Updated". EURO[...] stands for EURO3, EURO4, EURO5 and EURO6 each time. In this Table, the names of the reference products match the activity names.

Activity Name	Geography	Time Period	V3.3
transport, freight, lorry >32 metric ton, EURO[...]	GLO, RER	2009 - 2013	U
transport, freight, lorry 16-32 metric ton, EURO[...]	GLO, RER	2009 - 2013	U
transport, freight, lorry 7.5-16 metric ton, EURO[...]	GLO, RER	2009 - 2013	U
transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO[...], carbon dioxide, liquid refrigerant, cooling	GLO	2010 - 2014	U
transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO[...], carbon dioxide, liquid refrigerant, freezing	GLO	2010 - 2014	U
transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO[...], R134a refrigerant, cooling	GLO	2010 - 2014	U
transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO[...], R134a refrigerant, freezing	GLO	2010 - 2014	U

11 Waste treatments

The sector has been greatly shaped by the update in the Swiss Supply chains and by the addition of new Swiss and Europe without Switzerland markets (chapter 3). Similarly, many Europe without Switzerland activities have been added, in order to cover the geographical region Europe.

Some GLO markets have seen the transport modified and improved, they are also listed in the table below.

Table 32. Activities modified or added new in the waste treatment sector for v3.3. If an activity is present with the same time period in several geographies all of them are listed under "Geography". The reference product name can be retrieved from the activity name after "treatment of" or "market for". In column v3.3, "N" stands for "New" and "U" for "Updated".

Activity name	Geography	Time period	V3.3
market for process-specific burden, sanitary landfill	GLO	2011 - 2011	U
market for process-specific burdens, hazardous waste incineration plant	GLO	2011 - 2011	U
market for process-specific burdens, inert material landfill	GLO	2011 - 2011	U
market for process-specific burdens, municipal waste incineration	GLO	2011 - 2011	U
market for process-specific burdens, residual material landfill	GLO	2011 - 2011	U
market for process-specific burdens, slag landfill	GLO	2011 - 2011	U
process-specific burdens, municipal waste incineration	Europe without Switzerland	1995 - 2000	N
process-specific burdens, residual material landfill	Europe without Switzerland	1995 - 1995	N
process-specific burdens, slag landfill	Europe without Switzerland	1995 - 1995	N
treatment of ash from paper production sludge, residual material landfill	Europe without Switzerland	1994 - 2000	N
treatment of bilge oil, hazardous waste incineration	CH	1997 - 2000	U
treatment of bilge oil, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of condensate from light oil boiler, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of conditioned spent nuclear fuel, in interim storage	Europe without Switzerland	1992 - 1998	N
treatment of decommissioned pipeline, natural gas, inert material landfill	CH	1995 - 1995	U
treatment of digester sludge, municipal incineration, future	CH	2010 - 2020	U
treatment of drilling waste, landfarming	CH	2000 - 2000	U

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Activity name	Geography	Time period	V3.3
treatment of fly ash and scrubber sludge, hazardous waste incineration	CH	1997 - 2000	U
treatment of fly ash and scrubber sludge, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of hard coal ash, sanitary landfill	CH	1994 - 2000	U
treatment of hazardous waste, hazardous waste incineration	CH	1997 - 2000	U
treatment of hazardous waste, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of heat carrier liquid, 40% C ₃ H ₈ O ₂ , capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of inert waste, inert material landfill	CH	1995 - 1995	U
treatment of inert waste, sanitary landfill	CH	1994 - 2000	U
treatment of inert waste, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of lignite ash, sanitary landfill	CH	1994 - 2000	U
treatment of limestone residue, inert material landfill	CH	1995 - 1995	U
treatment of municipal solid waste, sanitary landfill	CH	1994 - 2000	U
treatment of rainwater mineral oil storage, in wastewater treatment plant, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of rainwater mineral oil storage, in wastewater treatment plant, capacity 1.1E10l/year	Europe without Switzerland	1994 - 2000	N
treatment of raw sewage sludge, municipal incineration	CH	1994 - 2000	U
treatment of refinery sludge, hazardous waste incineration	CH, GLO	1997 - 2000	U
treatment of refinery sludge, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of refinery sludge, landfarming	CH	2000 - 2000	U
treatment of refinery sludge, landfarming	Europe without Switzerland	2000 - 2000	N
treatment of refinery sludge, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of refinery sludge, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of residue from cooling tower, sanitary landfill	CH	1994 - 2000	U
treatment of scrap aluminium, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of scrap copper, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of scrap steel, inert material landfill	CH, GLO	1995 - 1995	U
treatment of scrap steel, inert material landfill	Europe without Switzerland	1995 - 1995	N

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Activity name	Geography	Time period	V3.3
treatment of scrap steel, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of scrap tin sheet, sanitary landfill	CH	1994 - 2000	U
treatment of slag from metallurgical grade silicon production, inert material landfill	CH	1995 - 1995	U
treatment of sludge from pulp and paper production, sanitary landfill	CH	1994 - 2000	U
treatment of sludge from pulp and paper production, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment, sludge from pulp and paper production, landfarming	Europe without Switzerland	2011 - 2012	N
treatment of sludge, pig iron production, residual material landfill	Europe without Switzerland	1994 - 2000	N
treatment of spent antifreezer liquid, hazardous waste incineration	CH	1997 - 2000	U
treatment of spent oxychlor catalyst for ethylene dichloride production, hazardous waste incineration	CH	1997 - 2000	U
treatment of spent solvent mixture, hazardous waste incineration	CH	1997 - 2000	U
treatment of spent solvent mixture, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of used capacitor, to hazardous waste incineration	CH	1997 - 2000	U
treatment of used vegetable cooking oil, purification	CH	2003 - 2006	U
treatment of waste aluminium, sanitary landfill	CH	1994 - 2000	U
treatment of waste asphalt, sanitary landfill	CH	1994 - 2000	U
treatment of waste bitumen, sanitary landfill	CH	1994 - 2000	U
treatment of waste bitumen, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste brick, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste brick, recycling	CH, GLO	1994 - 2002	U
treatment of waste brick, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste brick, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste bulk iron, excluding reinforcement, sorting plant	CH	1994 - 2002	U
treatment of waste bulk iron, excluding reinforcement, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste cement in concrete and mortar, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste cement in concrete and mortar, sorting plant	CH	1994 - 2002	U
treatment of waste cement in concrete and mortar, sorting plant	Europe without Switzerland	1994 - 2002	N

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Activity name	Geography	Time period	V3.3
treatment of waste cement, hydrated, residual material landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste concrete gravel, sorting plant	CH	1994 - 2002	U
treatment of waste concrete, inert material landfill	CH, GLO	1995 - 1995	U
treatment of waste concrete, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste concrete, not reinforced, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste concrete, not reinforced, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste concrete, not reinforced, recycling	CH, GLO	1994 - 2002	U
treatment of waste concrete, not reinforced, recycling	Europe without Switzerland	1994 - 2002	N
treatment of waste concrete, not reinforced, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste concrete, not reinforced, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste emulsion paint on wall, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste emulsion paint on wall, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste emulsion paint on wood, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste emulsion paint, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste emulsion paint, hazardous waste incineration	CH	1997 - 2000	U
treatment of waste emulsion paint, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of waste emulsion paint, inert material landfill	CH	1995 - 1995	U
treatment of waste emulsion paint, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste emulsion paint, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste emulsion paint, sanitary landfill	CH	1994 - 2000	U
treatment of waste emulsion paint, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste glass pane in burnable frame, sorting plant	CH	1994 - 2002	U
treatment of waste glass sheet, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste glass sheet, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste glass sheet, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste glass sheet, sorting plant	Europe without Switzerland	1994 - 2002	N

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Activity name	Geography	Time period	V3.3
treatment of waste glass, inert material landfill	CH	1995 - 1995	U
treatment of waste glass, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste graphical paper, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste graphical paper, municipal incineration	GLO	2006 - 2012	U
treatment of waste graphical paper, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of waste graphical paper, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste gypsum plasterboard, sorting plant	CH	1994 - 2002	U
treatment of waste gypsum, inert material landfill	CH, GLO	1995 - 1995	U
treatment of waste gypsum, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste gypsum, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of waste gypsum, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste mineral oil, hazardous waste incineration	CH	1997 - 2000	U
treatment of waste mineral oil, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of waste mineral plaster, sorting plant	CH	1994 - 2002	U
treatment of waste mineral wool, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste mineral wool, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste mineral wool, inert material landfill	CH, GLO	1995 - 1995	U
treatment of waste mineral wool, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste mineral wool, recycling	CH, GLO	1994 - 2002	U
treatment of waste mineral wool, recycling	Europe without Switzerland	1994 - 2002	N
treatment of waste mineral wool, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste mineral wool, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste newspaper, sanitary landfill	CH	1994 - 2000	U
treatment of waste paint on metal, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste paint on metal, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste paint on wall, collection for final disposal	CH, GLO	1994 - 2002	U

Documentation of changes implemented in ecoinvent 3.3

Activity name	Geography	Time period	V3.3
treatment of waste paint on wall, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste paint on wood, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste paint, hazardous waste incineration	CH	1997 - 2000	U
treatment of waste paint, hazardous waste incineration	Europe without Switzerland	1997 - 2000	N
treatment of waste paint, inert material landfill	CH	1995 - 1995	U
treatment of waste paint, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste paint, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste paint, sanitary landfill	CH	1994 - 2000	U
treatment of waste paint, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste paper, unsorted, sorting	CH, GLO	1993 - 2007	U
treatment of waste paper, unsorted, sorting	Europe without Switzerland	1993 - 2007	U
treatment of waste paperboard, inert material landfill	CH	1995 - 1995	U
treatment of waste paperboard, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste paperboard, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste paperboard, sanitary landfill	CH	1994 - 2000	U
treatment of waste paperboard, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste paperboard, sorting plant	CH	1994 - 2002	U
treatment of waste paperboard, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste plaster-cardboard sandwich, sorting plant	CH	1994 - 2002	U
treatment of waste plastic plaster, inert material landfill	CH	1995 - 1995	U
treatment of waste plastic plaster, sanitary landfill	CH	1994 - 2000	U
treatment of waste plastic plaster, sorting plant	CH	1994 - 2002	U
treatment of waste plastic, mixture, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste plastic, mixture, municipal incineration	GLO	2006 - 2012	U
treatment of waste plastic, mixture, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of waste plastic, mixture, sanitary landfill	Europe without Switzerland	1994 - 2000	N

Documentation of changes implemented in ecoinvent 3.3

Activity name	Geography	Time period	V3.3
treatment of waste polyethylene terephthalate, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste polyethylene terephthalate, sanitary landfill	CH	1994 - 2000	U
treatment of waste polyethylene terephthalate, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste polyethylene, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste polyethylene, sanitary landfill	CH	1994 - 2000	U
treatment of waste polyethylene, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste polyethylene/polypropylene product, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste polypropylene, sanitary landfill	CH	1994 - 2000	U
treatment of waste polystyrene isolation, flame-retardant, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste polystyrene, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste polystyrene, sanitary landfill	CH	1994 - 2000	U
treatment of waste polystyrene, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste polyurethane foam, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste polyurethane seal, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste polyurethane seal, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste polyurethane, inert material landfill	CH	1995 - 1995	U
treatment of waste polyurethane, inert material landfill	Europe without Switzerland	1995 - 1995	N
treatment of waste polyurethane, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste polyurethane, municipal incineration with fly ash extraction	CH, GLO	2006 - 2012	U
treatment of waste polyurethane, sanitary landfill	CH	1994 - 2000	U
treatment of waste polyurethane, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste polyvinylchloride product, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste polyvinylchloride, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste polyvinylchloride, sanitary landfill	CH	1994 - 2000	U
treatment of waste polyvinylchloride, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste reinforced concrete, collection for final disposal	CH, GLO	1994 - 2002	U

