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Life Cycle Data Network — Handbook for data developers and providers

How to develop, check and share ILCD Entry Level compliant data through the Life Cycle Data Network

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2016



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[Repre] Representativeness (overall)51
[P] Precision and [U] Uncertainty53
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Abstract

After its debut in the European Commission's integrated product policy (1) (COM(2003)302) as the 'best framework for assessing the potential environmental impacts of products', life cycle thinking (LCT) and life cycle assessment (LCA) has become increasingly used in support of community policies and business. Focus has been primarily on establishing agreed methods, both within Europe and internationally. The European Commission's European platform on LCA (EPLCA) has continued to address the equally essential issue of data availability, coherence and quality assurance.

LCA has become an important approach to boost smart, sustainable and inclusive growth in the European Union (EU). As an example, in the context of the Europe 2020 flagship initiative, 'A resource-efficient Europe' (²),the 'Single market for green products communication' (3) and the related European Commission recommendation for the product environmental footprint and the organisation environmental footprint guides (⁴). These methodologies reflect a vital milestone in the aim to increase coherence and quality in the assessment of the environmental performance of products and organisations. Other prominent applications include, in support of the waste framework directive, the ecodesign directive, the EU ecolabel scheme, the EU green public procurement, the raw materials initiative and the bio economy strategy, as well as provide a more advanced basis for indicators and targets accounting for the burdens of EU imports and exports to help focus policies and research funding. LCT is essential in modern decision-making in business and policy. Commonly implemented through LCA, it is increasingly necessary to quantify the benefits and burdens associated with products, both goods and services, that occur in their supply chains during use as well as at end-of-life. This helps to avoid the shifting of burdens between different geographic regions, generations and impacts.

Within this framework the EPLCA, developed by the JRC together with DG Environment, represents the reference point for data and methods essential to implementing life cyclebased approaches. The EPLCA promotes the availability of data and information, with a focus on coherence and quality assurance.

Although methodology development is advancing fast, the availability of coherent, qualityassured life cycle data and studies still represents a major challenge to mainstream the use of LCA and associated environmental footprint methods in business and in policy.

To date, the EPLCA has facilitated the following notable developments.

- The Life Cycle Data Network (LCDN): launched in early 2014, it aims at providing a globally usable infrastructure for consistent and quality-assured life cycle data.
- The European Reference Life Cycle Database: comprises life cycle emissions and resource consumption inventory data from front-running, EU-level business associations and other sources for key materials, energy carriers, transport and waste management to be used as a source for secondary data.
- The Resource Directory: provides a structured repository for several types of life cyclebased documents and studies as well as a worldwide list of life cycle support software packages and databases from suppliers/developers and service providers.

^{(&}lt;sup>1</sup>) COM(2003) 302.

^{(&}lt;sup>2</sup>) COM(2011) 21.

^{(&}lt;sup>3</sup>) COM(2013) 196.

^{(&}lt;sup>4</sup>) Commission Recommendation 2013/179/EU.

 The Reviewer Registry: provides a list of potential reviewers for different LCA schemes and automatically assesses the eligibility of single reviewers and reviewers' teams according to different levels of compliance.

This guide provides comprehensive instructions on how to utilise the LCDN for publishing LCA data. It summarises how to orchestrate the various tools in order to guide the data developers through the entire process from generation of a dataset to publication on the LCDN. Further and more detailed documentation for the individual steps can be found in the annexes to this technical report.

In principle, the following steps are required in order to publish data on the LCDN and are therefore covered in this document:

- (1) preparation of data (export from an LCA modelling tool);
- (2) technical validation of the data;
- (3) setting up of a node for participation in the LCDN;
- (4) uploading of the data to the node;
- (5) publication of the data on the LCDN.

Beyond that, a detailed guidance on how to document different International Reference Life Cycle Data System entry-level (ILCD-EL) aspects, in three commonly used LCA software in Europe (GaBi (⁵), OpenLCA (⁶) and SimaPro (⁷)), is also provided. **This document provides some examples, taking into account some of the abovementioned LCA software because they are the most commonly used and widespread in Europe. However, this does not imply any recommendation or endorsement from the JRC or the European Commission.**

An exemplary dataset was used to provide an overview and an understanding of how to address some compliance issues in different software. Some general guiding principles that apply to all of the software are summarised, along with a short review of discrepancies found when exporting the dataset in ILCD format using the individual LCA software. The editable compliance elements are explained individually, showing some screenshots of different software tools.

Finally a set of slides, resuming the content of this guide, is provided in Annex II.

^{(&}lt;sup>5</sup>) http://www.gabi-software.com/international/downloads/

^{(&}lt;sup>6</sup>) http://www.openlca.org/

^{(&}lt;sup>7</sup>) https://www.pre-sustainability.com/simapro

1. Introduction

This guide provides comprehensive instructions on how to utilise the LCDN for publishing LCA data. It summarises how to orchestrate the various tools in order to guide you through the entire process from generation of a dataset to publication on the LCDN. Further and more detailed documentation for the individual steps can be found in the annexes to this document.

The European Platform on LCA

The EPLCA is managed by the Commission's JRC Bioeconomy Unit (D1), working closely with the circular economy and green growth policies of DG Environment. This platform supports business and government needs for the availability, interoperability and quality of life cycle data, methods and studies.

LCA has been identified as the 'best framework for assessing the potential environmental impacts of products' in the European Commission's integrated product policy communication (COM(2003) 302). This communication highlighted the necessity for a platform on LCA and for an increase in the availability of quality-assured life cycle data. The European Commission, through its DG Environment and the JRC, responded to these needs by establishing the EPLCA.

The Life Cycle Data Network

The LCDN is a non-centralised web-based infrastructure that ensures life cycle data can be easily accessed via searches, filtering and sorting. Datasets in the network can be provided globally by any data developer/owner, e.g. industry, national LCA projects, research groups and consultants.

To participate in the network, interested parties can set up their own node where data can be hosted and shared on the network. While an individual node may be used to publish any data that is desired, only datasets that fulfil the requirements of the network (ILCD-EL requirements) can be registered and shared on the network. That means that only those datasets that are ILCD-EL compliant are visible through the LCDN, while all others can be accessed only from the individual nodes.

Steps for publishing data on the LCDN

The following steps are required in order to publish data on the LCDN and are therefore covered in this document:

- (a) preparation of data (export from an LCA modelling tool);
- (b) technical validation of the data;
- (c) setting up of a node for participation in the LCDN;
- (d) uploading of the data onto the node;
- (e) publication of the data on the LCDN.

Figure 1.1 shows the flowchart of the abovementioned steps.

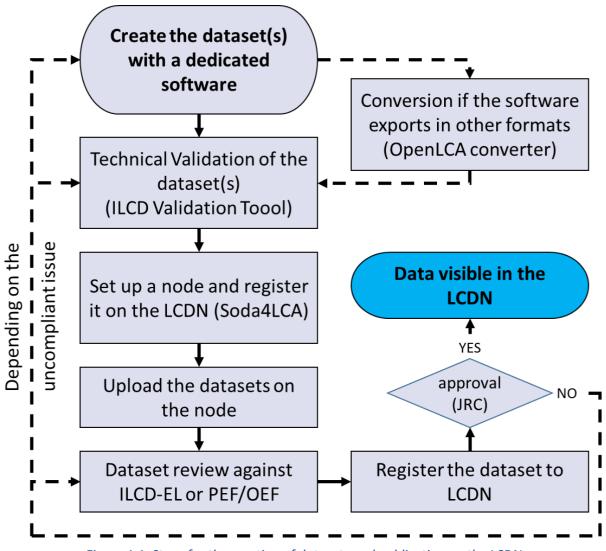


Figure 1.1. Steps for the creation of datasets and publication on the LCDN

List of software components

The following software components are used for the procedures described in this document, aside from an LCA modelling tool:

- ILCD validation tool
- OpenLCA converter
- soda4LCA

The following software components are necessary to set up an LCDN node:

- soda4LCA
- Java ™
- MySQL ™
- Apache Tomcat ™

2. Creating ILCD Entry Level compliant datasets

2.1. Requirements

In order to fulfil the ILCD-EL requirements (^a), the following information needs to be documented in process datasets.

Table 2.1. Overview of ILCD-EL requirements

Compliance area ILCD-EL requirements

Format	Use of ILCD format
Documentation	 Minimum documentation extent specified Based on ISO quality criteria
Nomenclature	 ILCD nomenclature compliant documents (e.g. use of ILCD reference elementary flows) Permission of certain aggregated elementary flows ILCD terminology use not enforced
Data quality	 In general following ISO quality criteria No minimum data quality required BUT documentation of data necessary, using ISO quality criteria Technological, time and geographical representativeness to be documented
Method	 ISO 14040 and 14044 compliant process-based LCA Methodological ILCD compliance not enforced Applied modelling frameworks and allocation/substitution approaches to be documented
Review [*]	 Use of reviewers from registry not required 'Qualified reviewer' required (based on ISO 14025): knowledge of relevant sector; knowledge of represented process or product LCA method expertise and experience. Qualified independent external reviewer in line with ISO 14044 requirements BUT separate review report is NOT required OR Qualified independent internal reviewer in line with ISO 14044 requirements BUT separate review report IS required (with the ILCD template/minimum review documentation scope in addition to review documentation provided within dataset) Review on unit process level may not be required, depending on data quality claims

The JRC is reviewing ILCD-EL requirements and particularly regarding the use of reviewers from the Reviewer Registry of the EPLCA, which may become mandatory, and the request for a separate review report, which may also become mandatory for external reviewers.

