

# **Life Cycle Inventory (LCI)**

**from**

# **Industrial Minerals Association (IMA-Europe)**

**March 2013**  
**Version 02**

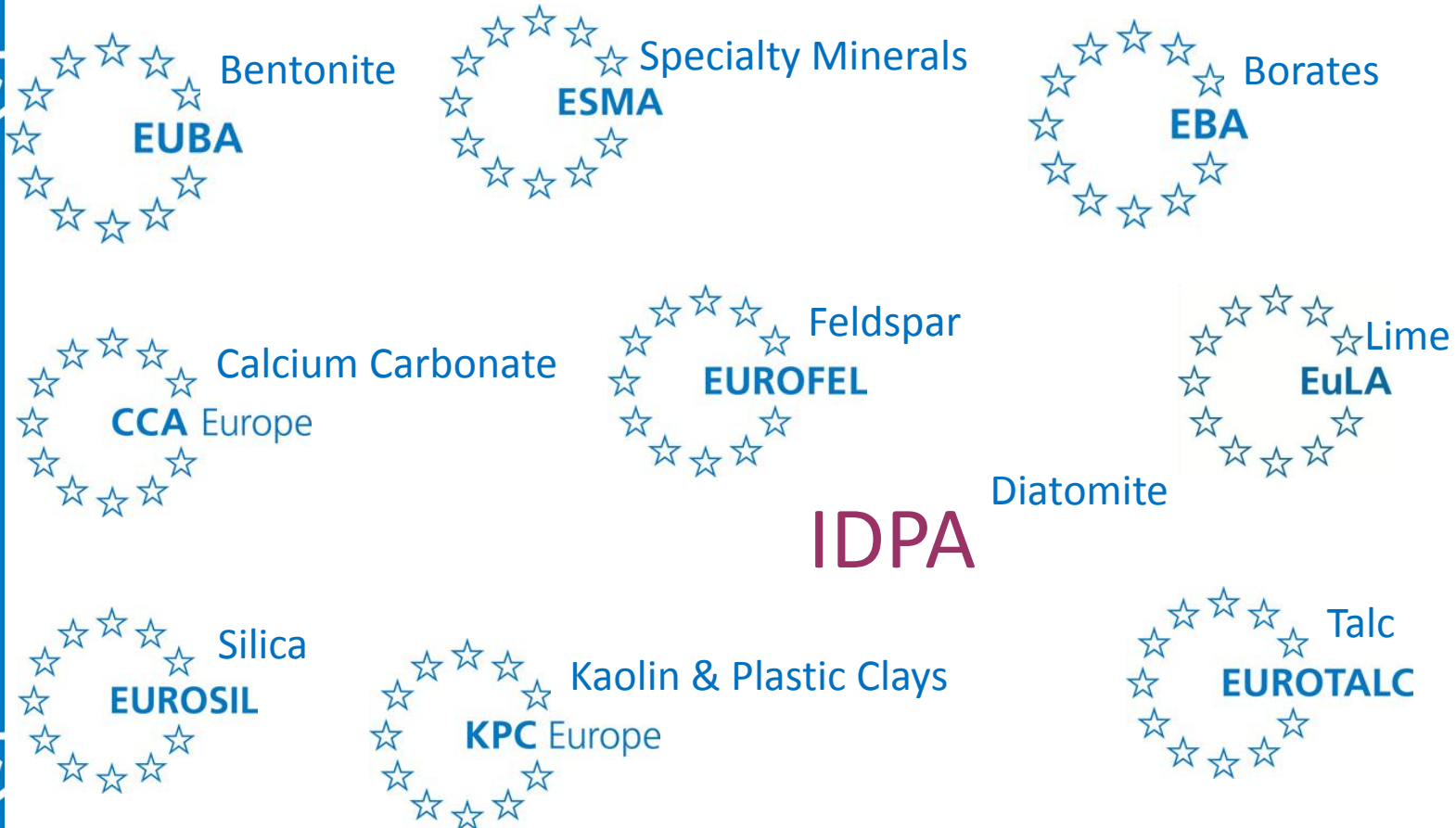
# External Communication

Summary of assumptions + outcome

Audience: Authorities, Customers, LCA practitioners, Associations

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Industrial Minerals Association (IMA-Europe) is an umbrella organization which brings together nine European and one international association specific to individual minerals:



# ***Representative membership***

IMA-Europe covers the following industrial minerals:  
Andalusite, Bentonite, Borate, Diatomite, Ground/Precipitated Calcium Carbonate (GCC/PCC), Feldspar, Kaolin, Lime, Mica, Plastic Clays, Sepiolite, Silica, Talc, Vermiculite

***28 European Countries***  
***i.e. 23 EU Member States + Croatia, Norway, Switzerland, Turkey and Ukraine***

***500 companies***  
***(685 mines & quarries, 750 plants)***

***42,500 employees***  
***180 million tpa,***  
***EUR 10 billion turnover***

## **Promote the interests of the European industrial minerals industry in all non commercial issues**

### ✓ **Representation**

In regulatory bodies, end-user associations, Unions, NGO's, etc

### ✓ **Regulatory Monitoring**

H & S, Products, Raw Materials policy  
Environment & Sustainable Development

### ✓ **Communication**

Image, public relations & dissemination of information to member companies

### ✓ **Standardisation & Product Defense**

Norms, specifications definitions and authorisation

## Goal:

To calculate the generic environmental footprint of various industrial minerals using the ISO 14040 – 14044 standards.

## Scope:

Cover three industrial mineral families grouped by similar process stages and energy consumption.

## Disclaimer:

Estimation of the environmental footprint of the investigated industrial minerals (IM) consists in broad evaluations per product family, and provides first generic data which can be used as such in global LCI analysis and estimates.

However for more refined and specific values, e.g. to prepare new products and to anticipate the impact of using any of the listed IM in their finished products, the LCA practitioners and companies are advised to contact their suppliers and /or companies manufacturing the specific industrial minerals.

The data provided hereafter are provided by industrial sites and, to the best knowledge of IMA-Europe, are considered as accurate for the time the data were collected. Should the facts and/or assumptions be different the conclusions might differ.

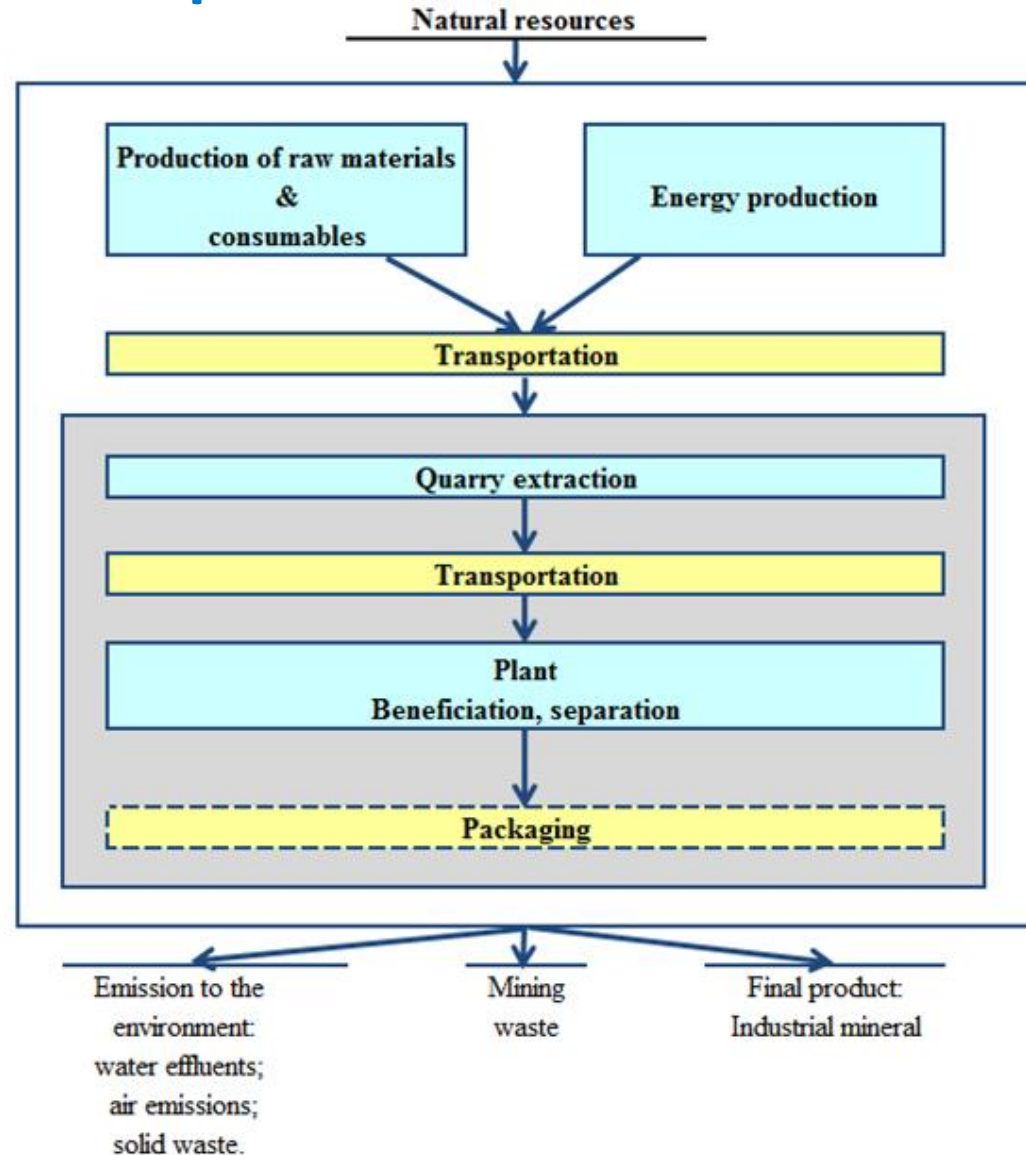
<b>Family 1 name:</b>	<b>Calcium carbonate above 63 <math>\mu\text{m}</math></b>
<b>Family 1 includes also</b>	<b>Wet silica sand, Crude blended feldspar and Ball clay</b>
Description:	This product corresponds to a mineral that is extracted, with or without crushing, and without drying. Total average energy consumption of these products is below 1 MJ per kilogram.
<b>Product name</b>	<b><i>Particle size and description</i></b>
Calcium carbonate	$d_{50} > 63 \mu\text{m}$
Wet silica sand	$d_{50} = 0,24\text{mm}$
Crude blended feldspar	$d_{50} = 6 \text{ mm}$
Ball clay	$d_{50} = 12 \text{ mm}; \text{Length} < 4 \text{ cm}$