Documentation of changes implemented in ecoinvent 3.3

Activity name	Geography	Time period	V3.3
treatment of waste reinforced concrete, collection for final disposal	Europe without Switzerland	1994 - 2002	N
treatment of waste reinforced concrete, recycling	CH, GLO	1994 - 2002	U
treatment of waste reinforced concrete, recycling	Europe without Switzerland	1994 - 2002	N
treatment of waste reinforced concrete, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste reinforced concrete, sorting plant	Europe without Switzerland	1994 - 2002	N
treatment of waste reinforced plasterboard, sorting plant	CH	1994 - 2002	U
treatment of waste reinforcement steel, collection for final disposal	CH, GLO	1994 - 2002	U
treatment of waste reinforcement steel, recycling	CH, GLO	1994 - 2002	U
treatment of waste reinforcement steel, sorting plant	CH, GLO	1994 - 2002	U
treatment of waste rubber, unspecified, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of waste wood, untreated, municipal incineration	GLO	2006 - 2012	U
treatment of waste wood, untreated, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of waste wood, untreated, sanitary landfill	Europe without Switzerland	1994 - 2000	N
treatment of waste zeolite, inert material landfill	CH	1995 - 1995	U
treatment of wastewater from anaerobic digestion of whey, capacity 1E9l/year	CH	1994 - 2000	U
treatment of wastewater from black chrome coating, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from cathode ray tube production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from ceramic production, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater from concrete production, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater from glass production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from grass refinery, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater from liquid crystal display backlight production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from liquid crystal display production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from liquid crystal production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from lorry production, capacity 4.7E10l/year	CH	1994 - 2000	U
treatment of wastewater from maize starch production, capacity 1.1E10l/year	CH	1994 - 2000	U

Documentation of changes implemented in ecoinvent 3.3

Activity name	Geography	Time period	V3.3
treatment of wastewater from pig iron production, capacity 5E9l/year	CH, GLO	1994 - 2000	U
treatment of wastewater from pig iron production, capacity 5E9l/year	Europe without Switzerland	1994 - 2000	N
treatment of wastewater from plywood production, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater from potato starch production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from PV cell production, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater from tube collector production, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater from wafer fabrication, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater, average, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater, average, capacity 1.6E8l/year	CH	1994 - 2000	U
treatment of wastewater, average, capacity 1E9l/year	CH	1994 - 2000	U
treatment of wastewater, average, capacity 1E9l/year	Europe without Switzerland	1994 - 2000	N
treatment of wastewater, average, capacity 4.7E10l/year	CH	1994 - 2000	U
treatment of wastewater, average, capacity 5E9l/year	CH	1994 - 2000	U
treatment of wastewater, from residence, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wastewater, unpolluted, from residence, capacity 1.1E10l/year	CH	1994 - 2000	U
treatment of wood ash mixture, pure, landfarming	CH	2000 - 2000	U
treatment of wood ash mixture, pure, landfarming	Europe without Switzerland	2000 - 2000	N
treatment of wood ash mixture, pure, municipal incineration	Europe without Switzerland	2006 - 2012	N
treatment of wood ash mixture, pure, sanitary landfill	CH, GLO	1994 - 2000	U
treatment of wood ash mixture, pure, sanitary landfill	Europe without Switzerland	1994 - 2000	N
waste paint, collection for hazardous waste incineration	CH, GLO	1994 - 2002	U

12 Wood and wood products

The database kept on updating and ensuring consistency in this sector. First, consistency with the new land use change model introduced in the framework of additions in the agricultural sector (chapter 4.1). For that, some activities created specifically for v3 for the modelling of land use change have been deleted, as they are no longer of use.

Table 33. Deleted activities in the wood sector. Those activities are related to the land use change modelling, and have become inconsistent with the wood sector modelling and the land use change modelling.

Activity Name	Geography	Time period	Reference product
harvest, roundwood, primary forest	GLO	1990 - 2009	roundwood
harvest, roundwood, secondary forest	GLO	1990 - 2009	roundwood
harvest, roundwood, shrubland	GLO	1990 - 2009	roundwood
market for roundwood	GLO	1990 - 2009	roundwood

Some new data have been added from Québec in this sector. Otherwise, the update on the other activities concern error corrections (sometimes large ie. “wood pellet factory production” RER), update of production volumes, and correction of transport distances (some markets). In the case of Swiss activities, activity links have been added to services or infrastructures to increase the detail of Swiss Supply chains (chapter 3). Otherwise, changes were done to ensure that the generic products “sawnwood, [...]” are accurately produced, considering all specific products (beam, board, lath) each time.

The “market for slab and siding, hardwood, wet, measured as dry mass” and “market for slab and siding, softwood, wet, measured as dry mass” are constrained markets where the marginal consumer activity has been changed from “slab and siding, hardwood, wet, measured as dry mass to generic market for residual hardwood, wet”, to “wood chips production, hardwood, at sawmill”. This will derive in changes in results in the consequential System Model.

Table 34. New and updated activities in the wood sector. If several geographies of the same activity with the same time period exist, all of them are listed in the “Geography” column. In the column v3.3, “U” stands for “Updated”, “N” for “New”, “***” indicates that also a change in Technology level occurred; from “current”, to “modern”. Technology changes will affect the results in the consequential System Model.

Activity Name	Geography	Time Period	V3.3
hardwood forestry, mixed species, sustainable forest management	CH	2010 - 2012	U
market for sawnwood, hardwood, dried (u=10%), planed	GLO, RER	2011 - 2011	U
market for sawnwood, hardwood, dried (u=20%), planed	GLO, RER	2011 - 2011	U
market for sawnwood, hardwood, raw, dried (u=10%)	GLO, RER	2011 - 2011	U
market for sawnwood, hardwood, raw, dried (u=20%)	GLO, RER	2011 - 2011	U

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market for sawnwood, softwood, dried (u=10%), planed	GLO, RER	2011 - 2011	U
market for sawnwood, softwood, dried (u=20%), planed	GLO, RER	2011 - 2011	U
market for sawnwood, softwood, raw, dried (u=10%)	GLO, RER	2011 - 2011	U
market for sawnwood, softwood, raw, dried (u=20%)	GLO, RER	2011 - 2011	U
market for slab and siding, hardwood, wet, measured as dry mass	GLO	2011 - 2011	U
market for slab and siding, softwood, wet, measured as dry mass	GLO	2011 - 2011	U
market for wood chips, wet, measured as dry mass	CA-QC	2011 - 2011	N
planing, beam, hardwood, u=10%	CA-QC, CH, GLO	2011 - 2011	U
planing, beam, hardwood, u=20%	CA-QC, CH, GLO	2011 - 2011	U
planing, beam, softwood, u=10%	CA-QC, CH, GLO	2011 - 2011	U
planing, beam, softwood, u=20%	CA-QC, CH, GLO	2011 - 2011	U
planing, board, hardwood, u=10%	CA-QC, CH, GLO	2011 - 2011	U
planing, board, hardwood, u=20%	CA-QC, CH, GLO	2014 - 2014	U
planing, board, softwood, u=10%	CA-QC, CH, GLO	2014 - 2014	U
planing, board, softwood, u=20%	CA-QC, CH, GLO	2011 - 2013	U
planing, lath, hardwood, u=10%	CA-QC, CH, GLO	2011 - 2013	U
planing, lath, hardwood, u=20%	CA-QC, CH, GLO	2011 - 2013	U
planing, lath, softwood, u=10%	CA-QC, CH, GLO	2011 - 2013	U
planing, lath, softwood, u=20%	CA-QC, CH, GLO	2011 - 2013	U
sawing, softwood	CA-QC	2011 - 2013	U
sawmill construction	CH	2012 - 2013	U
sawnwood production, hardwood, dried (u=10%), planed	GLO, RER	2011 - 2013	U
sawnwood production, hardwood, dried (u=20%), planed	GLO, RER	2011 - 2013	U
sawnwood production, hardwood, raw, dried (u=10%)	GLO, RER	2011 - 2013	U
sawnwood production, hardwood, raw, dried (u=20%)	GLO, RER	2011 - 2013	U
sawnwood production, softwood, dried (u=10%), planed	GLO, RER	2011 - 2013	U
sawnwood production, softwood, dried (u=20%), planed	GLO, RER	2011 - 2013	U
sawnwood production, softwood, raw, dried (u=10%)	GLO, RER	2011 - 2013	U
sawnwood production, softwood, raw, dried (u=20%)	GLO, RER	2011 - 2013	U
softwood forestry, mixed species, sustainable forest management	CH	2011 - 2013	U
wood pellet factory production	GLO, RER**	2011 - 2013	U

The changes above described will affect the subsequent supply chains

Table 35. Products affected by the changes described in Table 34.

Product name
sawlog and veneer log, hardwood, measured as solid wood under bark
sawlog and veneer log, softwood, measured as solid wood under bark
sawnwood, beam, hardwood, dried (u=10%), planed
sawnwood, beam, hardwood, dried (u=20%), planed
sawnwood, beam, softwood, dried (u=10%), planed
sawnwood, beam, softwood, dried (u=20%), planed
sawnwood, board, hardwood, dried (u=10%), planed
sawnwood, board, hardwood, dried (u=20%), planed
sawnwood, board, softwood, dried (u=10%), planed
sawnwood, board, softwood, dried (u=20%), planed
sawnwood, hardwood, dried (u=10%), planed
sawnwood, hardwood, dried (u=20%), planed
sawnwood, hardwood, raw, dried (u=10%)
sawnwood, hardwood, raw, dried (u=20%)
sawnwood, lath, hardwood, dried (u=10%), planed
sawnwood, lath, hardwood, dried (u=20%), planed
sawnwood, lath, softwood, dried (u=10%), planed
sawnwood, lath, softwood, dried (u=20%), planed
sawnwood, softwood, dried (u=10%), planed
sawnwood, softwood, dried (u=20%), planed
sawnwood, softwood, raw
sawnwood, softwood, raw, dried (u=10%)
sawnwood, softwood, raw, dried (u=20%)
slab and siding, hardwood, wet, measured as dry mass
slab and siding, softwood, wet, measured as dry mass

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Annex 1: price change

This Annex lists all products with changed prices. Compared to v3.2, the listed products have new or updated prices. The users of the database which have valid ecoinvent licences can access all the prices directly in the database or check the concrete changes in the Change Report Annex excel file.