2.2. Export from LCA tools

In order to publish data on the LCDN, the dataset must be formatted in the ILCD data format. Data export directly to the ILCD data format is supported by major LCA software tools used in Europe. For all cases where this is not possible, a free converter tool (⁹), which has been developed in collaboration between GreenDelta and the JRC, is available to convert data from EcoSpold to ILCD (see Chapter 3, 'Using the EcoSpold-ILCD converter', for further details. See also Annex I for further information on how to create an ILCD-EL compliant dataset using the major software for LCA modelling).

 $^{(\}circle{a}) http://eplca.jrc.ec.europa.eu/uploads/ILCD-Data-Network-Compliance-Entry-level-Version 1.1-Jan 2012.pdf$

^(°) http://www.openica.org/openica-format-converter/

2.2.1.GaBi software

In GaBi, select the items you want to export and then choose `Export' and `ILCD $\ldots '$ from the `File' menu.



Figure 2.1. GaBi export

2.2.2.OpenLCA software

In OpenLCA, choose 'Export' from the 'File' menu, then the item 'Processes' under 'ILCD', as shown in Figure 2.2. In the next step of the export wizard, select the processes to be exported and confirm with 'Finish' (Figure 2.3). A file named 'ILCD.zip' will be created at the selected location.

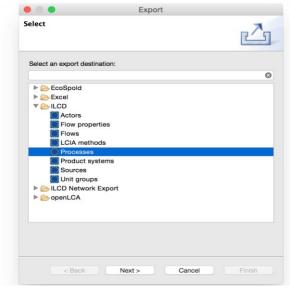


Figure 2.2. OpenLCA ILCD export

To directo	End-of-life treatme	itaTale/export		rowse
Land	Energy carriers and Materials production			
	Systems			
	Transport services			
	Final Assembly and Granulate producti	-		
	intermediate produ			
	PET Bottles Germa	any		
Lined	Transport A Transport B			
	100 Million and a second s	ed water bottle to re	tailers (Transport	C)

Figure 2.3. openLCA ILCD export

2.2.3.SimaPro software

In the most recent release, SimaPro offers native ILCD export. With previous versions of the software tool, generating ILCD datasets from SimaPro requires two steps: first exporting the data from SimaPro in EcoSpold, and then converting that data to ILCD using the OpenLCA converter tool.

Export from SimaPro software

Example: select the items you want to export and select 'Export' from the 'File' menu. In the following dialogue, choose 'ILCD database' as the data format, as shown in Figure 2.4. Then select 'Browse' under the 'Mapping file' section and navigate to the mapping file, which is located in the database directory under:

C:\Users\Public\Documents\SimaPro\Database\SimaProToILCDMapping820.xlsx

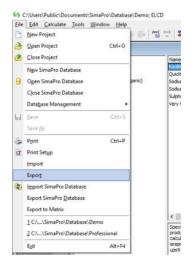


Figure 2.4. SimaPro export

ents Summary	Grouping C Category	
Details	Category Cone list	
hoToILCDMapping	520.xlex	Browse
	Export fields	
(1)	☐ Skip empty fields	
(1)	Uncertainty values	
(444)	Convert expressions to constant	5
(444)		
, units, etc.)		
	EcoSpold 1 options	
	🔽 Use multiple xml files	
	🔛 Export mapping file	
	Export ElementaryFlows.xml	
	Only used elementary flows	
	Econvent compatible	
	(1) (1) (444) (444)	(1) F Skip empty fields (1) F Uncertainty values (444) Convert expressions to constant (444) Convert expressions to constant (444) EcoSpold 1 options (2) EcoSpold 1 options (2) Ecospold 1 options (2) Ecospold 1 options (3) F Export ElementaryFlows.cml (4) (4)

Figure 2.5. Select target format

After the mapping file has been selected, click on 'OK'. A file dialogue will appear, prompting you to specify a target folder and a file name for the exported data. The result will be an ILCD ZIP file.

				1.	100.11.00		
→ ↑ ↑ C\\Users\Public\Docu	nts\SimaPro\Datab	0486		ٽ ×	"Database"	durchsuchen	
Organisieren 👻 Neuer Ordner						188 •	
 OK-Projekt Dropbox OneDrive Dieser PC Bay Area - california - 2014_v3_mcf-t Bilder Desktop Dokumente Downloads Musik Videos Acer (C:) 	Name	∽ bstances820 iILCDMapping820	Änderungsdatum 31.03.2016 08:00 31.03.2016 08:00	Typ Microsoft Excel-Ar Microsoft Excel-Ar	Große 195 KB 3.889 KB		
 DVD-RW-Laufwerk (D:) PACS_CD Microsoft Office Klick-und-Los 2010 							

Figure 2.6. Select mapping file

xport setup			3
Data format ILCD database	Contents C Summary C Details	Grouping C Category C One list	
Mapping file	-7-		
C:\Users\Public\Documents\SimaPro\Data	base\SimaProToILCDMapping	820.xlsx	Browse
Selection		Export fields	
Current	(1)	F Skip empty fields	
Selection	(1)	Uncertainty values	
C All of this project	(444)	Convert expressions to o	onstants
C All including libraries	(444)		
Related objects (system descriptions,	oubstances units atr.)		
Include sub product stages and proce			
Format options		EcoSpold 1 options	
CSV separator		Use multiple xml files	
C Tab		Export mapping file	
€ Comma		Export ElementaryFlows.	int
𝚱 Semicolon		Only used elementary	/ flows
Page break after each object		Econvent compatible	
Restore default settings		OK	Cancel

Figure 2.7. Select target folder and file name

→ ~ ↑ 🛱 > Dieser PC >	Dokumente a		v 0 -	Dokumente" durchsuchen	Q
a - 1. a - piperre -	bekanishe ?		• 0	vokumente uurensuenen	~
Irganisieren 👻 Neuer Ordner				E •	6
🐔 OneDrive	Name	Änderungsdatum	Тур	Größe	
Dieser PC	GaBi	28.06.2016 18:06	Dateiordner		
	ILCDFormatValidationTool_1.2.1_20160224_win-64bit	05.05.2016 07:58	Dateiordner		
Bay Area - california - 201-	LCDFormatValidationTool_1.2.1_20160224_win-64bit-1	06.05.2016 09:24	Dateiordner		
E Bilder	SetupSimaPro820	27.06.2016 09:24	Dateiordner		
Desktop	SimaPro	26.06.2016 17:15	Dateiordner		
Dokumente	K-Project	08.05.2016 09:16	ZIP-komprimien	9 KB	
🕹 Downloads					
👌 Musik					
Videos					
Acer (C:)					
DVD-RW-Laufwerk (D:) PA					
Microsoft Office Klick-und					
Netzwerk *					
Dateiname: ILCD-export file	4ZIP				
Dateityp: ILCD archive (*.	ZIP)				

Figure 2.8. Ready for export

Optional: convert data to ILCD

In case you are using a previous version of SimaPro that does not yet support ILCD export, you may alternatively export the dataset as EcoSpold1 and subsequently use the OpenLCA converter to convert the data to ILCD format.

Follow the instructions in the section on SimaPro in Chapter 3, 'Using the EcoSpold-ILCD converter', of this document in order to convert the data generated in the previous step to ILCD.

3. Using the Ecospold-ILCD converter

The OpenLCA converter is a tool to bridge the various data formats and nomenclature systems that currently exist, enabling users to convert data from EcoSpold 1 and 2 and SimaPro formats to the ILCD format in order to publish data on the LCDN. As regards the conversion of datasets from Ecospold to ILCD, the conversion of elementary flows is fully covered.

3.1. Obtaining and installing the OpenLCA converter

The tool can be downloaded from

http://sourceforge.net/projects/OpenLCA/files/OpenLCA_converter/.

Select the latest version and download the converter-3.x.x.jar file.

This file is an executable JAR file, which requires Java to be installed on the local machine in order to run it. The converter runs by simply double-clicking on the executable file. If a message is displayed claiming that the file cannot be opened, then an updated version of Java is required, which is downloadable from http://java.com/download/.

3.2. Using the converter

Once started, the converter tool displays its main window as shown in Figure 3.1. To convert an EcoSpold dataset to ILCD, users must simply select the originating dataset in the 'Source' field as well as an (empty) target folder in the 'Target' field, as shown in Figure 3.2.