<b>Family 2 name:</b>	<b>Kaolin coarse filler</b>
<b>Family 2 includes also</b>	<b>Dry silica sand</b>
Description:	This product corresponds to a mineral that is extracted with or without crushing before drying. The total average energy consumption of these products is around 2 MJ per kilogram.
<b>Product name</b>	<b><i>Particle size and description</i></b>
Kaolin coarse filler	$d_{50} = 2 \mu\text{m}$
Dry silica sand	$d_{50} = 0,26 \text{ mm}$

<b>Family 3 name:</b>	<b>Very fine milled silica sand</b>
<b>Family 3 includes also</b>	<b>Dry milled feldspar</b>
Description:	This product corresponds to a mineral that is extracted with crushing, dried and finally dry milled. The total average energy consumption of these products is between 2.5 and 3 MJ per kilogram.
<b>Product name</b>	<b><i>Particle size and description</i></b>
Very fine milled silica sand	$d_{50} = 22 \mu\text{m}$
Dry milled feldspar	$d_{50} = 6 \mu\text{m}$



## Cradle to gate of the plant



# IMA LCI: Assumptions (1)

<b>Data format &amp; Compliance</b>	ISO 14040-14044 compliant ILCD entry-level requirements
<b>Data quality</b>	Generic industrial minerals screening results
<b>Coverage</b>	Europe + Turkey
<b>Reference year</b>	2006
<b>Data validity</b>	2016
<b>Energy</b>	EU energy fuel mix
<b>Reference flow</b>	1 kg of dry mineral produced
<b>Cut-off criteria</b>	Cut-off ratio >99. Inputs and outputs below 1% threshold were not considered.
<b>Main consultant</b>	Data collection, consolidation; modelling and averaging have been conducted by PwC-Ecobilan based on data from IMA member companies.
<b>Critical review</b>	Methodology report was revised by EESAC, an independent LCA expert
<b>Data flows</b>	<div style="background-color: #90EE90; padding: 2px;">1. Consumption of natural resources</div> <div style="background-color: #FFDAB9; padding: 2px;">2. Emissions</div>

## ***IMA LCI: Assumptions (2)***

### **Data collection & aggregation**

(Pre)Questionnaire sent to Industrial Minerals (IMA-Europe) members manufacturing industrial minerals within the scope of the IMA LCI project.