Exhaustive list of products with new price in v3.3

[sulfonyl]urea-compound; [thio]carbamate-compound; 1,1-difluoroethane, HFC-152a; 1-propanol; 2,4-dichlorophenol; 2,4-dichlorotoluene; 2-methyl-2-butanol; 2-nitroaniline; 2-pyridinol; 3-methyl-1-butyl acetate; 4-methyl-2-pentanone; 4-tert-butylbenzaldehyde; 4-tert-butyltoluene; acetamide-anilide-compound, unspecified; acetanilide; acetoacetic acid; acetyl chloride; acetylene; acetonifene; acrolein; acrylic acid; acrylic filler; acrylic varnish, without water, in 87.5% solution state; adhesive mortar; adhesive, for metal; adipic acid; alfalfa-grass mixture, Swiss integrated production; alkylbenzene sulfonate, linear, petrochemical; alkylketene dimer sizing agent, for paper production; alpha-naphthol; alpha-picoline; aluminium alloy, AlMg3; aluminium around steel bi-metal stranded cable, 3x3.67mm external diameter wire; aluminium fluoride; aluminium hydroxide; aluminium removed by drilling, conventional; aluminium removed by turning, average, conventional; aluminium removed by turning, primarily dressing, conventional; aluminium removed by turning, primarily roughing, conventional; aluminium sulfate, powder; aluminium, primary, ingot; ammonium bicarbonate; ammonium carbonate; ammonium nitrite; ammonium thiocyanate; anhydrite; anhydrite floor; anhydrite, burned; aniline; anthranilic acid; antimony; application of plant protection product, by field sprayer; argon, liquid; arsine; asbestos, chrysotile type; atrazine; bale loading; baling; barite; barley seed, for sowing; barley seed, organic, for sowing; barley seed, Swiss integrated production, for sowing; base plaster; battery, NaCl; beet seed, Swiss integrated production, for sowing; bentonite quarry infrastructure; benzal chloride; benzaldehyde; benzimidazole-compound; benzyl alcohol; benzyl chloride; beverage carton converting; bisphenol A, powder; blasting; blower and heat exchange unit, Avent E 97; borax, anhydrous, powder; boric acid, anhydrous, powder; boric oxide; boron carbide; boron trifluoride; brass; brass removed by drilling, conventional; brass removed by turning, average, conventional; brass removed by turning, primarily dressing, conventional; brass removed by turning, primarily roughing, conventional; brazing solder, cadmium free; brick production facility; bromine; bromopropane; bronze; building machine; butane-1,4-diol; butyl acetate; cable yarding; cable, data cable in infrastructure; cable, three-conductor cable; cadmium chloride, semiconductor-grade; cadmium sulfide, semiconductor-grade; cadmium telluride, semiconductor-grade; cadmium, semiconductor-grade; calcareous marl; calcium borates; calcium carbide, technical grade; canal; capacitor, electrolyte type, < 2cm height; capacitor, electrolyte type, > 2cm height; capacitor, film type, for through-hole mounting; capacitor, for surface-mounting; capacitor, tantalum-, for through-hole mounting; captan; carbon black; carbon dioxide, liquid; carbon

disulfide; carboxymethyl cellulose, powder; cast iron removed by drilling, conventional; cast iron removed by turning, average, conventional; cast iron removed by turning, primarily dressing, conventional; cast iron removed by turning, primarily roughing, conventional; casting, brass; casting, bronze; cathode, for aluminium electrolysis; cement cast plaster floor; cement factory; cement mortar; cement, alternative constituents 21-35%; cement, alternative constituents 6-20%; cement, blast furnace slag 18-30% and 18-30% other alternative constituents; cement, blast furnace slag 31-50% and 31-50% other alternative constituents; cement, unspecified; ceramic factory; chemical factory; chemical, inorganic; chimney; chlorine dioxide; chloroacetic acid; chloroacetyl chloride; chloromethyl methyl ether; chloronitrobenzene; chloropropionic acid; chlorosulfonic acid; chlorothalonil; chlorotoluron; chopping, maize; chromite ore concentrate; chromium; chromium oxide, flakes; chromium steel pipe; chromium steel removed by drilling, conventional; chromium steel removed by turning, average, conventional; chromium steel removed by turning, primarily dressing, conventional; chromium steel removed by turning, primarily roughing, conventional; clay; clay pit infrastructure; clay plaster; clefting of energy wood; clover seed, Swiss integrated production, at farm; clover seed, Swiss integrated production, for sowing; coal stove, 5-15kW; coating, with melamine impregnated paper; cobwork; combine harvesting; concrete block; concrete mixing factory; concrete roof tile; contouring, brass; contouring, bronze; cooling energy; copper carbonate; copper oxide; cork slab; cottonseed meal; cover plaster, mineral; cover plaster, organic; cow milk; cumene; cyanoacetic acid; cyanogen chloride; cyanuric chloride; cyclic N-compound; cyclohexane; cyclohexanol; cyclohexanone; deep drawing, steel, 10000 kN press, automode; deep drawing, steel, 10000 kN press, single stroke; deep drawing, steel, 3500 kN press, automode; deep drawing, steel, 3500 kN press, single stroke; deep drawing, steel, 38000 kN press, automode; deep drawing, steel, 38000 kN press, single stroke; deep drawing, steel, 650 kN press, automode; deep drawing, steel, 650 kN press, single stroke; deep well closure; de-icer; deinking emulsion, in paper production; delimbing/sorting, excavator-based processor; diazine-compound; diazole-compound; diesel, burned in diesel-electric generating set, 18.5kW; diesel-electric generating set, 10MW; dimethenamide; dimethyl ether; dimethyl malonate; dimethyl sulfate; dimethyl sulfide; dimethyl sulfoxide; dimethylacetamide; dimethylamine; dimethylamine borane; dinitroaniline-compound; diode, glass-, for surface-mounting; diode, glass-, for through-hole mounting; dioxane; diphenylether-compound; dipropyl amine; dipropylene glycol monomethyl ether; disk drive, CD/DVD, ROM, for desktop computer; disk drive, CD/DVD, ROM, for laptop computer; display, cathode ray tube, 17 inches; display, liquid crystal, 17 inches; dithiocarbamate-compound; dolomite; drawing of pipe, steel; drying of bread grain, seed and legumes; drying of feed grain; drying of grass; drying of maize grain; drying of maize straw and whole-plant; DTPA, diethylenetriaminepentaacetic acid; EDTA, ethylenediaminetetraacetic acid; electric connector, peripheral component interconnect buss; electric connector, peripheral type buss; electric connector, wire clamp; electric motor, vehicle; electric scooter, without battery; electricity, high voltage; electricity, high voltage, for Swiss Federal Railways; electricity, high voltage, label-certified; electricity, medium voltage, aluminium industry; electrode, negative, LiC6; electrode, positive, LaNi5; electrolyte, KOH, LiOH additive; electron gun, for cathode ray tube display; electronic component

machinery, unspecified; electronic component, active, unspecified; electronic component, passive, unspecified; electrostatic paint; energy requirement for assembly of heat and power co-generation unit, 160kW electrical; energy saving; energy use and operation emissions, electric bicycle; energy use and operation emissions, electric bicycle, label-certified electricity; epoxy resin insulator, Al₂O₃; epoxy resin insulator, SiO₂; esters of versatic acid; ethoxylated alcohol (AE11); ethoxylated alcohol (AE3); ethoxylated alcohol (AE7); ethyl benzene; ethylamine; ethylene bromide; ethylene carbonate; ethylene dichloride; ethylene glycol diethyl ether; ethylene glycol dimethyl ether; ethylene glycol monoethyl ether; ethylene oxide; ethylene vinyl acetate copolymer; ethylenediamine; ethylvinylacetate, foil; EUR-flat pallet; evaporation of milk; exhaust air outlet, steel/aluminium, 85x365 mm; exhaust air roof hood, steel, DN 400; expanded clay; expanded vermiculite; explosives factory; fan, for power supply unit, desktop computer; fatty alcohol sulfate; fava bean seed, for sowing; fava bean seed, organic, for sowing; fava bean, organic; fava bean, Swiss integrated production; feldspar; ferronickel, 25% Ni; fertilising, by broadcaster; fibre cement facing tile; flat glass factory; fluorine, liquid; fluorspar, 97% purity; flux, for wave soldering; foam glass factory; foaming agent; fodder beet seed, for sowing; fodder beet, Swiss integrated production; fodder loading, by self-loading trailer; folpet; forwarding, forwarder; fosetyl-Al; frit, for ceramic tile; fuel cell, solid oxide, with micro gas turbine, 180kW electrical, future; gallium, in Bayer liquor from aluminium production; gas boiler; gas power plant, 100MW electrical; gas power plant, 300MW electrical; gas power plant, combined cycle, 400MW electrical; gas turbine, 10MW electrical; geothermal power plant, 5.5MWel; geothermal power plant, Hot-Dry-Rock; geothermal power plant, undefined type; glass etching factory; glass fibre reinforced plastic, polyamide, injection moulded; glass fibre reinforced plastic, polyester resin, hand lay-up; glass tube factory; glazing, double, U<1.1 W/m²K, laminated safety glass; glycine; glyoxal; glyphosate; goods wagon; graphite; graphite, battery grade; grass seed, organic, for sowing; grass seed, Swiss integrated production, at farm; grass seed, Swiss integrated production, for sowing; grass silage, organic; grass, organic; grass, Swiss integrated production; gravel/sand quarry infrastructure; green manure, organic, until April; green manure, organic, until February; green manure, organic, until January; green manure, organic, until March; green manure, Swiss integrated production, until April; green manure, Swiss integrated production, until February; green manure, Swiss integrated production, until January; green manure, Swiss integrated production, until March; gypsum plasterboard; hard disk drive, for desktop computer; hard disk drive, for laptop computer; harvesting, by complete harvester, beets; harvesting, by complete harvester, ground crops; harvesting, forestry harvester; harvesting/bundling, energy wood harvester; hay, organic, intensive; hay, Swiss integrated production, extensive; hay, Swiss integrated production, intensive; haying, by rotary tedder; heat and power co-generation unit, 160kW electrical, common components for heat+electricity; heat and power co-generation unit, 160kW electrical, components for electricity only; heat and power co-generation unit, 160kW electrical, components for heat only; heat and power co-generation unit, 1MW electrical, common components for heat+electricity; heat and power co-generation unit, 1MW electrical, components for electricity only; heat and power co-generation unit, 1MW electrical, components for heat only; heat and power co-generation unit, 200kW electrical, common

components for heat+electricity; heat and power co-generation unit, 200kW electrical, components for electricity only; heat and power co-generation unit, 200kW electrical, components for heat only; heat and power co-generation unit, 200kW electrical, diesel SCR, common components for heat+electricity; heat and power co-generation unit, 200kW electrical, diesel SCR, components for electricity only; heat and power co-generation unit, 200kW electrical, diesel SCR, components for heat only; heat and power co-generation unit, 500kW electrical, common components for heat+electricity; heat and power co-generation unit, 500kW electrical, components for electricity only; heat and power co-generation unit, 500kW electrical, components for heat only; heat and power co-generation unit, 50kW electrical, common components for heat+electricity; heat and power co-generation unit, 50kW electrical, components for electricity only; heat and power co-generation unit, 50kW electrical, components for heat only; heat and power co-generation unit, 6400kW thermal, components for electricity only; heat and power co-generation unit, organic Rankine cycle, 1400kW thermal, components for electricity only; heat and power cogeneration unit, organic Rankine cycle, 1MWe, 6.4 MWth; heat pump, 30kW; heat, air-water heat pump 10kW; heat, borehole heat pump; heat, central or small-scale, Jakobsberg; heat, central or small-scale, natural gas and heat pump, Jakobsberg; heat, diffusion absorption heat pump; heat, in chemical industry; heat, solar+electric, multiple-dwelling, for hot water; heat, solar+gas, multiple-dwelling, for hot water; heat, solar+gas, one-family house, for combined system; heat, solar+gas, one-family house, for hot water; heat, solar+wood, one-family house, for combined system; heavy fuel oil, burned in refinery furnace; helicopter; hoeing; horn meal; hot water tank factory; hydraulic digger; hydraulic fracturing fluid; hydrazine; hydrogen sulfide; hydroquinone; hydroxylamine; imidazole; impact extrusion of aluminium, 1 stroke; impact extrusion of aluminium, 2 strokes; impact extrusion of aluminium, 3 strokes; impact extrusion of aluminium, 4 strokes; impact extrusion of aluminium, 5 strokes; impact extrusion of aluminium, cold, initial surface treatment; impact extrusion of aluminium, cold, tempering; impact extrusion of aluminium, deformation stroke; impact extrusion of steel, cold, 1 strokes; impact extrusion of steel, cold, 2 strokes; impact extrusion of steel, cold, 3 strokes; impact extrusion of steel, cold, 4 strokes; impact extrusion of steel, cold, 5 strokes; impact extrusion of steel, cold, deformation stroke; impact extrusion of steel, cold, initial surface treatment; impact extrusion of steel, cold, tempering; impact extrusion of steel, hot, 1 strokes; impact extrusion of steel, hot, 2 strokes; impact extrusion of steel, hot, 3 strokes; impact extrusion of steel, hot, 4 strokes; impact extrusion of steel, hot, 5 strokes; impact extrusion of steel, hot, deformation stroke; impact extrusion of steel, hot, initial warming; impact extrusion of steel, hot, tempering; impact extrusion of steel, warm, 1 strokes; impact extrusion of steel, warm, 2 strokes; impact extrusion of steel, warm, 3 strokes; impact extrusion of steel, warm, 4 strokes; impact extrusion of steel, warm, 5 strokes; impact extrusion of steel, warm, deformation stroke; impact extrusion of steel, warm, initial warming; inductor, low value multilayer chip; inductor, miniature radio frequency chip; inductor, ring core choke type; industrial furnace, coal, 1-10MW; industrial furnace, natural gas; industrial machine, heavy, unspecified; inert gas for discharge lamps; insulation spiral-seam duct, rockwool, DN 400, 30 mm; integrated circuit, logic type; integrated circuit, memory type; internet access equipment; internet access, videoconference, 0.7 Mbit/s;