NB: It is necessary that for each conversion a new empty folder is chosen as target.

The resulting files will be written into the specified folder as can be seen in Figure 3.4. If during the conversion any issues have occurred, this is indicated in the converter's log window. In addition, the converter tool offers to perform a validation on the generated files.

3.3. Converting data generated with SimaPro

To convert data generated with SimaPro to the ILCD format, additional mapping files are required, which can be downloaded at http://www.pre-sustainability.com/data-conversion-tool-ilcd-format, along with instructions on how to set up the converter tool accordingly. See `converting SimaPro to ILCD format' guidance (¹⁰).

^{(&}lt;sup>10</sup>) https://simapro.com/wp-content/uploads/2015/07/Converting-SimaPro-to-ILCD-format.pdf

	OPENLCA
Source:	
Target:	
Use proxies in mappings	5
	EcoSpold 1
Welco	me to the openLCA data converter!
he converter is a free and op prmats EcoSpold 01 / 02 , IL	en source tool for the transformation of the XML based LCA data CD and SimaPro CSV.
sing the converter is straightfo	orward:
01 / 02 data sets are 2. Select a target directo permissions for this di	ry: In this directory the created files are stored, so you need write

Figure 3.1. OpenLCA converter main window

Conversion Database	OPENLCa
	format converter
Source:	/Users/oliver.kusche/Downloads/18.11.2015_ecc
Target:	/Users/oliver.kusche/Downloads/result
Use proxies in map	opings
	ILCD
w	elcome to the openLCA data converter!
	nd open source tool for the transformation of the XML based LCA data 2, ILCD and SimaPro CSV.
Using the converter is stra	aightforward:
 Select a source f 01 / 02 data set 	ormat file: XML files or ZIP files containing XML files with ILCD or EcoSpold
	irectory: In this directory the created files are stored, so you need write
Select a target for	ins directory. irmat: The selected format must be different from the source format. on by clicking on the green arrow.
OpenI CA is administered	and developed by <u>GreenDelta</u> . For further information about the project ebsite. If you need help to get started you can also read our <u>online help</u> .
	ensite. If you need neip to get started you can also read our onine neip.

Figure 3.2. Converting EcoSpold 2 to ILCD

Conversion Database	XPath Search About
	OPENLCa
Source:	/Users/oliver.kusche/Downloads/18.11.2015_ecc
Target:	/Users/oliver.kusche/Downloads/result
Use proxies in mapp	pings 📃
	ILCD
19 files created (0 s	seconds)
cement production, unspen process data set	
19 files created (0 s cement production, unspec process data set file:/Users/ollver.kusche/Down cement, alternative constitu	<mark>cified</mark> loads/result/ILCD/ILCD/processes/7f9445bd-a424-439f-943e-9771e017b44f.xml
cement production, unsper process data set file:/Users/oliver.kusche/Down cement, alternative constitu flow data set	<mark>cified</mark> loads/result/ILCD/ILCD/processes/7f9445bd-a424-439f-943e-9771e017b44f.xml
cement production, unsper process data set file:/Users/oliver.kusche/Down cement, alternative constitu flow data set file:/Users/oliver.kusche/Down	<mark>cified</mark> loads/result/ILCD/ILCD/processes/7f9445bd-a424-439f-943e-9771e017b44f.xml uents 21-35% loads/result/ILCD/ILCD/flows/936059f1-6468-444f-a00d-fd59386943a3.xml
cement production, unsper process data set file:/Jusers/oliver.kusche/Down cement, alternative_constitt flow data set file:/Users/oliver.kusche/Down cement, alternative_constitt flow data set	<mark>cified</mark> loads/result/ILCD/ILCD/processes/7f9445bd-a424-439f-943e-9771e017b44f.xml uents 21-35% loads/result/ILCD/ILCD/flows/936059f1-6468-444f-a00d-fd59386943a3.xml
cement production, unsper process data set file:/Users/oliver.kusche/Down cement, alternative constitu flow data set file:/Users/oliver.kusche/Down cement, alternative constitu flow data set file:/Users/oliver.kusche/Down	<mark>cified</mark> loads/result/ILCD/ILCD/processes/7f9445bd-a424-439f-943e-9771e017b44f.xml uents 21-35% loads/result/ILCD/ILCD/flows/936059f1-6468-444f-a00d-fd59386943a3.xml uents 6-20%

Figure 3.3. Conversion finished

Name ^	Größe	Art
V 📃 ILCD		Ordner
V 🖿 ILCD		Ordner
contacts		Ordner
external_docs		Ordner
flowproperties		Ordner
flows		Ordner
🗟 ILCDClassification.xml	16 KB	XML-Text
😸 ILCDFlowCategorization.xml	5 KB	XML-Text
🐻 ILCDLocations.xml	14 KB	XML-Text
processes		Ordner
sources		Ordner
unitgroups		Ordner
index.html	9 KB	HTML-Text
o log.html	201 Byte	HTML-Text
META-INF		Ordner
schemas		Ordner
stylesheets		Ordner
validation.html	9 KB	HTML-Text

Figure 3.4. Resulting files

4. Data validation

For the (technical) validation of datasets, a free software tool is available. It can be used to check syntax, categories, nomenclature, references between datasets and other technical aspects.

By default, the tool will check against the ILCD format syntax only. Other aspects can be selected if desired.

4.1. Obtaining and running the ILCD validation tool

The validation tool (developed by Oliver Kusche in collaboration with the JRC) is available for all major operating systems and can be downloaded at

https://bitbucket.org/okusche/ilcdvalidationtool/downloads

The programme runs simply by unzipping the downloaded package launching the application. On Mac OS X, Java is required and can be obtained at

http://java.com/download/

4.2. Validation aspects

The tool offers to perform validations of the following aspects:

- (1) dataset level:
- ILCD format syntax: the dataset conforms to the ILCD format specification,
- advanced ILCD format syntax: the dataset conforms to more specific rules,

• compliance to a reference nomenclature: the dataset references only elementary flows (and optionally flow properties and unit groups) that are defined by a reference nomenclature (such as the ILCD scheme);

- (2) on a set of datasets:
- links: all local references (links) between datasets can be resolved,

• orphaned datasets: in a set of datasets, there are no extra datasets present that are not referenced from any other local dataset;

(3) on an archive:

• archive structure: the ZIP archive complies with the ILCD format specification regarding its internal folder structure and optional manifest file.

The aspects to validate against can be selected using the check boxes in the 'Validation aspects' component as shown in Figure 4.1.

Valid	ation Aspects	
	Default	Profile
	Archive Structure	Default ILCD
	Categories	
	Links	
	Orphaned Items	
	Nomenclature (Refe	rence Flows)
	ILCD Format Syntax	(XML Schemas)
	Advanced ILCD Form	nat Syntax (XSLT Stylesheet)

Figure 4.1. Validation aspects selection

4.3. Validation profiles

The tool allows for checking against different sets of rules, which are called profiles. In addition to the default ILCD profile, distinct profiles are available to check against EL and environmental footprint requirements.

As profiles are sometimes updated, they carry a version number where the latest version number is always the highest one.

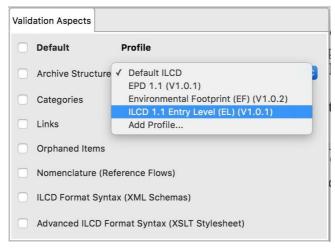


Figure 4.2. Profile selection

New profiles can be added (or existing ones updated) using the 'Add profile ...' menu entry in the profile selector, as shown in Figure 4.3.

4.4. Using the validation tool

The datasets can be opened in the validation tool by simply dragging and dropping the ZIP file or folder generated from the LCA modelling tool (or the OpenLCA converter) to the area labelled 'Drop files or folders here' (see Figure 4.4). Then the desired validation aspects must be selected on the left-hand side, as shown in Figure 4.1. Optionally, a profile can also be chosen, then the validation can be launched by selecting the green 'Play' button.

Profiles Profiles Name:	
Name:	
	Version alidation/src/main/resour 1.0.1 alidation/src/main/resour 1.0.2 alidation/src/main/resour 1.0.1
	Cancel OK

Figure 4.3. Adding new profile

• • •		ILCD Validati	on Tool 1.1.0			
File Selection					Validation Aspects	
Filename	Path		Va	lidation Progress	Default	Profile
	6				Archive Structu	Default ILCD
	1	Drop files or folders here			Categories	
			i.		Links	
					Orphaned Items	
					Reference Flow	5
_					✓ XML Schemas	
+ - 🔜					✓ XSLT Styleshee	t
alidation Messages						
Aspect Name	Filename	UUID	Dataset Type	Message		

Figure 4.4. ILCD validation tool

Validation messages are issued on the bottom section of the application window with details for the respective dataset.

When validating a folder, right clicking on an individual message reveals the dataset file on the file system (see Figure 4.5). This does not work for a ZIP file, however, as this can be extracted in advance before the folder can be validated.