Inventory data were collected in full reference to the ISO 14040-14044 standards and flows by means of a pre-questionnaire and a final questionnaire.

To generate European typical values, the horizontal aggregation per process was applied. Three ways to aggregate the data were used:

1. Standard process: a simple arithmetic average is used;
2. Non-standard process: the percentage of an arithmetic average is used for a product family (e.g. 30% of industrial mineral goes through the magnetic separation step);
3. Standard process for a particular mineral: mix of technologies and ad-hoc weighting of datasets is used (e.g. wet vs dry mineral separation).

Data for fuel production, electricity and transport were taken from the ELCD (European Life Cycle Database).

### **Omission from the life cycle stages**

Closing and rehabilitation stages of the quarries;  
Capital equipment.

## **Family 1: Calcium Carbonate > 63 $\mu\text{m}$**

(includes also: *Wet silica sand, Crude blended feldspar and Ball clay*)

Impact category	Unit	Reference flow 1 kg
<b>Primary energy consumption</b>	MJ	0.74
<b>Water consumption</b>	litre	0.04
<b>Global warming potential (GWP)</b>	g eq. CO <sub>2</sub>	39.6
<b>Acidification</b>	g eq. SO <sub>2</sub>	0.09
<b>Abiotic depletion</b>	g eq. Sb	0.3

Note:

These products are sold in bulk, therefore the calculated environmental impact excludes packaging.

**Family 2: Kaolin coarse filler**  
 (includes also: *Dry silica sand*)

Impact category	Unit	Reference flow 1 kg
<b>Primary energy consumption</b>	MJ	2.2
<b>Water consumption</b>	litre	1.61
<b>Global warming potential (GWP)</b>	g eq. CO <sub>2</sub>	92.3
<b>Acidification</b>	g eq. SO <sub>2</sub>	0.61
<b>Abiotic depletion</b>	g eq. Sb	0.85

Note:

These products are sold packed, therefore the calculated environmental impact includes packaging.

**Family 3: Very fine milled silica sand**  
 (includes also: *Dry milled feldspar*)

Impact category	Unit	Reference flow 1 kg
<b>Primary energy consumption</b>	MJ	2.86
<b>Water consumption</b>	litre	4.58
<b>Global warming potential (GWP)</b>	g eq. CO <sub>2</sub>	120.3
<b>Acidification</b>	g eq. SO <sub>2</sub>	0.41
<b>Abiotic depletion</b>	g eq. Sb	1.04

Note:

These products are sold packed, therefore the calculated environmental impact includes packaging.

IMA LCI study has passed the critical review from EESAC.

Main outcome of the critical review:

- IMA LCI methodology report is **compliant** with **basic requirements** of the **ISO 14040-14044**;
- IMA LCI is **compliant** with the entry-level requirements of the International Life Cycle Datasets (**ILCD**);
- IMA LCI can be used for **typical industrial minerals**, as **screening values**;
- For **future updates**, **more sites shall be added**, in order to **ensure better representativeness at European level**.

## IMA LCI: Support

[Secretariat@ima-europe.eu](mailto:Secretariat@ima-europe.eu)

The complete IMA life cycle inventory can be found in the following link in the European Life Cycle Database (ELCD):

<http://elcd.jrc.ec.europa.eu/>



# ELCD: IMA information

## 1. Processes LCI data in XML format

Home

**Browse Data Sets**

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LCIA Methods

Flows

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Unit Groups

Sources

Contacts

**Search Data Sets**

Search Processes

**Process data sets**

Filter results +

(2 of 33) 1 2 3 4 5 6 7 8 9 10 10 entries per page (329 total)