internet access, work, 0.2 Mbit/s; intral; iodine; iron (III) chloride, without water, in 40% solution state; iron ore, crude ore, 46% Fe; iron sulfate; iron(II) chloride; iron(III) sulfate, without water, in 12.5% iron solution state; iron-nickel-chromium alloy; isobutyl acetate; isohexane; isopropanol; isopropyl acetate; isopropylamine; isoproturon; jatropha seed; kaolin; lactic acid; laser machining, metal, with CO₂-laser, 2000W power; laser machining, metal, with CO₂-laser, 2700W power; laser machining, metal, with CO₂-laser, 3200W power; laser machining, metal, with CO₂-laser, 4000W power; laser machining, metal, with CO₂-laser, 5000W power; laser machining, metal, with CO₂-laser, 6000W power; laser machining, metal, with YAG-laser, 120W power; laser machining, metal, with YAG-laser, 200W power; laser machining, metal, with YAG-laser, 30W power; laser machining, metal, with YAG-laser, 330W power; laser machining, metal, with YAG-laser, 40W power; laser machining, metal, with YAG-laser, 500W power; laser machining, metal, with YAG-laser, 50W power; laser machining, metal, with YAG-laser, 60W power; layered sodium silicate, SKS-6, powder; light emitting diode; light mortar; lignite; lime mortar; lime, hydrated, loose weight; lime, hydrated, packed; lime, packed; limestone quarry infrastructure; limestone, crushed, for mill; limestone, crushed, washed; limestone, unprocessed; liquid crystal display, unmounted; liquid manure spreading, by vacuum tanker; liquid packaging board container; lithium brine, 6.7 % Li; lithium chloride; lithium manganese oxide; lubricating oil; machine operation, diesel, < 18.64 kW, generators; machine operation, diesel, < 18.64 kW, high load factor; machine operation, diesel, < 18.64 kW, low load factor; machine operation, diesel, < 18.64 kW, steady-state; machine operation, diesel, < 18.64 kW, underground mining; machine operation, diesel, >= 18.64 kW and < 74.57 kW, generators; machine operation, diesel, >= 18.64 kW and < 74.57 kW, high load factor; machine operation, diesel, >= 18.64 kW and < 74.57 kW, low load factor; machine operation, diesel, >= 18.64 kW and < 74.57 kW, steady-state; machine operation, diesel, >= 18.64 kW and < 74.57 kW, underground mining; machine operation, diesel, >= 74.57 kW, generators; machine operation, diesel, >= 74.57 kW, high load factor; machine operation, diesel, >= 74.57 kW, low load factor; machine operation, diesel, >= 74.57 kW, steady-state; machine operation, diesel, >= 74.57, underground mining; machine, for treatment of waste electric and electronic equipment; magnesium factory; magnesium oxide; magnesium sulfate; magnesium-alloy, AZ91; magnesium-alloy, AZ91, diecast; maintenance, barge; maintenance, freight ship, transoceanic; maintenance, light commercial vehicle; maintenance, lorry 16 metric ton; maintenance, lorry 28 metric ton; maintenance, lorry 40 metric ton; maintenance, micro gas turbine, 100kW electrical; maintenance, polymer electrolyte membrane fuel cell, 2kW electrical; maintenance, solid oxide fuel cell, 125kW electrical, future; maintenance, solid oxide fuel cell, with micro gas turbine, 180kW electrical, future; maintenance, stirling heat and power co-generation unit, 3kW electrical, wood pellet, future; maize grain, organic; maize grain, Swiss integrated production; maize seed, at farm; maize seed, for sowing; maize seed, organic, at farm; maize seed, organic, for sowing; maize seed, Swiss integrated production, at farm; maize seed, Swiss integrated production, for sowing; maize silage, organic; maize silage, Swiss integrated production; malusil; mancozeb; manganese concentrate; manganese(III) oxide; manual dismantling of electric scooter; manual dismantling of used electric passenger car; manual dismantling of used passenger car with internal combustion engine; manual treatment facility,

waste electric and electronic equipment; manure, liquid, cattle; manure, liquid, swine; manure, solid, cattle; mastic asphalt; mecoprop; melamine; melamine formaldehyde resin; metal coating facility; metal working factory; metal working, average for aluminium product manufacturing; metal working, average for chromium steel product manufacturing; metal working, average for copper product manufacturing; metal working, average for metal product manufacturing; metal working, average for steel product manufacturing; metaldehyde; metallization paste, back side; metallization paste, back side, aluminium; metallization paste, front side; methacrylic acid; methane sulfonic acid; methane, 96% by volume; methane, 96% by volume, from biogas, from high pressure network, at service station; methane, 96% by volume, from biogas, from low pressure network, at service station; methane, 96% by volume, from biogas, from medium pressure network, at service station; methane, 96% by volume, from biogas, high pressure, at user; methanol; methanol factory; methyl acrylate; methyl formate; methyl iodide; methyl tert-butyl ether; methyl-3-methoxypropionate; methylamine; metolachlor; milking; mine infrastructure, bauxite; mine infrastructure, gold; mine infrastructure, gold and silver; mine infrastructure, gold-silver-zinc-lead-copper; mine infrastructure, iron; mine infrastructure, open cast, ilmenite from hard-rock ore; mine infrastructure, open cast, non-ferrous metal; mine infrastructure, open cast, uranium; mine infrastructure, phosphate rock; mine infrastructure, steatite; mine infrastructure, underground, non-ferrous metal; mine infrastructure, underground, uranium; mine infrastructure, vermiculite; mini CHP plant, common components for heat+electricity; mini CHP plant, components for electricity only; mini CHP plant, components for heat only; mischmetal; molybdenum trioxide; mowing, by motor mower; mowing, by rotary mower; mulching; multi-Si wafer; multi-Si wafer, ribbon; municipal waste collection service by 21 metric ton lorry; N,N-dimethylformamide; naphthalene sulfonic acid; napropamide; natural gas processing plant; natural gas, burned in gas motor, for storage; natural gas, from high pressure network (1-5 bar), at service station; natural gas, from low pressure network (<0.1 bar), at service station; natural gas, from medium pressure network (0.1-1 bar), at service station; natural gas, liquefied; natural gas, low pressure; natural gas, unprocessed, at extraction; natural gas, vented; natural stone plate, cut; natural stone plate, grounded; natural stone plate, polished; neutralising agent, sodium hydroxide-equivalent; nickel ore, beneficiated, 16%; nitrile-compound; nitrobenzene; nitrogen fertiliser, as N; nitrous dioxide; nitrous oxide; N-methyl-2-pyrrolidone; non-ferrous metal smelter; NO_x retained, by selective catalytic reduction; nuclear fuel element, for boiling water reactor, UO₂ 4.0% & MOX; nuclear fuel element, for pressure water reactor, UO₂ 3.8% & MOX; nuclear fuel element, for pressure water reactor, UO₂ 3.9% & MOX; nuclear fuel element, for pressure water reactor, UO₂ 4.0% & MOX; nuclear fuel element, for pressure water reactor, UO₂ 4.2% & MOX; nuclear fuel element, for pressure water reactor, UO₂ 4.2% centrifuge & MOX; nuclear power plant, boiling water reactor 1000MW; nuclear power plant, pressure water reactor 1000MW; nuclear waste storage, final repository for high level radioactive waste; o-aminophenol; oat grain; o-chlorobenzaldehyde; o-chlorotoluene; o-cresol; offshore platform, natural gas; oil mill; o-nitrophenol; onshore natural gas field infrastructure; operation, computer, desktop, home use; operation, computer, desktop, office use; operation, computer, desktop, with cathode ray tube display, active mode; operation, computer, desktop,

with cathode ray tube display, off mode; operation, computer, desktop, with cathode ray tube display, standby mode; operation, computer, desktop, with liquid crystal display, active mode; operation, computer, desktop, with liquid crystal display, off mode; operation, computer, desktop, with liquid crystal display, standby mode; operation, computer, laptop, 23% active work; operation, computer, laptop, 68% active work; operation, computer, laptop, 68% active work with internet access 0.2 Mbit/s; operation, computer, laptop, 68% active work with internet access 0.2 Mbit/s, label-certified electricity; operation, computer, laptop, 68% active work, label-certified electricity; operation, computer, laptop, active mode; operation, computer, laptop, off mode; operation, computer, laptop, standby/sleep mode; operation, computer, laptop, video mode; operation, computer, laptop, video mode, label-certified electricity; operation, computer, laptop, videoconference; operation, computer, laptop, videoconference, label-certified electricity; operation, dried roughage store, air dried, solar; operation, dried roughage store, cold-air dried, conventional; operation, dried roughage store, non ventilated; operation, housing system, cattle, loose, per animal unit; operation, housing system, cattle, tied, per animal unit; operation, housing system, pig, fully-slatted floor, per pig place; operation, housing system, pig, label-certified, per pig place; operation, intermodal shipping container; operation, internet access equipment; operation, internet access equipment, label-certified electricity; operation, liquid manure storage and processing facility; operation, reefer, cooling; operation, reefer, freezing; optical brighteners, for paper production; orbencarb; organophosphorus-compound, unspecified; ozone, liquid; packaging film, low density polyethylene; palm fruit bunch; palm kernel meal; paper, melamine impregnated; p-chlorophenol; pea seed, for sowing; pea seed, organic, for sowing; peat; pendimethalin; perfluoropentane; perlite; petrol, 15% ETBE additive by volume, with ethanol from biomass; petrol, 4% ETBE additive by volume, with ethanol from biomass; petrol, 5% ethanol by volume from biomass; petrol, 85% ethanol by volume from biomass; petrol, two-stroke blend; petroleum combustion, in drilling tests; phacelia silage; phenol; phenolic resin; phenoxy-compound; phenyl acetic acid; phenyl isocyanate; phosgene, liquid; phosphane; phosphate rock, as P2O5, beneficiated, dry; phosphate rock, as P2O5, beneficiated, wet; phosphorous chloride; phosphorus pentachloride; phosphorus, white, liquid; phosphoryl chloride; photovoltaic facade installation, 3kWp, multi-Si, laminated, integrated, at building; photovoltaic facade installation, 3kWp, multi-Si, panel, mounted, at building; photovoltaic facade installation, 3kWp, single-Si, laminated, integrated, at building; photovoltaic facade installation, 3kWp, single-Si, panel, mounted, at building; photovoltaic flat-roof installation, 3kWp, multi-Si, on roof; photovoltaic flat-roof installation, 3kWp, single-Si, on roof; photovoltaic panel factory; photovoltaic panel, a-Si; photovoltaic plant, 570kWp, multi-Si, on open ground; photovoltaic slanted-roof installation, 3kWp, a-Si, laminated, integrated, on roof; photovoltaic slanted-roof installation, 3kWp, a-Si, panel, mounted, on roof; photovoltaic slanted-roof installation, 3kWp, CdTe, laminated, integrated, on roof; photovoltaic slanted-roof installation, 3kWp, CIS, panel, mounted, on roof; photovoltaic slanted-roof installation, 3kWp, multi-Si, laminated, integrated, on roof; photovoltaic slanted-roof installation, 3kWp, multi-Si, panel, mounted, on roof; photovoltaic slanted-roof installation, 3kWp, ribbon-Si, laminated, integrated, on roof; photovoltaic slanted-roof installation, 3kWp, ribbon-Si, panel, mounted, on