Validation Messages					
Aspect Name	Filename	UUID	Dataset Type Message		
Categories	Oad48afe-38d8-47d1-8c74-705b6f	Oad48afe-38d8-47d1-8c74-705b6f296b94	process d show in file system 1	assification "oekobau.dat": category	"Nutzung von Wärmeerzeugern
There were errors.					

Figure 4.5. Show in file system

4.4.1.Validation messages

The entire log or single entries can be copied to the system clipboard using the entries in the context menu (see Figure 4.6).

e Selection				Validation Aspec	:18
Filename K E_data_to_check.zip	Path /Users/oli/Downloads/E_data_ Drop		Validation Progres	Archive St Categorie: Links Orphaned	
idation Messages				ILCD Form	at Syntax (XML Schemas) ILCD Format Syntax (XSLT Styleshee
119d5cc5-9c 119d5cc5-9c 119d5cc5-9c 119d5cc5-9c 119d5cc5-9c 119d5cc5-9c 119d5cc5-9c	Dataset Type D0-4668-9. process data set 100-4668-9. process data set	Message referenced flow is not part of the reference is referenced flow is not part of the reference is the referenced flow is not part of the reference is referenced flow is not p	ystem: 465e8306-30d7-4ff1-9ad5 ystem: 26fd4e1-a971-4be3-a9ea ystem: 26fd4e1-a971-4be3-a9ea ystem: 65fafd63-a4e4-4ac2-adbb- ystem: 55fafd63-a4e4-4ac2-adbb- ystem: 55fafd63befafdefafd615e5bat ystem: 8 Copy item	-5e866f91878d demolition wast -ce8273b48101 highly radioactiv e-edc4ec8815a6 medium and lox -1f838a2b6399 overburden (uns 1=ef <mark>3390e584dc plutonium as re</mark>	e waste v radicactive wastes becified) sidual product gs id)
f19d5cc5-9d	20b-466a-9 process data set 20b-466a-9 process data set 20b-466a-9 process data set	referenced flow is not part of the reference a referenced flow is not part of the reference a	ystem: fa ruuses was ruus acco	5146d462 spoil (unspecifie	d)

Figure 4.3 Copy log to clipboard

These logs can be further processed by, for instance, inserting them into a spreadsheet application like Microsoft Excel (see Figure 4.4.4).

4.4.2. Validating against ILCD-EL requirements

When validating data against ILCD EL requirements, the EL profile must be selected from the profile selector. The 'Nomenclature', 'ILCD format syntax' and 'Advanced ILCD format syntax' aspects should be checked.

Valid	ation Aspects	
	Default	Profile
	Archive Structure	ILCD 1.1 Entry Level (EL) (V1.0.1)
	Categories	
	Links	
	Orphaned Items	
	Nomenclature (Ret	ference Flows)
	ILCD Format Synta	ax (XML Schemas)
	Advanced ILCD Fo	rmat Syntax (XSLT Stylesheet)

Figure 4.4. Validation for EL requirements

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Referen	ce Flows	1194500	9000-4662-9	575-6b0d07e	02223.0	el Electric	ky Mix 119	d5cc5-9c0	b-466a-95	75-6b0d07e02	2a3: process da	ta set: refere	nced flow i	s not part o	the refere	nce system	1: 465e8	06-3047-411	-9ad5-6e8	667918784 (demolition w	aste
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											Zalk process da											
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Reference	ce Flows	119d5oc	-9c0b-466a-9	575-6b0d07e	022a3.wr	ni; Electrici	ity Mix; f194	dSoc5-9c0	6-4668-95	75-6b0d07e02	2a3; process da	na set; refere	nced flow i	s not part o	the refere	nce system	1: a70cdi	81-7cd3-415	-able-a87	02ecf28d9 u	iranium depl	leted
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Reference	ce Flows	001b3cb	7 6868 4061	191-3e6d7b	cc90c6.a	ni: Electric	ity Mix: 003	183cb7-88	68-4061-4	8a91-3e6d7bcc	90c6: process d	ata set: refer	enced flow	is not part of	I the refere	ence system	m: 455e8	306-3047-41	1-9ad5-6e8	856791878d	demolition v	Naster
Reference	CP Flows	001blacb	7-5868-4061-	1a91-3e6d7b	190c6.a	nt: Electric	ity Mix: 001	1blicb7-b8	68-4061-8	a91-Je6d7bcc	90c6; process d	ata set: refer	enced flow	is not part o	f the refere	ICCE SYSTEM	m: 26644	ed1-a971-4be	1-aliva-ca9	273648101	highly radios	activ
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Reference	ce Flows	4103502	0-4599-4244-4	148 627b35d	dia70.xr	ni; Waste i	ncineration	of municip	pal solid v	vaste (MSW); 4	1035020 4599 4	240-8748-62	7b35dd1a7	1: process d	ita set; refe	renced flo	w is not	part of the re	ference sys	stem: 455e8	306-30d7-4f	11-91
Reference	CE FL WY	4f03502	0-4599-424d-1	If48-627b35d	dla7far	i; Waste k	ncineration	of municip	nal solid v	vaste (MSW): 4	f035020-4599-4	24d-8f48-62	7b35dd1a7	t; process d	ta set; refe	renced flo	w is not	part of the re	ference sys	tem: 25fd4	ed1-a97f-4be	1-05
Reference	ce El wa	4/03502	0.4599.4244-	148-627b35d	dia71.sr	i: Waste in	ncineration	of municip	oal solid v	vaste (MSW): 4	1035020-4599-4	240-8748-62	7635661a7	f: process d	ta set: refe	renced flo	w is not	part of the re	ference sys	tem: a6069	1d7-758b-40	76-9
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Figure 4. 8. Validation log: paste into Excel

4.4.3. Post-processing validation logs

If there are a large number of validation messages, it may be desirable to further process them and, for instance, provide them to other parties in a structured way. As the copied entries are in plain CSV format, they can be post-processed in spreadsheet applications like Microsoft Excel. This process is described below.First, the entire validation log must be copied into the clipboard using the menu entry. Then in the spreadsheet application and pasting the clipboard contents into the A column of line 1, the 'Text to columns' option must be chosen, as shown in Figure 4.8.

A wizard will appear, where the option 'Delimited' must be chosen before the user can press the 'Next' button, as shown in Figure 4.9.

Home Insert	Page Layout Formulas Data Review View		0.
	Contractions Contrel Contractions Contractions Contractions Contra	Remove Outa Consolitation What-If Ductorate Visitation Analysis	
1 2 ×		icc5-9c0b-466a-9575-6b0d07e022a3; process data set; referenced flow is not part of the refe	rence
A	Convert Text to Columns Wizard - Step 1 of 3	K L M N O P Q R	5
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Reference Flows;		i set; referenced flow is not part of the reference system: 465e8306-30d7-4H1-9ad5-6e866H91878d demoli	tion waste
Reference Flows;	The Text Wizard has determined that your data is Fixed Width.	set; referenced flow is not part of the reference system: 26/64ed1-a97/-4be3-a9ea-ca9273b48101 highly	
Beference Flows;	If this is correct, choose Next, or choose the Data Type that best describes your data.	set; referenced flow is not part of the reference system: a60b91d7-798b-4f76-973e-edo4ec8815a6 mediu	
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Reference Flows;	Delimited - Characters such as commas or tabs separate each field.	set; referenced flow is not part of the reference system: 50df304b-46ad-4915-871d-ef3390e584dc pluton	
Reference Flows; Reference Flows;	Fixed width - Fields are aligned in columns with spaces between each field.	 set; referenced flow is not part of the reference system: 8df3d2af-d7ac-4365-9b4a-17e28b9ca482 radioan set; referenced flow is not part of the reference system: 3c4b0e5d-6500-4ada-9a2c-58e43ac96500 slag (u) 	
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Reference Flows:		set: referenced flow is not part of the reference system: a70cd68f-7cd3-4156-ab1e-a8702ecf28d9 uraniur	
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Reference Flows;		a set; referenced flow is not part of the reference system: 62fafd63-a4e4-4ac2-adbb-1/838a2b6399 overbu	
B Reference Flows;	[]Reference Flows; f13d5cc5-9c8b-466a-9575-6b887e822a3.wl; Electricity Wix; f19d5cc5-9c8b-466a-9575-6b8 [Reference Flows; f13d5cc5-9c8b-466a-9575-6b887e822a3.wl; Electricity Wix; f19d5cc5-9c8b-466a-9575-6b8	a set; referenced flow is not part of the reference system: 59df304b 46ad-4915-871d ef3390e584dc plutor	
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A Reference Flows:		a set; referenced flow is not part of the reference system: a70cd68f-7cd3-4156-ab1e-a8702ecf28d9 uraniu	
S Reference Flows;	Cancel < Back Next 21. Finish	4d-8H48-627b35dd1a7f; process data set; referenced flow is not part of the reference system: ddfc151d-e0	f7-4b1e-9e
6 Reference Flows;		4d-8f48-627b35dd1a7f; process data set; referenced flow is not part of the reference system: 465e6306-30	0d7-4ff1-9:
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	035020-4599-424d-8F48-627b35dd1a7f.xml; Waste incineration of municipal solid waste (MSW); 4f035020-4599-4		
	035020-4599-424d-8748-627b35dd1a7f.cml; Waste incineration of municipal solid waste (MSW); 4f035020-4599-4 035020-4599-424d-8748-627b35dd1a7f.cml; Waste incineration of municipal solid waste (MSW); 4f035020-4599-4		
	035020-4599-4240-848-6275350d1a71.cm); Waste incineration of municipal solid waste (MSW); 41035020-4599-4 035020-4599-4240-8548-6275350d1a71.cm); Waste incineration of municipal solid waste (MSW): 41035020-4599-4		
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		Count 66 🗰 🔟 🗝 🔷 🕂	100 %

Figure 4.9. Validation log: choose 'Delimited'

In the following step, the user must select 'Semicolon' as the delimiter, as shown in Figure 4.10).