Name	Type	Location	Classification	Reference year	Valid until	LCI Method Principle	C
<a href="#">Benzene:technology mix, from pyrolysis gasoline, reformat and toluene dealkylation:production mix, at plant:liquid</a>	LCI result	EU-27	Materials production / Organic chemicals	2005	2010	Attributional	
<a href="#">Beverage carton converting:Converting:converting mix, at plant:beverage carton</a>	Unit process, single operation	EU-27	Systems / Packaging	2009	2014	Attributional	E
<a href="#">Bulk carrier ocean:technology mix:100.000-200.000 dwt</a>	(Parameterized) Unit process, single operation	GLO	Transport services / Water	2005	2010	Attributional	
<a href="#">Bulk carrier ocean:technology mix:100.000-200.000 dwt</a>	LCI result	RER	Transport services / Water	2005	2010	Attributional	
<a href="#">Calcium carbonate &gt; 63 microns:Production:at plant</a>	LCI result	EU-27	Materials production / Other mineralic materials	2006	2016	Attributional	E

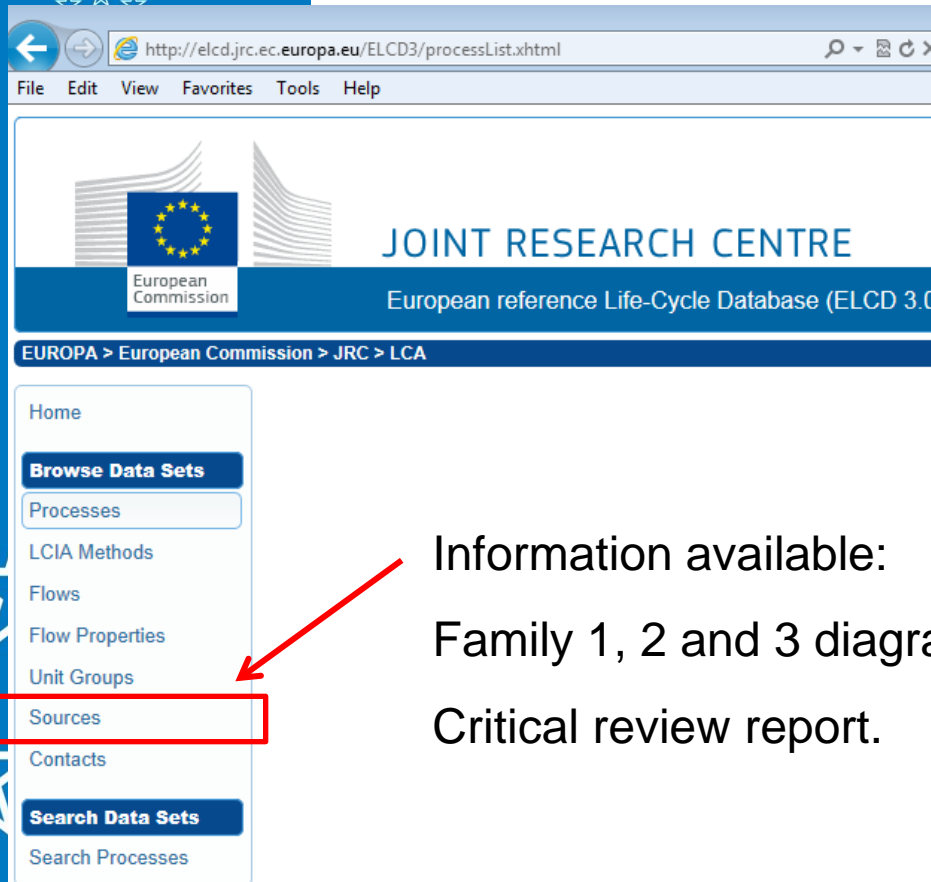
Page 2: Calcium Carbonate > 63  $\mu$ m family;

Page 13: Kaolin Coarse filler family;

Page 30: Very fine mixed silica sand family.

# *ELCD: IMA information*

## **2. Sources Supporting LCI information available**



The screenshot shows a web browser window with the URL <http://elcd.jrc.ec.europa.eu/ELCD3/processList.xhtml>. The page header features the European Commission logo and the text "JOINT RESEARCH CENTRE" and "European reference Life-Cycle Database (ELCD 3.0)". Below the header is a breadcrumb trail: "EUROPA > European Commission > JRC > LCA". A navigation menu is displayed on the left side, containing the following items: Home, Browse Data Sets (button), Processes, LCIA Methods, Flows, Flow Properties, Unit Groups, Sources (highlighted with a red box), Contacts, Search Data Sets (button), and Search Processes.

Information available:  
Family 1, 2 and 3 diagrams.  
Critical review report.