roof; photovoltaic slanted-roof installation, 3kWp, single-Si, laminated, integrated, on roof; photovoltaic slanted-roof installation, 3kWp, single-Si, panel, mounted, on roof; phthalic anhydride; phthalimide; phthalimide-compound; piperidine; pitch despergents, in paper production; planning, cogen unit mini CHP plant; planning, heat and power co-generation unit, 160kW electrical; planting; plaster mixing; plastic processing factory; plasticiser, for concrete, based on sulfonated melamine formaldehyde; plug, inlet and outlet, for computer cable; plug, inlet and outlet, for network cable; plug, inlet and outlet, for printer cable; p-nitrophenol; p-nitrotoluene; polar fleece production, energy use only; polishing powder; polyacrylamide; polycarboxylates, 40% active substance; polymer foaming; polyphenylene sulfide; polystyrene foam slab; polystyrene foam slab for perimeter insulation; polystyrene foam slab with graphite, 6% recycled; polystyrene foam slab, 10% recycled; polystyrene scrap, post-consumer; polysulfide, sealing compound; polyvinylchloride, bulk polymerised; polyvinylfluoride; polyvinylfluoride, dispersion; polyvinylfluoride, film; port facilities; portachrom; portafer; potassium nitrate; potassium perchlorate; potato grading; potato haulm cutting; potato planting; potato seed, at farm; potato seed, for setting; potato seed, organic, at farm; potato seed, organic, for setting; potato seed, Swiss integrated production, at farm; potato seed, Swiss integrated production, for setting; potato, organic; potato, Swiss integrated production; potentiometer, unspecified; power saw, with catalytic converter; power supply unit, for desktop computer; printed wiring board mounting facility, surface mounting line; printed wiring board mounting facility, through-hole mounting line; printing ink, rotogravure, without solvent, in 55% toluene solution state; process-specific burden, sanitary landfill; process-specific burdens, hazardous waste incineration plant; process-specific burdens, inert material landfill; process-specific burdens, municipal waste incineration; process-specific burdens, residual material landfill; process-specific burdens, slag landfill; propanal; propane, burned in building machine; propionic acid; propyl amine; propylene glycol, liquid; propylene oxide, liquid; prosulfocarb; protein feed, 100% crude; protein pea; protein pea, organic; protein pea, Swiss integrated production; pumice; purified terephthalic acid; pyrazole; pyrethroid-compound; pyridine-compound; quicklime, in pieces, loose; quicklime, milled, loose; quicklime, milled, packed; railway track; railway track, for high-speed train; rape seed, for sowing; rape seed, organic; rape seed, organic, for sowing; rape seed, Swiss integrated production; recultivation, bauxite mine; recultivation, bentonite mine; recultivation, ilmenite mine; recultivation, iron mine; recultivation, limestone mine; recultivation, shale quarry; red meat, live weight; reinforcing steel; residual material landfill; resistor, metal film type, through-hole mounting; resistor, surface-mounted; resistor, wirewound, through-hole mounting; retention aid, for paper production; rice; rice seed, for sowing; road maintenance; road vehicle factory; road, company, internal; rock crushing; roof tile; rosin size, for paper production; roundwood, azobe from sustainable forest management, CM, debarked; roundwood, azobe from sustainable forest management, under bark; roundwood, eucalyptus ssp. from sustainable forest management, under bark; roundwood, meranti from sustainable forest management, MY, debarked; roundwood, meranti from sustainable forest management, under bark; roundwood, paran pine from sustainable forest management, under bark; router, internet; rye seed, for sowing; rye seed, organic, for sowing; rye seed, Swiss integrated production, for sowing; ryegrass silage;

ryegrass-Egyptian&Persian clover-mixture silage; ryegrass-red&Egyptian clover-mixture silage; sanitary landfill facility; sawnwood, hardwood, raw, dried (u=10%); sawnwood, hardwood, raw, dried (u=20%); sawnwood, softwood, raw; sawnwood, softwood, raw, dried (u=10%); sawnwood, softwood, raw, dried (u=20%); seal, natural rubber based; seawater reverse osmosis module; section bar rolling, steel; selective coat, aluminium sheet, nickel pigmented aluminium oxide; selective coat, copper sheet, physical vapour deposition; selective coat, stainless steel sheet, black chrome; selenium; shale; shale brick; silencer, steel, DN 125; silencer, steel, DN 315, 50 mm; silica fume, densified; silicon, multi-Si, casted; silicon, single crystal, Czochralski process, electronics; silicon, single crystal, Czochralski process, photovoltaics; single-Si wafer, photovoltaic; sinter, iron; skidding, skidder; slab and siding, hardwood, wet, measured as dry mass; slab and siding, softwood, wet, measured as dry mass; slag landfill; sodium aluminate, powder; sodium amide; sodium arsenide; sodium borates; sodium chloride, brine solution; sodium cyanide; sodium dichromate; sodium dithionite, anhydrous; sodium ethoxide; sodium fluoride; sodium hydrogen sulfite; sodium hydrosulfide; sodium hypochlorite, without water, in 15% solution state; sodium metasilicate pentahydrate, 58% active substance, powder; sodium nitrate; sodium nitrite; sodium perborate, monohydrate, powder; sodium perborate, tetrahydrate, powder; sodium percarbonate, powder; sodium perchlorate; sodium persulfate; sodium phenolate; sodium phosphate; sodium pyrophosphate; sodium silicate, solid; sodium silicate, spray powder, 80%; sodium sulfite; sodium tripolyphosphate; solar collector factory; solar glass, low-iron; solder factory; solder, bar, Sn63Pb37, for electronics industry; solder, bar, Sn95.5Ag3.9Cu0.6, for electronics industry; solid manure loading and spreading, by hydraulic loader and spreader; solvent for chromatography analysis; sour gas, burned in gas turbine; sowing; SO_x retained, in lignite flue gas desulfurisation; soybean seed, for sowing; soybean seed, organic, for sowing; soybean, organic; soybean, Swiss integrated production; spiral-seam duct, steel, DN 125; spiral-seam duct, steel, DN 400; spodumene; spray-drying of milk; sputtering target, sintered, indium tin oxide; sputtering, indium tin oxide, for liquid crystal display; start-up, heat and power co-generation unit, 160kW electrical; steatite; steel removed by drilling, conventional; steel removed by turning, average, conventional; steel removed by turning, primarily dressing, conventional; steel removed by turning, primarily roughing, conventional; stibnite ore, 70% stibnite; stimulation, deep well; stone meal; stone wool factory; stone wool, packed; storage building, chemicals, solid; straw, stand-alone production; strontium carbonate; strontium sulfate, unprocessed; stucco; sugar beet seed, for sowing; sulfate pulp, unbleached, from eucalyptus ssp. from sustainable forest management, TH; sulfite; sulfur dichloride; sulfur hexafluoride, liquid; sulfur trioxide; sulfonyl chloride; sunflower seed; sunflower seed, for sowing; sunflower seed, Swiss integrated production; sunflower silage; supply air inlet, steel/SS, DN 75; swath, by rotary windrower; sweet gas, burned in gas turbine; sweetening, natural gas; swine for slaughtering, live weight; switch, toggle type; synthetic rubber; tantalum, powder, capacitor-grade; tempering, flat glass; tert-butyl amine; tetraethyl orthosilicate; tetrafluoroethylene film, on glass; tetrahydrofuran; thermal plaster, outdoor; thionyl chloride; tillage, cultivating, chiselling; tillage, currying, by weeder; tillage, harrowing, by rotary harrow; tillage, harrowing, by spring tine harrow; tillage, hoeing and earthing-up, potatoes; tillage, ploughing; tillage, rolling; tillage, rotary cultivator; tin dioxide; tin plated

chromium steel sheet, 2 mm; titanium primary, triple-melt; titanium tetrachloride; titanium zinc plate, without pre-weathering; titanium, primary; toner, black, powder; toner, colour, powder; tram track; transistor, surface-mounted; transistor, wired, big size, through-hole mounting; transistor, wired, small size, through-hole mounting; transmission network, long-distance; transport, freight, aircraft; transport, freight, aircraft with reefer, cooling; transport, freight, aircraft with reefer, freezing; transport, freight, inland waterways, barge; transport, freight, inland waterways, barge tanker; transport, freight, inland waterways, barge with reefer, cooling; transport, freight, inland waterways, barge with reefer, freezing; transport, freight, light commercial vehicle; transport, freight, lorry >32 metric ton, EURO3; transport, freight, lorry >32 metric ton, EURO4; transport, freight, lorry >32 metric ton, EURO5; transport, freight, lorry >32 metric ton, EURO6; transport, freight, lorry 16-32 metric ton, EURO3; transport, freight, lorry 16-32 metric ton, EURO4; transport, freight, lorry 16-32 metric ton, EURO5; transport, freight, lorry 16-32 metric ton, EURO6; transport, freight, lorry 28 metric ton, vegetable oil methyl ester 100%; transport, freight, lorry 3.5-7.5 metric ton, EURO3; transport, freight, lorry 3.5-7.5 metric ton, EURO4; transport, freight, lorry 3.5-7.5 metric ton, EURO5; transport, freight, lorry 3.5-7.5 metric ton, EURO6; transport, freight, lorry 7.5-16 metric ton, EURO3; transport, freight, lorry 7.5-16 metric ton, EURO4; transport, freight, lorry 7.5-16 metric ton, EURO5; transport, freight, lorry 7.5-16 metric ton, EURO6; transport, freight, lorry with reefer, cooling; transport, freight, lorry with reefer, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO3, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO3, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO3, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO3, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO4, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO4, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO4, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO4, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO6, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO6, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO6, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO6, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, R134a

refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO4, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO4, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO4, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO4, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO5, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO5, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO5, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO5, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO6, carbon dioxide, liquid refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO6, carbon dioxide, liquid refrigerant, freezing; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO6, R134a refrigerant, cooling; transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO6, R134a refrigerant, freezing; transport, freight, lorry with refrigeration machine, cooling; transport, freight, lorry with refrigeration machine, freezing; transport, freight, lorry, unspecified; transport, freight, sea, liquefied natural gas; transport, freight, sea, transoceanic ship; transport, freight, sea, transoceanic ship with reefer, cooling; transport, freight, sea, transoceanic ship with reefer, freezing; transport, freight, sea, transoceanic tanker; transport, freight, train with reefer, cooling; transport, freight, train with reefer, freezing; transport, helicopter; transport, helicopter, LTO cycle; transport, passenger car; transport, passenger car with internal combustion engine; transport, passenger car, EURO 3; transport, passenger car, EURO 4; transport, passenger car, EURO 5; transport, passenger car, medium size, liquefied petroleum gas, EURO 5; transport, passenger coach; transport, passenger train; transport, passenger, aircraft; transport, passenger, bicycle; transport, passenger, electric scooter; transport, passenger, motor scooter; transport, pipeline, offshore, petroleum; transport, pipeline, onshore, petroleum; transport, regular bus; transport, tractor and trailer, agricultural; transport, tram; transport, trolleybus; triazine-compound, unspecified; trichloroacetic acid; trichloroborane; trichloromethane; triethyl amine; trifluoroacetic acid; trifluoromethane; trimethyl borate; trimethylamine; tube insulation factory; ultraviolet lamp; uranium mill; uranium ore, as U; uranium, in yellowcake; urea formaldehyde resin; urea, as N; vegetable oil esterification facility; ventilation components factory; ventilation duct, connection piece, steel, 100x50 mm; ventilation duct, elbow 90°, steel, 100x50 mm; ventilation duct, steel, 100x50 mm; venting of argon, crude, liquid; venting of nitrogen, liquid; vermiculite; vinyl acetate; wafer factory; waste collection lorry, 21 metric ton; waste newspaper; waste packaging paper; water, deionised, from tap water, at user; water, ultrapure; weaving, bast fibre; welding, arc, aluminium; welding, arc, steel; welding, gas, steel; wheat grain; wheat seed, for sowing; wheat seed, organic, for sowing; wheat seed, Swiss integrated production, for sowing; white spirit; window frame, poly vinyl chloride, $U=1.6 \text{ W/m}^2\text{K}$; wood chipping, chipper, mobile, diesel, at forest road; wood chipping, forwarder with terrain chipper, in forest; wood chipping, industrial residual wood, stationary electric chipper; wood chips and particles, willow; wood pellet factory; wood preservation, dipping/immersion method, organic solvent-based,