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Reference Flows;	Semicolon	Tex	t qualifier:	-	0		i set; refere	nced flow	is not pa	rt of the	reference	system: 3	:4b0e5d-6	500-4ada	-9a2c-58	e43ac96500 :	lag (unspe	cifie
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Reference Fl ws;	-						i set; refere	nced flow	is not pa	rt of the	reference	system: fa	1d0ee9-d	657-4d0b	-9ee4-7a	of5146d462 s	oll (unspe	stifie
Reference Flows;	Space						set; refere	nced flow	is not pa	rt of the	reference	system: 9	s868495-f	5fc-431e-	a4fe-3c3	aefae3269 un	specified n	adio
Reference Flows;	Other:						i set; refere	nced flow	is not pa	rt of the	reference	system: a	70cd68f-7	d3-4156-	able-a8	702ecf28d9 u	ranium dep	plete
Reference Flows;							a set; refer	enced flow	is not pa	ert of the	reference	e system: o	idfc151d-i	0f7-4b1e	-9ed3-fel	bab09d0c6e o	alcium fluo	oride
Reference Flows;							a set; refer	enced flow	is not pa	ert of the	reference	e system: 4	65e8306-	30d7-4ff3	-9ad5-6e	866f91878d -	demolition	was
Reference Flows;	Preview of selected data:						a set; refer	enced flow	is not pa	ert of the	reference	e system: 2	dfd4ed1-	97f-4be3	l-a9ea-ca	9273548101	highly radio	pacti
Reference Flows;							a set; refer	enced flow	is not pa	ert of the	reference	e system: a	60691d7-	7985-4(7)	6-973e-e	dc4ec8815a6	medium an	nd le
Reference Flaws;							a set; refer	enced flow	is not pa	ert of the	reference	e system: t	2fafd63-a	4e4-4ac2	-adbb-1fi	338a2b6399 c	werburden	s (un
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Figure 4.5. Validation log: choose semicolon delimiter

In the next step, the user must select a data format for each column, which is 'General' by default (Figure 4.11). Then the user can select the 'Finish' button.

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Figure 4. 11. Validation log: finish the wizard

Now there is an extra column for each part of the log message. In order to have each column as wide as its contents, the user must select all cells and then choose 'AutoFit selection' from the 'Format'/'Column' menu, as shown in Figure 4.12.

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Figure 4.6 Validation log: auto-fit the columns

If there are any log messages of the type 'Reference flows' and the user wants to further separate the wrong flow of UUIDs and names in separate columns, then the following steps have to be followed.

First, the entire F column should be selected before the user chooses 'Text to columns' again, as shown in Figures 4.13 and 4.14.

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Figure 4.7. Validation log: select column F (flow UUIDs and names)

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Figure 4.8. Validation log: choose 'Text to columns'

In the following wizard, the options 'Fixed width' and 'Next' have to be selected, as shown in Figure 4.15.

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Electricity Mix	Preview of selected data:	not part of the reference system: 20/04/2017/98b-4776-973e-ed/4e/3815a6 medium and low radioactive waster				
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Figure 4.9. Validation log: select 'Fixed width'

In the next step of the wizard, the user has to create two vertical break lines that separate the text blocks by clicking on the respective positions and removing all other possibly existing break lines by double-clicking on them, as shown in Figure 4.16.

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Figure 4.10. Validation log: set the break line to finish the wizard

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Electricity Mix	1222-1224-1223-1243-1243-1243-1243-1243-			not part of the reference system: 465e8306-30d		
Electricity Mix	This screen lets you select each column	and set the Data Forma	t.	not part of the reference system: 26/d4ed1-a97f		
Electricity Mix				tot part of the reference system: a60b91d7-798		
Electricity Mix	Column data format			not part of the reference system: 62fafd63-a4e4		
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ectricity Mix				tot part of the reference system: 465e8306-30d		
electricity Mix	Preview of selected data:			not part of the reference system: 26/d4ed1-a971		
Electricity Mix				not part of the reference system: a60b91d7-798		
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Electricity Mix	referenced flow is not part of the reference syste referenced flow is not part of the reference syste	nie ddfc151d-e8f7-4b1e-9ed1-febd nie 465e8306-30d7-4ff1-9ad5-6e86	sb99d8c6e csicium fluori CE/010784 desclition wat	tot part of the reference system: 59df304b-46ad		ial product
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ectricity Mix	co	Contraction of the state state - state	raceous instal (misherra	not part of the reference system: 9e86849b-f5fc		ve waste
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Sheet1	+					
teady	STATE OF STATE				Count 66 III III	+ 100

Figure 4.11. Validation log: finish the wizard

The result will be a spreadsheet table where every part of the validation message (dataset name, UUID, error message, etc.) will be in an extra column, as shown in Figure 4.18.

•	●● 🖺 🖯 🖬 🗠 • ଓ ⊽		Workbook1	Q= Search Sheet
н	ome Insert Page Layout Form	ulas Data Review View		0 -
	om From From New Database Refresh	Connections Connections Properties	Receir Advanced Text to Remove Data Consolidate What-if	Group Ungroup Subtotal Hide Detail
M	faker HTML Text Query All	jo Edit Unks	Columns Duplicates Validation Analysis	
4	‡ × √ f _x 465e8306-30d7-	4ff1-9ad5-6e866f91878d		
	с	D	E F	G H
ŧ	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: 8d/3d2a/-d7a	ac-4365-9b4a-17e28b9ca482 radioactive tailings
1	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: 3c4b0e5d-65	300-4ada-9a2c-58e43ac96500 slag (unspecified)
ł	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: be6e0598-a5	9e9-4366-b341-631cbc7b2e70 slag (uranium conversion)
ł	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: falldDee9-d6	
	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: Se86849b-I5	
ł	Electricity Mix	001b3cb7-b868-4061-8a91-3e6d7bcc90c6	process data set referenced flow is not part of the reference system: a70cd68f-7ci	d3-4156-ab1e-a8702ecf28d9 uranium depleted
1	Waste incineration of municipal solid waste (MSW)	4f035020-4599-424d-8f48-627b35dd1a7f	process data set referenced flow is not part of the reference system: ddfc151d-e0	7-4b1e-9ed3-febab09d0c6e calcium fluoride
ì	Waste incineration of municipal solid waste (MSW)	4/035020-4599-424d-8/48-627b35dd1a7/	process data set referenced flow is not part of the reference system: 465e8306-30	0d7-4ff1-9ad5-6e866f91878d demolition waste (unspecified)
1	Waste incineration of municipal solid waste (MSW)	4f035020-4599-424d-8f48-627b35dd1a7f	process data set referenced flow is not part of the reference system: 26/d/ied1-a9	7f-dbe3-a9ea-ca9273b68101 highly radioactive waste
ï	Waste incineration of municipal solid waste (MSW)	4f035020-4599-424d-8f48-627b35dd1a7f	process data set referenced flow is not part of the reference system: a60b91d7-75	985-4f76-973e-edc4ec8815a6 medium and low radioactive wastes
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: e3e55f5f-a45	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: 62fafd63-a4e	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: 59df304b-46	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: 8df3d2af-d7a	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: 3c4b0e5d-65	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: be6e0598-a5	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: fa1d0ee9-d5	
	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: \$474163c.05	
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	Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: a70cd68f-7cs	
	Waste incineration of municipal solid waste (MSW) Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: #700068-70 process data set referenced flow is not part of the reference system: e96/2d0c-de	
	Waste incineration of municipal solid waste (MSW) Waste incineration of municipal solid waste (MSW)		process data set referenced flow is not part of the reference system: esot2auc-oe process data set referenced flow is not part of the reference system: c5a6072c-83	
	Waste incineration of municipal solid waste (MSW) Landfill of glass/inert waste	44035020-4599-424d-8448-827635dd1acm 64197304-3307-11dd-bd11-0800200c9a66	process data set referenced flow is not part of the reference system: c3ab072c-83 process data set referenced flow is not part of the reference system: ddfc151d+e0	
	Landfill of glass/inert waste	64197304-3307-11dd-bd11-0800200c9a66	process data set referenced flow is not part of the reference system: 465e8306-30	
	Landfill of glass/inert waste	64197304-3307-11dd-bd11-0800200c9u66	process data set referenced flow is not part of the reference system: 26/d4ed1-a9	
	Landfill of glass/inert waste	64197304-3307-11dd-bd11-0800200c9a66	process data set referenced flow is not part of the reference system: a60b91d7-75	
	Landfill of glass/inert waste	64197304-3307-11dd-bd11-0800200c9u66	process data set referenced flow is not part of the reference system: e3e55f5f-a40	
	Landfill of glass/inert waste		process data set referenced flow is not part of the reference system: 62fald63-a4e	
	Landfill of glass/inert waste		process data set referenced flow is not part of the reference system: \$9d1304b-46	
	Landfill of glass/inert waste		process data set referenced flow is not part of the reference system: 8d/3d2af-d7a	
ļ	Landfill of glass/inert waste	64197304-3307-11dd-bd11-0800200c9a66	process data set referenced flow is not part of the reference system: 3c4b0e5d-65	500-4ada-9a2c-58e43ac96500 slag (unspecified)
	Sheet1 +			
а.	eady			III - + 100 t