# ELCD: IMA information

## 3. Contacts IMA Europe contact details

Home

**Browse Data Sets**

Processes

LCIA Methods

Flows

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**Search Data Sets**

Search Processes

JOINT RESEARCH CENTRE  
European reference Life-Cycle Database (ELCD 3.0)

EUROPA > European Commission > JRC > LCA

Process data sets

(5 of 14) 1 2 3 4 5 6 7 8 9 10 10 entries per page (135 total)

Name	Category	E-Mail	Homepage
<a href="#">Federal Office for the Environment (FOEN) (FOEN)</a>	Organisations / Governmental organisations	info@bafu.admin.ch	<a href="http://www.bafu.admin.ch/index.lang=en">http://www.bafu.admin.ch/index.lang=en</a>
<a href="#">GlassFibre Europe (GlassFibre Europe)</a>	Organisations / Private companies	info@glassfibreeurope.eu	<a href="http://www.glassfibreeurope.eu/">http://www.glassfibreeurope.eu/</a>
<a href="#">Government of the Netherlands (Government of the Netherlands)</a>	Organisations / Governmental organisations		<a href="http://www.government.nl/">http://www.government.nl/</a>
<a href="#">Government of the Netherlands (Government of the Netherlands)</a>	Organisations / Governmental organisations		<a href="http://www.government.nl/">http://www.government.nl/</a>
<a href="#">Groupement Européen des Fabricants de Papiers pour Ondulé (GO)</a>	Organisations / Other organisations	groupement-ondule@wanadoo.fr	<a href="http://www.groupement-ondule.t">http://www.groupement-ondule.t</a>
<a href="#">Industrial Minerals Association Europe (IMA-Europe)</a>	Organisations / Other organisations	secretariat@ima-europe.eu	<a href="http://www.ima-europe.eu">http://www.ima-europe.eu</a>

## 4. Process data sets compliant with ILCD\*

\* International Life Cycle Dataset

### Search Process data sets

Search terms will be interpreted as additive search conditions. To include all options, just leave all possible entries empty.

Search  Search across network

Registry

Select registry to search: ILCD Data Network (not selected)

ILCD Data Network

### Search Process data sets

#### Search Results

[Back to search form](#)

Name	Node ID	Type	Location	Classification	Reference year	Valid until	LCI Method
<a href="#">Acrylonitrile-Butadiene-Styrene granulate (ABS):production mix, at plant</a>	JRC_ELCD3	Partly terminated system	RER	Materials production / Plastics	1996	2006	Attribu
<a href="#">Beverage carton converting;Converting;converting mix, at plant;beverage carton</a>	JRC_ELCD3	Unit process, single operation	EU-27	Systems / Packaging	2009	2014	Attribu
<a href="#">Calcium carbonate &gt; 63 microns;Production;at plant</a>	JRC_ELCD3	LCI result	EU-27	Materials production / Other mineralic materials	2006	2016	Attribu
<a href="#">Chlorine:production mix for PVC production, at plant</a>	JRC_ELCD3	Partly terminated system	RER	Materials production / Inorganic chemicals	1996	2006	Attribu
<a href="#">High impact polystyrene granulate (HIPS):production mix, at plant</a>	JRC_ELCD3	Partly terminated system	RER	Materials production / Plastics	2002	2012	Attribu
<a href="#">Hydrogen chloride gas (HCl):production mix for PVC production, at plant</a>	JRC_ELCD3	Partly terminated system	RER	Materials production / Inorganic chemicals	2000	2010	Attribu
<a href="#">Kaolin coarse filler ;Production;at plant</a>	JRC_ELCD3	LCI result	EU-27	Materials production / Other mineralic materials	2006	2016	Attribu
<a href="#">Steel sections, including recycling;blast furnace route / electric arc furnace route;production mix, at plant;1kg</a>	JRC_ELCD3	LCI result	GLO	Materials production / Metals and semimetals	2007	2015	Attribu
<a href="#">Very fine milled silica sand d50 = 20 micrometer;Production;at plant;median diameter of silica sand grains is 20 micrometers</a>	JRC_ELCD3	LCI result	EU-27	Materials production / Other mineralic materials	2006	2016	Attribu
<a href="#">Vinyl chloride monomer (VCM):production mix for PVC production, at plant</a>	JRC_ELCD3	Partly terminated system	RER	Materials production / Organic chemicals	1999	2009	Attribu