indoor use, dry; wood preservation, dipping/immersion method, organic solvent-based, indoor use, occasionally wet; wood preservation, dipping/immersion method, organic solvent-based, outdoor use, no ground contact; wood preservation, dipping/immersion method, water-based, indoor use, dry; wood preservation, dipping/immersion method, water-based, indoor use, occasionally wet; wood preservation, dipping/immersion method, water-based, outdoor use, no ground contact; wood preservation, hot/cold dipping, creosote, outdoor use, ground contact; wood preservation, oscillating pressure method, inorganic salt, containing Cr, outdoor use, ground contact; wood preservation, oscillating pressure method, organic salt, Cr-free, outdoor use, ground contact; wood preservation, pressure vessel, creosote, outdoor use, ground contact; wood preservation, spray tunnel/deluging, organic solvent-based, indoor use, dry; wood preservation, spray tunnel/deluging, organic solvent-based, indoor use, occasionally wet; wood preservation, spray tunnel/deluging, organic solvent-based, outdoor use, no ground contact; wood preservation, spray tunnel/deluging, water-based, indoor use, dry; wood preservation, spray tunnel/deluging, water-based, indoor use, occasionally wet; wood preservation, spray tunnel/deluging, water-based, outdoor use, no ground contact; wood preservation, vacuum pressure method, inorganic salt, containing Cr, outdoor use, ground contact; wood preservation, vacuum pressure method, organic salts, Cr-free, outdoor use, ground contact; wood preservative, organic salt, Cr-free; wood wool boards, cement bonded; zeolite, powder; zinc coat, pieces, adjustment per micro-m.

Exhaustive list of products with updated prices.

1,1-dimethylcyclopentane; 2,3-dimethylbutan; 2-butanol; 2-cyclopentone; 2-methylpentane; absorption chiller, 100kW; acetaldehyde; acetic acid, without water, in 98% solution state; acetic anhydride; acetone cyanohydrin; acrylic binder, without water, in 34% solution state; acrylic dispersion, without water, in 65% solution state; acrylonitrile-butadiene-styrene copolymer; activated bentonite; activated silica; agricultural machinery, unspecified; air compressor, screw-type compressor, 300kW; air compressor, screw-type compressor, 4kW; air distribution terminal panel, steel, 120 m³/h; air filter, central unit, 600 m³/h; air filter, decentralized unit, 180-250 m³/h; air filter, decentralized unit, 250 m³/h; air filter, in exhaust air valve; air input/output unit, heat and power co-generation unit, 160kW electrical; airport; alfalfa-grass silage; alkyd paint, white, without solvent, in 60% solution state; alkyd paint, white, without water, in 60% solution state; alkyd resin, long oil, without solvent, in 70% white spirit solution state; alkylbenzene, linear; aluminium alloy, ALi; aluminium alloy, metal matrix composite; aluminium around steel bi-metal wire, 3.67mm external diameter; aluminium melting furnace; aluminium oxide; aluminium removed by drilling, computer numerical controlled; aluminium removed by milling, average; aluminium removed by milling, dressing; aluminium removed by milling, large parts; aluminium removed by milling, small parts; aluminium removed by turning, average, computer numerical controlled; aluminium removed by turning, primarily dressing, computer numerical controlled; aluminium removed by turning,

primarily roughing, computer numerical controlled; aluminium scrap, new; aluminium scrap, post-consumer, prepared for melting; aluminium sulfate, without water, in 4.33% aluminium solution state; aluminium, primary, cast alloy slab from continuous casting; aluminium, primary, liquid; aluminium, wrought alloy; aminopyridine; ammonia, liquid; ammonium nitrate, as N; ammonium sulfate, as N; anionic resin; anode, for metal electrolysis; anode, graphite, for lithium-ion battery; anode, paste, for aluminium electrolysis; anode, prebake, for aluminium electrolysis; anodising, aluminium sheet; anthraquinone; anti-reflex-coating, etching, solar glass; assembly of generator and motor, auxiliaries and energy use, for mini CHP plant; assembly of generator and motor, auxiliaries and energy use, for heat and power co-generation unit, 160 KW electrical; assembly of liquid crystal display, auxiliaries and energy use; aubergine; autoclaved aerated concrete block; auxiliary heating unit, electric, 5kW; avocado; backlight, for liquid crystal display; barge; barley grain, feed; barley grain, feed, organic; barley grain, feed, Swiss integrated production; basalt; battery cell, Li-ion; battery separator; battery, Li-ion, rechargeable, prismatic; battery, NiMH, rechargeable, prismatic; bauxite, without water; bentonite; benzoic acid; benzoic-compound; biogas, from grass; bipyridylum-compound; bisphenol A epoxy based vinyl ester resin; bitumen adhesive compound, cold; bitumen adhesive compound, hot; bitumen seal; bitumen seal, Alu80; bitumen seal, polymer EP4 flame retardant; bitumen seal, V60; bitumen seal, VA4; blast furnace; blast furnace slag; blast oxygen furnace converter; blow moulding; blower and heat exchange unit, central, 600-1200 m³/h; blower and heat exchange unit, decentralized, 180-250 m³/h; blower and heat exchange unit, GE 250 RH; blower and heat exchange unit, KWL 250; blower and heat exchange unit, KWLC 1200; blower and heat exchange unit, Storkair G 90; borehole heat exchanger, 150m; brass removed by drilling, computer numerical controlled; brass removed by turning, average, computer numerical controlled; brass removed by turning, primarily dressing, computer numerical controlled; brass removed by turning, primarily roughing, computer numerical controlled; building, hall; building, hall, steel construction; building, hall, wood construction; building, multi-storey; bundle, energy wood, measured as dry mass; burnt shale; butadiene; butane; butene, mixed; butter, from cow milk; buttermilk, from cow milk; butyl acrylate; butyrolactone; cable yarder with sled winch; cable yarding; cable, connector for computer, without plugs; cable, network cable, category 5, without plugs; cable, printer cable, without plugs; cable, ribbon cable, 20-pin, with plugs; cable, unspecified; cadmium; cadmium sludge from zinc electrolysis stockpiling; calcium nitrate; calendering, rigid sheets; capacitor, auxiliaries and energy use; carbon monoxide; carbon tetrachloride; carton board box production, with gravure printing; carton board box production, with offset printing; cast iron; cast iron removed by drilling, computer numerical controlled; cast iron removed by milling, average; cast iron removed by milling, dressing; cast iron removed by milling, large parts; cast iron removed by milling, small parts; cast iron removed by turning, average, computer numerical controlled; cast iron removed by turning, primarily dressing, computer numerical controlled; cast iron removed by turning, primarily roughing, computer numerical controlled; casting, aluminium, lost-wax; casting, steel, lost-wax; catalytic converter, oxidation, 20 litre; catalytic converter, selective catalytic reduction, 200 litre; catalytic converter, three-way, mini CHP plant; cathode, LiMn₂O₄, for lithium-ion battery; cathode-ray tube, cathode ray tube

display; cationic resin; cattle for slaughtering, live weight; cellulose fibre, inclusive blowing in; cement tile; cement, alternative constituents 21-35%; cement, alternative constituents 6-20%; cement, blast furnace slag 18-30% and 18-30% other alternative constituents; cement, blast furnace slag 25-70%, US only; cement, blast furnace slag 31-50% and 31-50% other alternative constituents; cement, blast furnace slag 36-65%, non-US; cement, blast furnace slag 5-25%, US only; cement, blast furnace slag 70-100%, non-US; cement, blast furnace slag 81-95%, non-US; cement, blast furnace slag, 66-80%, non-US; cement, Portland; cement, pozzolana and fly ash 11-35%, non-US; cement, pozzolana and fly ash 15-40%, US only; cement, pozzolana and fly ash 36-55%, non-US; cement, pozzolana and fly ash 5-15%, US only; ceramic tile; charcoal; charger, for electric scooter; chassis, internet access equipment; cheese, from cow milk, fresh, unripened; chemical, organic; chemi-thermomechanical pulp; chicken for slaughtering, live weight; chipper, mobile, diesel; chipper, stationary, electric; chlorine, gaseous; chlorodifluoromethane; chromium steel removed by drilling, computer numerical controlled; chromium steel removed by milling, average; chromium steel removed by milling, dressing; chromium steel removed by milling, large parts; chromium steel removed by milling, small parts; chromium steel removed by turning, average, computer numerical controlled; chromium steel removed by turning, primarily dressing, computer numerical controlled; chromium steel removed by turning, primarily roughing, computer numerical controlled; citric acid; clay brick; cleft timber, measured as dry mass; clefting of energy wood; clinker; coating powder; coating, with melamine impregnated paper; coconut oil, crude; compressed air, 1000 kPa gauge; compressed air, 1200 kPa gauge; compressed air, 600 kPa gauge; compressed air, 700 kPa gauge; compressed air, 800 kPa gauge; computer, desktop, without screen; computer, laptop; concrete, 20MPa; concrete, 25MPa; concrete, 30-32MPa; concrete, 35MPa; concrete, 50MPa; concrete, for de-icing salt contact; concrete, high exacting requirements; concrete, normal; concrete, sole plate and foundation; controller, for electric scooter; conveyor belt; copper; copper cake; copper concentrate; copper scrap, sorted, pressed; copper sulfate; copper, blister-copper; copper, from solvent-extraction electro-winning; core board; cork, raw; corrugated board box; cotton seed; cotton seed, for sowing; cottonseed oil, crude; cottonseed oil, refined; cow milk; cream, from cow milk; crust from Parkes process for lead production; cryolite; dairy; deep well, drilled, for geothermal power; deep well, for geothermal power, onshore, 6000m; degreasing, metal part in alkaline bath; deinked pulp, wet lap; delimbing/sorting, excavator-based processor; dichloromethane; dicyclopentadiene based unsaturated polyester resin; diesel; diesel, burned in building machine; diesel, burned in diesel-electric generating set, 10MW; diesel, low-sulfur; diethanolamine; diethyl ether, without water, in 99.95% solution state; diode, auxiliaries and energy use; Distiller's Dried Grains with Solubles; door, inner, glass-wood; door, inner, wood; door, outer, wood-aluminium; door, outer, wood-glass; dried roughage store, air dried, solar; dried roughage store, cold-air dried, conventional; dried roughage store, non ventilated; drying, natural gas; dung slab; dust collector, electrostatic precipitator, for domestic use; dust collector, electrostatic precipitator, for industrial use; dust collector, multicyclone; electric bicycle; electric motor, for electric scooter; electric parts, heat and power co-generation unit, 160kW electrical; electric parts, mini CHP plant; electricity, high voltage, label-certified; electrode, negative, Ni; electronics,