Figure 4.12. Validation log: ready to process in Microsoft Excel

4.5. Correcting errors

The following examples demonstrate how to fix issues in datasets detected during validation.

4.5.1.Syntax

Example validation message:

e5255c06-4b2b-451e-a14f-bc64d99c57cf - source data set - 15,93 cvc-attribute. 3: The valu.....

This means that there is an illegal character in the URI of an external file that is referenced from the source dataset (e.g. the % sign). This can be fixed with the following steps:

- 1. go back to your modelling tool and identify the source dataset with the UUID that is displayed by the validation tool;
- 2. rename the file, e.g. 'Metal_production_32 %.JPG' to 'Metal_production_32_percent.JPG', removing the illegal character;
- 3. correct the reference from the source dataset to the JPG file so that the 'external file' property of the source dataset points to the renamed file;
- 4. re-export the datasets from the modelling tool.

4.5.2. Nomenclature (ref. elementary flows)

Example validation message:

0cbf76cc-0192-4617-acd3-0fdb3cecf6c7 - process data set - referenced flow with UUIDddfc

This means that one of the elementary flows in your model does not comply with the ILCD reference system. This can be fixed with the following steps:

- 1. go back to your model and identify the input or output flow with the UUID that is not part of the reference system;
- 2. substitute the flow with one that is listed in the list of ILCD reference flows.

4.6. Minimum requirements for LCDN acceptance

For datasets to be accepted in the LCDN, the following checks need to be passed without any errors: ILCD format syntax and advanced ILCD format syntax, categories and links.

5. Creating a new node

This section explains how to technically set up a new node within a self-managed IT infrastructure. The set-up process should be carried out by experienced IT personnel only. As an alternative to operating a node within a self-managed infrastructure, commercial turn-key hosting solutions are also available, where the set-up and operation services are provided for a fee. In the latter case, please skip Sections 5.1 to 5.3.

5.1. Node set-up

This section summarises how a new node is set up. A comprehensive installation quide can be found in the annexes of this document.

The software used to run LCDN nodes is called soda4LCA, which stands for 'Serviceoriented database application for LCA'. It is available free of charge under the open source GNU AGPL license. It is recommended to always use the latest available stable release.

5.1.1.System prerequisites

It is strongly recommended to run the node on a system with a GNU/Linux (1)- or *nix (12)-based operating system. The following components need to be installed on the target system:

- Java JDK3 (13) 1.7 or newer,
- J2EE servlet container (¹⁴) (recommended: Apache Tomcat 8.0 (¹⁵)),
- MySQL (¹⁶) 5.x database.

In general it is recommended to use the latest available releases.

5.1.2. Obtaining soda4LCA

The latest soda4LCA release can be downloaded at: https://bitbucket.org/okusche/soda4lca/downloads

The package has to be unzipped, and within the package there's a 'doc' folder which contains the documentation (which is also available online at https://bitbucket.org/okusche/soda4lca/).

5.1.3. Database and application set-up

The instructions for this step are contained in Chapter 4, 'Installing the application', of the installation guide in the 'doc' folder of the software package or online.

In principle, this would involve the following steps:

^{(&}lt;sup>11</sup>) http://www.linux.org/

^{(&}lt;sup>12</sup>) https://en.wikipedia.org/wiki/Unix-like

⁽¹³⁾ http://www.oracle.com/technetwork/java/javase/downloads/

https://en.wikipedia.org/wiki/Web_container
 https://tomcat.apache.org/

^{(&}lt;sup>16</sup>) http://dev.mysql.com/downloads/

- create a database schema;
- obtain and install the MySQL driver;
- add the database to the Tomcat configuration;
- create and adjust the soda4LCA configuration file;
- install the WAR file late.

5.2. Node set-up

Managing the soda4LCA.properties file described in the installation guide the options described in the following sections of the installation guide have to be customised:

- host name and port,
- node information,
- administrative contact,
- data and temporary directories.

5.3. Running the node

After installation and configuration is complete, the application server can be started (usually this will be Apache Tomcat) and checked.

<u>Important:</u> the default administrator password has to be changed immediately by logging onto the application as administrator, using the default credentials as described in the installation guide. A new password for the 'admin' account can be defined in the 'Change password' field at the bottom of the screen.

If necessary, additional settings for the appearance (logo, title, theme, etc.) can be selected as described in the installation guide.

For example, the title that will be displayed in the header section can be changed by setting the title property in the soda4LCA.properties file:

title = ACME Database

To change the theme of the integrated web user interface, any of the standard themes shown at http://jqueryui.com/themeroller/ in the gallery section can be specified, for example:

theme = Cupertino

To have, for example, the soda4LCA logo included in the header of the page, use the following line:

logo = templates/default/images/soda4LCA logo.png

As a path to the logo, you can also provide an absolute URL to an image (e.g. http://www.acme.org/files/logo.png)

5.4. Registering the node in the LCDN

After the node has been set up and is running, the node has to be registered with the network registry which is operated by the JRC in order to join the LCDN. The following instructions are also documented in the 'Registering with a registry' section of the soda4LCA administration guide (1^{7}) .

Before the registration process can start, the registry has to be added to the application's list of known registries. Only users with administrator privileges are allowed to perform this operation. In order to add a new registry, the user must follow these steps:

- 1. navigate to Network -> Registries;
- 2. press the 'Add registry' button;
- 3. the form as shown in Figure 5.1 will be displayed;
- 4. fill in all mandatory fields as follows and then press 'Save':
 - a) registry name: Life Cycle Data Network,
 - b) UUID: (to be added),
 - c) base URL: http://ilcd.jrc.ec.europa.eu/ILCDRegistry.

It is important to insert the exact values, especially the UUID and base URL. In case the network does not work as expected, the value of the UUID has to be re-checked. The procedure to send a registration request for the node to the LCDN registry is described in these steps, which the user must follow.

- 1. Navigate to Network -> Registries.
- 2. Select 'Registry' and click on 'Register' in the 'Action' column, when the registration page will appear.
- 3. Complete the 'Access account' and 'Access password' fields. NB: these fields are not the user's credentials for the node application, but will be used to authenticate the deregistration action, so the user must keep this information for later. Node ID and base URL are entered by default by the system, but it is possible to change the values. The user must be careful with the URL in case of an incorrect value, the registration will be not processed.
- 4. After successfully sending the node registration request, the status of this node on the registry is 'Pending registration'.
- 5. Send an email to eplca@jrc.ec.europa.eu asking to register the new node.
- 6. When the registry administrator approves your request, the status will be changed to 'Registered'. You will be also informed about the approval by email. NB: a node can be registered in multiple networks.

The node is now part of the LCDN. In case of problems, the JRC can be contacted via email at: eplca@jrc.ec.europa.eu.

^{(&}lt;sup>17</sup>) https://bitbucket.org/okusche/soda4lca/

Registry

Fields marked with (*) are mandatory

Registry details	
Registry name (*):	
UUID (*):	
Base URL (*):	
Description:	

Figure 5.1. Add registry

Save

5.5. Summary and procedure in case of node disconnection

The node should now be set up and registered with the LCDN. In case it gets disconnected from the network (e.g. due to maintenance of the central registry or changes in the remote node), the procedure described in Chapter 5.4 has to be repeated.

6. Managing and publishing data

The soda4LCA application merely stores datasets; it does not alter the data that is stored in any way.

6.1. Administration area

soda4LCA has a special administration area for data management, accessible by logging in with the 'admin' user account.

6.2. Uploading data

In order to import datasets into the node, the user must be logged in as administrator. Data can be imported using the 'Import datasets' button or the 'Import' menu entry into the administrator section (Figure 6.1).