for control units; electrostatic paint; enamelling; energy and auxilliary inputs, metal working factory; energy and auxilliary inputs, metal working machine; energy feed, gross; energy wood harvester; enriched uranium, 4.2%; epoxy resin, liquid; ethanol, without water, in 95% solution state, from fermentation; ethanol, without water, in 99.7% solution state, from ethylene; ethanol, without water, in 99.7% solution state, from fermentation; ethanol, without water, in 99.7% solution state, from fermentation, at service station; ethyl tert-butyl ether; ethylene, average; ethylene, pipeline system; evaporation of milk; excavation, hydraulic digger; excavation, skid-steer loader; exhaust air valve, in-wall housing, plastic/steel, DN 125; expansion vessel, 25l; expansion vessel, 80l; explosive, tovox; extrusion of plastic sheets and thermoforming, inline; extrusion, co-extrusion; extrusion, plastic film; extrusion, plastic pipes; fatty acid; fatty alcohol; fava bean, feed, Swiss integrated production; ferrite; ferrochromium, high-carbon, 68% Cr; ferromanganese, high-coal, 74.5% Mn; ferrosilicon; fibre cement corrugated slab; fibre cement facing tile, large format; fibre cement facing tile, small format; fibreboard, hard; fibreboard, soft; fibreboard, soft, latex bonded; fibreboard, soft, without adhesives; flat glass, coated; flat glass, uncoated; flat plate solar collector, Cu absorber; flexible duct, aluminium/PET, DN of 125; fluorescent whitening agent, DAS1, triazinylaminostilben type; fluorescent whitening agent, distyrylbiphenyl type; fluting medium; foaming agent; fodder yeast; forestry harvester; forging, steel; forwarder; forwarding, forwarder; fraction 1 from naphtha separation; fraction 7 from naphtha separation; fraction 8 from naphtha separation; frit, for cathode ray tube display; frit, for ceramic tile; fuel cell, polymer electrolyte membrane, 2kW electrical, future; fuel cell, solid oxide, 125kW electrical, future; fuel cell, stack polymer electrolyte membrane, 2kW electrical, future; fuel cell, stack solid oxide, 125kW electrical, future; funnel glass, for cathode ray tube display; furnace, logs, 30kW; furnace, logs, 6kW; furnace, logs, average storage area, 30kW; furnace, logs, average storage area, 6kW; furnace, logs, hardwood storage area, 30kW; furnace, logs, hardwood storage area, 6kW; furnace, logs, softwood storage area, 30kW; furnace, logs, softwood storage area, 6kW; furnace, pellets, 25kW; furnace, pellets, 9kW; gallium, semiconductor-grade; gas motor, 206kW; gas motor, mini CHP plant; generator, 200kW electrical; generator, mini CHP plant; geothermal power plant, 5.5MWel; glass fibre; glass tube, borosilicate; glass, for liquid crystal display; glazing, double, $U < 1.1 \text{ W/m}^2\text{K}$; glazing, triple, $U < 0.5 \text{ W/m}^2\text{K}$; glider, for electric scooter; glider, passenger car; glued laminated timber, for indoor use; glued laminated timber, for outdoor use; gold-silver, ingot; grass fibre; grass silage, Swiss integrated production; gravel, crushed; green asparagus; green bell pepper; ground granulated blast furnace slag; hard chromium coat, electroplating, steel substrate, 0.14 mm thickness; hard coal; hard coal briquettes; hard coal briquettes factory; hard coal coke factory; hard coal power plant; harvesting, forestry harvester; harvesting/bundling, energy wood harvester; hay; heat and power cogeneration unit, organic Rankine cycle, 1MWe, 6.4 MWth; heat and power cogeneration unit, organic Rankine cycle, 3MW electrical; heat pump, brine-water, 10kW; heat pump, diffusion absorption, 4kW, future; heat, district or industrial, other than natural gas; heating and sanitary equipment, heat and power co-generation unit, 160kW electrical; heating and sanitary equipment, mini CHP plant; heavy fuel oil; helium, crude stockpiling; hot rolling, steel; hot water tank, 600l; housing system, cattle, loose, per animal unit; housing system,

cattle, tied, per animal unit; housing system, pig, fully-slatted floor, per pig place; housing system, pig, label-certified, per pig place; hydrogen peroxide, without water, in 50% solution state; hydrogen, liquid; iceberg lettuce; ilmenite, 54% titanium dioxide; indium; indium rich leaching residues, from zinc production; indium rich leaching residues, from zinc production stockpiling; indium tin oxide powder, nanoscale, for sputtering target; inductor, auxiliaries and energy use; inert material landfill; infrastructure, for regional distribution of oil product; injection moulding; insulated gate bipolar transistor, electric vehicle application; intermodal shipping container, 20-foot; intermodal shipping container, 40-foot; intermodal shipping container, 40-foot, high-cube; intermodal shipping container, 45-foot, high-cube; internal combustion engine, for passenger car; inverter, 0.5kW; inverter, 2.5kW; ion-exchanger for water treatment; iron ore, beneficiated, 65% Fe; iron pellet; iron(II) chloride; iron(III) chloride, without water, in 14% iron solution state; iron(III) chloride, without water, in a 12% iron solution state; iron(III) sulfate, without water, in 12.5% iron solution state; irrigation; isophthalic acid based unsaturated polyester resin; joist, engineered wood; jute fibre; kenaf fibre; kerosene; keyboard; kiwi; kraft paper, bleached; kraft paper, unbleached; latex; lead; lead concentrate stockpiling; lean concrete; lettuce; light fuel oil; lightweight concrete block, expanded clay; lightweight concrete block, expanded perlite; lightweight concrete block, expanded vermiculite; lightweight concrete block, polystyrene; lightweight concrete block, pumice; lignite briquettes; lignite briquettes factory; lignite dust factory; limestone, unprocessed; linerboard; liquefied petroleum gas; liquid crystal display, minor components, auxiliaries and assembly effort; liquid manure storage and processing facility; liquid packaging board; liquid storage tank, chemicals, organics; lithium fluoride; lithium hexafluorophosphate; lorry with refrigeration machine, carbon dioxide, liquid as refrigerant, 16 metric ton; lorry with refrigeration machine, R134a as refrigerant, 16 metric ton; magnesium; magnetite; maintenance, bicycle; maintenance, bus; maintenance, electric bicycle; maintenance, electric scooter, without battery; maintenance, goods wagon; maintenance, intermodal shipping container, 20-foot; maintenance, intermodal shipping container, 40-foot; maintenance, intermodal shipping container, 40-foot, high-cube; maintenance, intermodal shipping container, 45-foot, high-cube; maintenance, locomotive; maintenance, mini CHP plant; maintenance, motor scooter; maintenance, passenger car, electric, without battery; maintenance, reefer, intermodal shipping container, 40-foot, high-cube; maintenance, train, passenger, high-speed; maintenance, train, passenger, long distance; maintenance, train, passenger, regional; maintenance, tram; maize grain; maize grain, feed; maize grain, feed, organic; maize grain, feed, Swiss integrated production; maize silage; maize starch; maleic unsaturated polyester resin; manganese; manganese dioxide; manganese sulfate; mechanical treatment facility, waste electric and electronic equipment; medium density fibreboard; metal part of electronics scrap, in blister-copper; metal working machine, unspecified; metamidron; methanol, from biomass; methyl methacrylate; methylchloride; methylcyclopentane; methylene diphenyl diisocyanate; micro gas turbine, 100kW electrical; milking parlour; mine infrastructure, open cast, hard coal; mine infrastructure, underground, hard coal; mobile cable yarder, trailer-mounted; mobile cable yarder, truck-mounted, incl. processor; molasses, from sugar beet; molybdenite; molybdenum; molybdenum trioxide; monoethanolamine; mounting,

surface mount technology, Pb-containing solder; mounting, surface mount technology, Pb-free solder; mounting, through-hole technology, Pb-containing solder; mounting, through-hole technology, Pb-free solder; MOX fuel element, for light water reactor; naphtha; natural gas, high pressure; nickel ore, beneficiated, 16%; nickel sulfate; nickel, 99.5%; nitric acid, without water, in 50% solution state; nitro-compound; nitrogen, liquid; n-olefins; non-Fe-Co-metals, from Li-ion battery, hydrometallurgical processing; non-Fe-Co-metals, from used Li-ion battery, pyrometallurgical processing; nuclear power plant, pressure water reactor, 650MW; nuclear spent fuel reprocessing facility; nylon 6; nylon 6, glass-filled; nylon 6-6; nylon 6-6, glass-filled; oat grain; offshore well, oil/gas; oil boiler, 10kW; onshore well, oil/gas; operation, intermodal shipping container; operation, reefer, cooling; operation, reefer, freezing; oriented strand board; orthophthalic acid based unsaturated polyester resin; outside air intake, stainless steel, DN 370; oxygen, liquid; packaging glass, brown; packaging glass, green; packaging glass, white; packing, cement; packing, clay product; packing, fibre cement product; packing, lime product; palladium; palm oil, refined; panel glass, for cathode ray tube display; paper, melamine impregnated; paper, newsprint; paper, woodcontaining, lightweight coated; paper, woodcontaining, supercalendred; paper, woodfree, coated; paper, woodfree, uncoated; paraffin; particle board, cement bonded; particle board, for indoor use; particle board, for outdoor use; particleboard, uncoated; passenger car maintenance; passenger car, diesel; passenger car, electric, without battery; passenger car, petrol/natural gas; peat moss; pentane; permanent magnet, for electric motor; petrol, low-sulfur; petrol, unleaded; petroleum refinery; photovoltaic cell, multi-Si wafer; photovoltaic cell, ribbon-Si; photovoltaic cell, single-Si wafer; photovoltaic laminate, a-Si; photovoltaic laminate, CdTe; photovoltaic laminate, CIS; photovoltaic laminate, multi-Si wafer; photovoltaic laminate, ribbon-Si; photovoltaic laminate, single-Si wafer; photovoltaic module, building-integrated, for facade installation; photovoltaic module, building-integrated, for slanted-roof installation; photovoltaic mounting system, for 570kWp open ground module; photovoltaic mounting system, for facade installation; photovoltaic mounting system, for flat-roof installation; photovoltaic mounting system, for slanted-roof installation; photovoltaic panel, CIS; photovoltaic panel, multi-Si wafer; photovoltaic panel, ribbon-Si; photovoltaic panel, single-Si wafer; photovoltaic plant, electric installation for 3kWp module; photovoltaic plant, electric installation for 570kWp open ground module; pig iron; pipeline, liquid manure; pipeline, natural gas, high pressure distribution network; pitch; plasticiser, for concrete, based on sulfonated melamine formaldehyde; plywood, for indoor use; plywood, for outdoor use; pointing device, optical mouse, with cable; polarizer, liquid crystals and colour filters, for liquid crystal display; polyacrylamide; polybutadiene; polycarbonate; polyester resin, unsaturated; polyester-complexed starch biopolymer; polyethylene pipe, corrugated, DN 75; polyethylene pipe, DN 200, SDR 41; polyethylene terephthalate, granulate, amorphous; polyethylene terephthalate, granulate, bottle grade; polyethylene, high density, granulate; polyethylene, linear low density, granulate; polyethylene, low density, granulate; polylactide, granulate; polymethyl methacrylate, beads; polymethyl methacrylate, sheet; polyol; polypropylene, granulate; polystyrene, expandable; polystyrene, extruded; polystyrene, general purpose; polystyrene, high impact; polysulfone; polyurethane, flexible foam; polyurethane, rigid foam; polyvinylchloride, emulsion

polymerised; polyvinylchloride, suspension polymerised; polyvinylidenchloride, granulate; potassium chloride, as K₂O; potato; potato starch; powder coat, aluminium sheet; powder coat, steel; power adapter, for laptop; power saw, without catalytic converter; power sawing, with catalytic converter; power sawing, without catalytic converter; powertrain, for electric scooter; precious metal refinery; printed paper; printed paper, offset; printed wiring board, for power supply unit, desktop computer, Pb containing; printed wiring board, for power supply unit, desktop computer, Pb free; printed wiring board, for surface mounting, Pb containing surface; printed wiring board, for surface mounting, Pb free surface; printed wiring board, for through-hole mounting, Pb containing surface; printed wiring board, for through-hole mounting, Pb free surface; printed wiring board, mounted mainboard, desktop computer, Pb containing; printed wiring board, mounted mainboard, desktop computer, Pb free; printed wiring board, mounted mainboard, laptop computer, Pb containing; printed wiring board, mounted mainboard, laptop computer, Pb free; printed wiring board, surface mounted, unspecified, Pb containing; printed wiring board, surface mounted, unspecified, Pb free; printed wiring board, through-hole mounted, unspecified, Pb containing; printed wiring board, through-hole mounted, unspecified, Pb free; printer, laser, black/white; printer, laser, colour; printing ink, offset, without solvent, in 47.5% solution state; propane; propylene; propylene, pipeline system; protein feed, 100% crude; protein pea, feed, Swiss integrated production; pulverised lignite; pyridazine-compound; pyridine; rainwater mineral oil storage; rape oil, crude; rape seed; red meat, live weight; reefer, intermodal shipping container, 40-foot, high-cube, carbon dioxide, liquid as refrigerant; reefer, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant; refractory, basic, packed; refractory, fireclay, packed; refractory, high aluminium oxide, packed; residential sewer grid, 0.087 km; residual hardwood, wet; residual softwood, wet; resistor, auxiliaries and energy use; rhodium; road; room-connecting overflow element, steel, approx. 40 m³/h; rye grain, feed, organic; rye grain, feed, Swiss integrated production; sanitary ceramics; sawmill; sawnwood, beam, hardwood, dried (u=10%), planed; sawnwood, beam, hardwood, dried (u=20%), planed; sawnwood, beam, softwood, dried (u=10%), planed; sawnwood, beam, softwood, dried (u=20%), planed; sawnwood, board, hardwood, dried (u=10%), planed; sawnwood, board, hardwood, dried (u=20%), planed; sawnwood, board, softwood, dried (u=10%), planed; sawnwood, board, softwood, dried (u=20%), planed; sawnwood, lath, hardwood, dried (u=10%), planed; sawnwood, lath, hardwood, dried (u=20%), planed; sawnwood, lath, softwood, dried (u=10%), planed; sawnwood, lath, softwood, dried (u=20%), planed; sawnwood, paraná pine from sustainable forest management, kiln dried; sealing tape, aluminium/PE, 50 mm wide; section bar extrusion, aluminium; selective coat, copper sheet, black chrome; selective coat, copper sheet, black majic; selective coat, copper sheet, sputter deposition; sewer grid, 1.1E10l/year, 242 km; sewer grid, 1.6E8l/year, 6 km; sewer grid, 1E9l/year, 30 km; sewer grid, 4.7E10l/year, 583 km; sewer grid, 5E9l/year, 110 km; shale; shale brick; shavings, hardwood, loose, measured as dry mass; shavings, hardwood, measured as dry mass; shavings, softwood, loose, measured as dry mass; shavings, softwood, measured as dry mass; shed; sheep fleece in the grease; sheep for slaughtering, live weight; sheet rolling, aluminium; sheet rolling, chromium steel; sheet rolling, copper; sheet rolling, steel; silica sand; silicon tetrachloride; silicon, metallurgical grade; silicone product; single-Si

wafer, for electronics; skidder; skidding, skidder; skimmed milk, from cow milk; soap; sodium; sodium aluminate, powder; sodium chlorate, powder; sodium chloride, powder; sodium pyrophosphate; sodium silicate, without water, in 37% solution state; sodium silicate, without water, in 48% solution state; sodium sulfide; soft solder, Sn97Cu3; solar collector glass tube, with silver mirror; solar collector system, Cu flat plate collector, multiple dwelling, hot water; solar collector system, with evacuated tube collector, one-family house, combined system; solder, paste, Sn63Pb37, for electronics industry; solder, paste, Sn95.5Ag3.9Cu0.6, for electronics industry; solid bleached board; solid unbleached board; solvent, organic; sound insulation, heat and power co-generation unit, 160kW electrical; SOx retained, in hard coal flue gas desulfurisation; soybean; soybean beverage; soybean meal; soybean oil, refined; soybean, feed; spinach; spinning, bast fibre; spray-drying of milk; stalk; steatite; steel removed by drilling, computer numerical controlled; steel removed by milling, average; steel removed by milling, dressing; steel removed by milling, large parts; steel removed by milling, small parts; steel removed by turning, average, computer numerical controlled; steel removed by turning, primarily dressing, computer numerical controlled; steel removed by turning, primarily roughing, computer numerical controlled; steel, chromium steel 18/8; steel, chromium steel 18/8, hot rolled; steel, low-alloyed; steel, unalloyed; stirling heat and power co-generation unit, 3kW electrical, future; stone groundwood pulp; stone wool; storage, 10'000 l; stretch blow moulding; strontium carbonate; strontium sulfate, unprocessed; styrene; styrene-acrylonitrile copolymer; sugar beet; sugar beet pulp; sugar, from sugar beet; sugar, from sugarcane; sugarcane; sulfite pulp, bleached; sulfur dioxide, liquid; sulfur stockpiling; sweet sorghum grain; swine for slaughtering, live weight; synthetic gas; tap water; tellurium, semiconductor-grade; terrain chipper on forwarder; tetrachloroethylene; tetraethyl orthosilicate; tetrafluoroethane; textile, jute; textile, kenaf; textile, knit cotton; textile, woven cotton; thermoforming of plastic sheets; thermoforming, with calendering; thermo-mechanical pulp; three layered laminated board; tin plating, pieces; tissue paper; tofu; toluene diisocyanate; toluene, liquid; tower silo, plastic; tractor, 4-wheel, agricultural; train, passenger, high speed; train, passenger, long-distance; transformer, high voltage use; transformer, low voltage use; transistor, auxiliaries and energy use; transport, freight train; transport, passenger car, electric; transport, passenger car, large size, diesel, EURO 3; transport, passenger car, large size, diesel, EURO 4; transport, passenger car, large size, diesel, EURO 5; transport, passenger car, large size, natural gas, EURO 3; transport, passenger car, large size, natural gas, EURO 4; transport, passenger car, large size, natural gas, EURO 5; transport, passenger car, large size, petrol, EURO 3; transport, passenger car, large size, petrol, EURO 4; transport, passenger car, large size, petrol, EURO 5; transport, passenger car, medium size, diesel, EURO 3; transport, passenger car, medium size, diesel, EURO 4; transport, passenger car, medium size, diesel, EURO 5; transport, passenger car, medium size, natural gas, EURO 3; transport, passenger car, medium size, natural gas, EURO 4; transport, passenger car, medium size, natural gas, EURO 5; transport, passenger car, medium size, petrol, EURO 3; transport, passenger car, medium size, petrol, EURO 4; transport, passenger car, medium size, petrol, EURO 5; transport, passenger car, small size, diesel, EURO 3; transport, passenger car, small size, diesel, EURO 4; transport, passenger car, small size, diesel, EURO 5; transport, passenger car, small size, natural gas,

EURO 3; transport, passenger car, small size, natural gas, EURO 4; transport, passenger car, small size, natural gas, EURO 5; transport, passenger car, small size, petrol, EURO 3; transport, passenger car, small size, petrol, EURO 4; transport, passenger car, small size, petrol, EURO 5; transport, passenger, electric bicycle; transport, passenger, electric bicycle, label-certified electricity; transport, pipeline, long distance, natural gas; transport, pipeline, offshore, long distance, natural gas; transport, pipeline, onshore, long distance, natural gas; tree seedling; trichloroethylene; trichloropropane; ultrafiltration module; uranium conversion facility; uranium enrichment diffusion facility; uranium hexafluoride; uranium, enriched 3.0%, in fuel element for light water reactor; uranium, enriched 3.0%, per separative work unit; uranium, enriched 3.8%, in fuel element for light water reactor; uranium, enriched 3.8%, per separative work unit; uranium, enriched 3.9%, in fuel element for light water reactor; uranium, enriched 3.9%, per separative work unit; uranium, enriched 4%, in fuel element for light water reactor; uranium, enriched 4.0%, per separative work unit; uranium, enriched 4.2%, in fuel element for light water reactor; uranium, enriched 4.2%, per separative work unit; used cable; used Li-ion battery; vegetable oil refinery; vegetable oil, refined; ventilation control and wiring, central unit; ventilation control and wiring, decentralized unit; ventilation of dwellings, central, 1 x 720 m³/h; ventilation of dwellings, decentralized, 6 x 120 m³/h; ventilation system, central, 1 x 720 m³/h, polyethylene ducts, with earth tube heat exchanger; ventilation system, central, 1 x 720 m³/h, steel ducts, with earth tube heat exchanger; ventilation system, decentralized, 6 x 120 m³/h, polyethylene ducts, with earth tube heat exchanger; ventilation system, decentralized, 6 x 120 m³/h, polyethylene ducts; ventilation system, decentralized, 6 x 120 m³/h, steel ducts; ventilation system, decentralized, 6 x 120 m³/h, steel ducts, with earth tube heat exchanger; vinasse, from fermentation of sugar beet molasses; vinyl chloride; vinyl fluoride; wafer, fabricated, for integrated circuit; waste newspaper; waste paper, sorted; waste paper, unsorted; waste paperboard; waste paperboard, sorted; waste wood, post-consumer; wastewater treatment facility, capacity 1.1E10l/year; wastewater treatment facility, capacity 1.6E8l/year; wastewater treatment facility, capacity 1E9l/year; wastewater treatment facility, capacity 4.7E10l/year; wastewater treatment facility, capacity 5E9l/year; water works, capacity 1.1E10l/year; water works, capacity 6.23E10l/year; water, completely softened, from decarbonised water, at user; water, decarbonised, at user; wax, lost-wax casting; wheat grain, feed; wheat grain, feed, organic; wheat grain, feed, Swiss integrated production; whey; white asparagus; wind turbine network connection, 750kW, onshore; wind turbine, 2.3MW, onshore; wind turbine, 750kW, onshore; window frame, aluminium, U=1.6 W/m²K; window frame, wood, U=1.5 W/m²K; window frame, wood-metal, U=1.6 W/m²K; wire drawing, copper; wire drawing, steel; wood chipping, chipper, mobile, diesel, at forest road; wood chipping, forwarder with terrain chipper, in forest; wood chips, dry, measured as dry mass; wood chips, from post-consumer wood, measured as dry mass; wood chips, wet, measured as dry mass; wood cladding, softwood; wood pellet factory; wood pellet, measured as dry mass; wood preservation facility, dipping/immersion tank; wood preservation facility, flow coating equipment; wood preservation facility, hot/cold dipping tank; wood preservation facility, oscillating pressure method; wood preservation facility, vacuum pressure method; wood preservation, dipping/immersion method, organic solvent-based, indoor use, dry; wood preservation, dipping/immersion method, organic

solvent-based, indoor use, occasionally wet; wood preservation, dipping/immersion method, organic solvent-based, outdoor use, no ground contact; wood preservation, dipping/immersion method, water-based, indoor use, dry; wood preservation, dipping/immersion method, water-based, indoor use, occasionally wet; wood preservation, dipping/immersion method, water-based, outdoor use, no ground contact; wood preservation, hot/cold dipping, creosote, outdoor use, ground contact; wood preservation, oscillating pressure method, inorganic salt, containing Cr, outdoor use, ground contact; wood preservation, oscillating pressure method, organic salt, Cr-free, outdoor use, ground contact; wood preservation, pressure vessel, creosote, outdoor use, ground contact; wood preservation, spray tunnel/deluging, organic solvent-based, indoor use, dry; wood preservation, spray tunnel/deluging, organic solvent-based, indoor use, occasionally wet; wood preservation, spray tunnel/deluging, organic solvent-based, outdoor use, no ground contact; wood preservation, spray tunnel/deluging, water-based, indoor use, occasionally wet; wood preservation, spray tunnel/deluging, water-based, indoor use, dry; wood preservation, spray tunnel/deluging, water-based, outdoor use, no ground contact; wood preservation, vacuum pressure method, inorganic salt, containing Cr, outdoor use, ground contact; wood preservation, vacuum pressure method, organic salts, Cr-free, outdoor use, ground contact; wood preservative, creosote; wood preservative, inorganic salt, containing Cr; wood preservative, organic, indoor use, dry; wood preservative, organic, indoor use, occasionally wet; wood preservative, organic, outdoor use, no ground contact; wood preservative, water-based, indoor use, dry; wood preservative, water-based, indoor use, occasionally wet; wood preservative, water-based, outdoor use, no ground contact; xylene; yarn, jute; yarn, kenaf; yogurt, from cow milk; zeolite, slurry, without water, in 50% solution state; zinc; zinc coat, coils; zinc coat, pieces; zinc monosulfate; zirconium oxide.