NB: soda4LCA accepts datasets in ILCD format only. You may upload single datasets as extensible markup language files as well as one or more ZIP files containing multiple datasets.

soda4LCA Administration
Data Import/Export - Quality assurance - Sto
Import 👦
Export Database
Main administrative tasks:

Figure 6.1. Data import in soda4LCA

6.3. Organising data in the node

For organising data within the node, datasets can be grouped in so-called data stocks. There are two types of data stocks: so-called root data stocks and logical (non-root) data stocks. Both may contain an arbitrary number of datasets. During import, every dataset is assigned to one (and only one) root data stock. This assignment cannot be changed later and a dataset can only be part of one single root data stock. A logical data stock, however, is different in that a dataset can be assigned to an arbitrary number of logical data stocks. After installation, one single root data stock exists, which is the default one.

Advanced data management options such as organising data in data stocks and managing permissions are covered in the soda4LCA administration guide (¹⁸) in the chapters 'Managing access' and 'Managing datasets'.

The next section gives a brief example of how data can be organised, differentiating between publicly visible and private datasets.

6.3.1. Private and public data

By default, all data imported into the default root data stock is publicly visible. Different data stocks can be used in order to differentiate between private and public data. This could be desirable in a scenario where datasets are imported into the node but are still waiting for final approval to be published or if part of the data is provided for a fee or only for registered users via a user account with proper permissions to access the data.

The following example explains a configuration where single datasets from a private root data stock can be assigned to a public data stock in order to be publicly available. It assumes that the administrator has already imported some datasets into the default root data stock.

- Log into the administrative interface with the 'admin' account.
- In the administration area, select 'Manage (root) stocks'.
- Select 'New stock' to create a new logical, non-root data stock.
- Enter a name and title as shown in Figure 6.2.

In the administration area, the following steps have to be followed.

- Select 'Manage (root) stocks' -> 'New stock' to create a new logical, non-root data stock.
- Enter a name and title as shown in Figure 6.2.

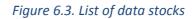
Туре	
Should b	e created as • Oroot stock
Name a	nd title
Name: *	PUBLIC (only letters, numbers and underscores are allowed)
Title:	public datasets
Organiza	ation information ation: * Default Organization
-	ation: Default Organization
Organiza	ation: Default Organization

Figure 6.2. Create new data stock

⁽¹⁸⁾ https://bitbucket.org/okusche/soda4lca/

• Select 'Save and close' — the new data stock will appear in the list of data stocks as shown in Figure 6.3.

Туре	Name	Title	Organization	User access rights	Group access rights	Assigned data sets	
root stock	default (Entry not deletable)	Default root data stock	Default Organization	٩	9	9	• Export
non-root stock	PUBLIC	public datasets	Default Organization	9	9	9	► Export



• Select the button in the column 'User access rights' of the default data stock and remove the read permissions for anonymous users by unchecking the check boxes, as shown in Figure 6.4. Confirm with 'Save and close'.

lain information	User acce	ss rights	Group access right	s Assigned	data sets				
Remove assig	ined entries								Assign
User name	READ	WRITE	IMPORT	EXPORT	CHECKIN	CHECKOUT	RELEASE	CREATE	DELETE
Anonymous									

Figure 6.4. Remove anonymous permissions for default root data stock

• Edit the permissions for the 'Public' data stock, granting READ and EXPORT to anonymous users (see Figure 6.5). Select 'Save'.

The READ permission controls whether a dataset is visible to a certain user or not. Without the EXPORT permission in addition, only the (process) dataset's metadata will be visible. Adding the EXPORT permission means that also the input/output section of a process dataset will be visible.

lain informatio	n User acce	ss rights G	roup access righ	ts Assigned	l data sets				
Remove assi	gned entries								Assign
User name	READ	WRITE	IMPORT	EXPORT	CHECKIN	CHECKOUT	RELEASE	CREATE	DELETE
Anonymous									

Figure 6.5. Grant anonymous read permissions for public data stock

- Still in the edit view for the 'Public' data stock, navigate to the tab 'Assigned datasets' and select 'Assign' as shown in Figure 6.6.
- A dialog box listing all available datasets appears. Data can be filtered by their root data stock using the drop-down box in the upper right-hand corner.
- Select some datasets for publication by checking the check box in the first column for every dataset before selecting 'Assign selected entries' (Figure 6.7).
- The newly assigned datasets are now listed in the edit stock view for the 'Public' data stock (Figure 6.8).

Processes	LCIA Methods Elem	entary Flows Product Fl	ows Flow Properties	Unit Groups So	ources Contacts	
	ab	ow only most recent versions				
Remove	selected entries	ow only most recent versions				Assign
		(1 of 1) 🛛 🗔 🔫	▶ ► 15	entries per page (0 tot	al)	u
	Name 🗘	Classification Classification	ocation 0	Root DS 0		
			Version	• •	contained in	Import timestamp 🗘

Figure 6.6. No datasets assigned yet to public data stock

gning Process	data sets						
Assign selecte	d entries show onl	y most recent versions				Selected data s	tock: default
		(1 of 5)	12345	►> ►I 15 \$	entries per page (65 to	tal)	
	Name ≎	Classification \$	Location \$	Version 0	Root DS \$	contained in	Import timestamp ♀
	Continuous filament glass fibre (wet chopped strands): at plant UUID: d176c895-2f1a- 4596-804a- 0db4d36378ab	Materials production / Glass and ceramics	RER	03.00.000	default		10.12.2015 10:53
	Electricity from wind power: AC; production mix, at power plant; < 1kV UUID: fe1a303-072b- 4da7-8fff-3505f9b01efc	Energy carriers and technologies / Electricity	RER	03.00.000	default		10.12.2015 10:53
	Electricity Mix; AC; consumption mix, at consumer: 115-220V UUID: f0a6c237-873e- 474e-a9cb-bcf8a6b3fe2	Energy carriers and technologies / Electricity	ES	03.00.000	default		10.12.2015 10:53
	Electricity Mix: AC:	Energy carriers and	NO	03.00.000	default		10 12 2015 10:53

Figure 6.7. Assign datasets

	ries per page (2 total Root DS \$ default		Assign Import timestamp ≎
Version ≎	Root DS 🗢	contained in	Import timestamp ≎
Version ≎	Root DS 🗢	contained in	
03.00.000	default	DUDUC	
		FUBLIC	10.12.2015 10:53
03.00.000	default	PUBLIC	10.12.2015 10:53
	03.00.000	03.00.000 default	03.00.000 default PUBLIC

Figure 6.8. Datasets assigned to public data stock

• After logging out of the admin account, only the datasets assigned to the 'Public' data stock are publicly visible (see Figure 6.9).

NB: this assignment procedure has to be done separately for all dataset types (process, flow, etc.) and for every dataset that needs to be publicly visible.

sod stock: public datasets	a4LCA			
Home Browse Data Sets Processes	Process data sets			→ Filter results
LCIA Methods	(1 of 1) 📧 < 🚺 🔛 ы	10 💠 entries per page	(2 total)	
Elementary Flows	Name 🗢	Type 🗘	Location	Classification \$
Product Flows Flow Properties	Electricity from wind power; AC; production mix, at power plant; < 1kV	LCI result	RER	Energy carriers and technologies / Electricity
Unit Groups	Electricity Mix: AC; consumption mix, at consumer; 115-220V	LCI result	ES	Energy carriers and technologies / Electricity
Sources	(1 of 1) 🔢 🔜 🚺 🔛 📦	10 💠 entries per page	(2 total)	
Contacts Search Data Sets Search Processes				
Login				soda4LCA 3.0.0_RC3

Figure 6.9. Publicly visible datasets

6.4. Publishing and restoring data in the LCDN

The dataset that has to be published (or restored, in case of problems within the server) on the LCDN needs to be accessible from the local soda4LCA node. Every dataset needs to be registered with the registry and approved by the registry administrator.

In order to register a dataset, the detailed procedure is described in the 'Node user guide' available in the soda4LCA zip package (19).

Once your datasets have been individually registered and subsequently approved by the network administrator at the JRC, they are publicly visible and available on the LCDN.

Here is a summary of the steps to be followed for the publication:

- Go to 'Manage datasets' and select 'Manage processes' (Figure 6.10)
- Select datasets you want to register and click on the 'Register selected' button.
- The registration datasets page appears. The user should select the network (Registry) where they want to send the registration request (the registry list contains only registries in which nodes are registered) and then click on the 'Register' button a datasets registration summary appears (Figure 6.11).
- In the datasets registration summary you can consult the number of datasets that have been approved and rejected (because of validation rules) by registry (Figure 6.12).

In case of rejection, datasets for each rejection reason is depicted. Possible reasons are that:

- compliance systems are not valid;
- the sent dataset is already registered on a selected registry (exactly the same dataset all data has to match).

^{(&}lt;sup>19</sup>) https://bitbucket.org/okusche/soda4lca/

Data Import/Export 💌	Manage Data Sets 💌	Use	r 🔻	Network -
	Manage Processes			
Welcome	Manage LCIA Method	s		
Please choose an action.	Manage Flows			
	Manage Flow Properties			
	Manage Unit Groups			
	Manage Sources			
	Manage Contacts			

Figure 6.10. Select 'Manage processes' from the drop-down menu

Register data sets

Fields marked with (*) are mandatory

	(1 of 1) 🗔 🤜 🚺		15 💌 entries p	per page			
UUID	Name	Version	Туре	Classification	Location	Reference year	Valid until
fd6e82e6-1aa5-4c0a-86d3- 4ca0b0ddb974							
	(1 of 1) 📧 🤜 🚺		15 💌 entries p	oer page			
Registry							
Register in (*): Registry test 1							

Register

Figure 6.11. Selection of the registry (e.g. LCDN)

Registry:		Registry test 1		
Approved:		1		
Rejected:		0		
Rejected datase	ets			
	(0 of 0)		▶ ► 15 ► entri	es per page
Name	(0 of 0) Version	Type	Classification	es per page Rejection reason
Name No entries found	Version			1



Annex I — How to document data quality, method and review aspects in different LCA software

This annex is providing some examples, taking into account some of the most commonly used and widespread LCA software in Europe. This does <u>not</u> imply any recommendation or endorsement from the JRC or the European Commission.

Moreover, the examples are based on the most updated versions of the software, when this report was edited (September 2016). Future changes in software user interface and functionalities can lead to differences in the approaches described below.

This annex does <u>not</u> represent an exhaustive guidance, considering all the variables and specific cases. It takes just an exemplary case study into account, proposing an overview of how to address some ILCD-EL-related issues in different software.

An exemplary dataset is used to provide an overview and understanding of how to provide ILCD-EL compliant datasets using some of the common LCA software tools used in Europe:

- GaBi
- OpenLCA
- SimaPro.

In the following, a brief description of the dataset, used to showcase the creation of an ILCD-EL compliant dataset, is provided. Some general guiding principles that apply for all of the quality aspects are summarised, along with a short review of discrepancies found when exporting the dataset in ILCD format using the individual LCA tools. The guide provides guidance on where the information should be entered in GaBi, OpenLCA and SimaPro.

SimaPro poses a somewhat special case, as the software does not provide any specific field where information on the individual compliance elements can be entered; consequently, this information cannot be displayed in the ILCD format correctly. Therefore, a different approach is used for SimaPro, where all the relevant information to reach ILCD-EL compliance is simply written into the general text box. In order to prevent repetitive information, ILCD-EL compliance documentation suggestions for LCA datasets created in SimaPro are provided separately.

For quick and easy reference, we employ the following color codes.

GaBi

OpenLCA

SimaPro

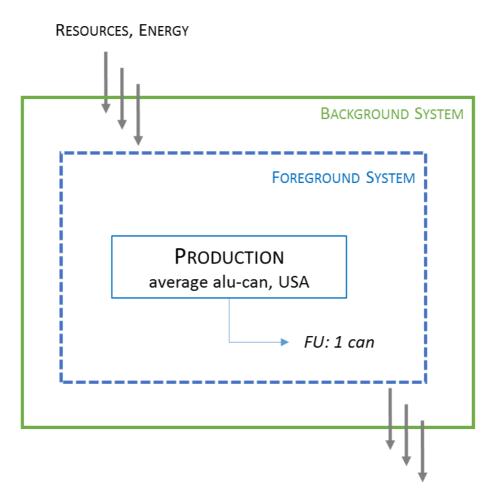
Dataset description

The dataset is taken from the OpenLCA case study `Beer containers: aluminium can vs PET bottle' (20). Figure 0.1 illustrates the model and system boundaries of the dataset.

Please note that the provided dataset and its related information are created for instructional purposes of how to create ILCD-EL compliant datasets. Thus, the provided detailed information on the ILCD-EL elements does not necessarily provide accurate information on aluminium can production, as it is meant for instructional purposes only.

System boundary

The system boundaries of the production of an average aluminium can in the United States are described in Figure 0.1. The guide will use the unit process of aluminium can production as an example to illustrate how to provide an ILCD-EL compliant dataset.



WASTE, EMISSIONS

Figure 0.1. Model and system boundaries for the 'aluminium can' case study dataset

^{(&}lt;sup>20</sup>) openLCA nexus. openLCA case study of a beer bottle: aluminium can vs PET bottle, 2013, Version 1.1.

General guiding principles

This example largely draws upon information provided in the ILCD handbook (21), DIN EN ISO 14040/14044 (22) (23) and other guidelines found in the handbook (24) (25). For more detailed information on ILCD-EL requirements the reader is thus directed to these sources; more up-to-date information can be found on the webpage http://eplca.jrc.ec.europa.eu/?page_id=134 or through the LCDN page at http://eplca.jrc.ec.europa.eu/LCDN/howto.xhtml.

In the following paragraphs, some general guidelines and additional information regarding ILCD-EL compliant dataset generation in the individual software evaluated will be provided.

General notation suggestion

Some information and handling thereof is of repetitive nature and will be provided within this section to avoid repetition.

As the different LCA software provides different documentation possibilities, notation suggestions for information provision on the dataset in general terms are provided in blue boxes. Information that may be selected from specific drop-down lists or within specified text boxes in the individual software should be entered in the adequate fields. Further information that cannot be entered into specified fields should be added into description boxes or comment fields.

Compatibility of required information in evaluated software and structure of documentation in ILCD format

GaBi and OpenLCA both provide specific entry fields to provide the required information for achievement of the ILCD-EL compliance level. However, one should note that some discrepancies are introduced when the datasets are loaded into the LCDN in the ILCD data format, as outlined in the following. No discrepancies were found in datasets exported from GaBi.

^{(&}lt;sup>21</sup>) European Commission, Joint Research Centre and Institute for Environment and Sustainability, *ILCD* handbook — Framework and requirements for life cycle impact assessment models and indicators, Publications Office of the European Union, Luxembourg, 2010.

^{(&}lt;sup>22</sup>) International Organisation for Standardisation, DIN EN ISO 14040, 2006.

^{(&}lt;sup>23</sup>) International Organisation for Standardisation, DIN EN ISO 14044, 2006.

^{(&}lt;sup>24</sup>) European Commission, Joint Research Centre and Institute for Environment and Sustainability, International Reference Life Cycle Data System (ILCD) Data Network — Compliance rules and entry-level requirements, Publications Office of the European Union, Luxembourg, 2012.

^{(&}lt;sup>25</sup>) European Commission, Joint Research Centre and Institute for Environment and Sustainability, International Reference Life Cycle Data System (ILCD) — Documentation of LCA datasets, Publications Office of the European Union, Luxembourg, 2011.

OpenLCA — **Documentation discrepancies**

OpenLCA provides an entry field for life cycle inventory (LCI) method, 'LCI method' (Figure 0.2), which should be used to fulfill the ILCD-EL requirement 'method'. However, in the ILCD format this information is not displayed in the field 'principal LCI method', but instead in the field 'deviation from principal LCI method' (Figure 0.3). Thus, there is no entry possibility for information provision of actual deviations from the principal LCI method employed in OpenLCA.

Further fields within the ILCD structure that are not addressed by entry possibilities in OpenLCA include 'completeness of the product system', 'deviation from data selection and combination principles' and 'data collection and interpretation principles'.

 Modeling and valid 	idation	
Process type	P Unit process	~
LCI method	attributional	^
Modeling constants	For all energy calculations the upper calorific value was used. Thus, for the calculation of energy consumption from methane the upper calorific value of 55.5 MJ/kg was used. The self-assessed quality level of [Cons] is considered (2) good.	~ ~
Data completeness	Mass based cut-off criteria were used, accounting for 98% mass. Emissions and infrastructure are not included. Electricity and transport are included. The self-assessed quality level of [Comp] is considered as poor (4).	< >
Data selection	The data was selected from the "openLCA case study" report and additional information from "Can Manufacturers Institute", as indicated in the sources.	^

Process information			
 Modelling and validation 			
LCI method and allocation			
Type of data set	Unit process, black box		
LCI Method Principle	Other		
Deviation from LCI method principle / explanations	attributional		
Modelling constants			ed. Thus, for the calculation of energy consumption sed. The self-assessed quality level of [Cons] is
Data sources, treatment and re	epresentativeness		
Data cut-off and completeness principles			mass. Emissions and infrastructure are not included. ality level of [Comp] is considered as poor (4).
Deviation from data cut-off and completeness principles / explanations	None.		
Data selection and combination principles		rom the "openLCA case study" rep as indicated in the sources.	ort and additional information from "Can
Deviation from data selection an combination principles / explanations	d None.		
Data source(s) used for this data set	o <u>openLCA case study</u> <u>Can Manufacturers In</u>	stitute	
Sampling procedure	Datasamples are taken f	from merely one source, due to the	educational character of the dataset.
Data collection period	The data was collected of	juring June-July 2016.	
Completeness			
Completeness of product model	No statement		
Validation			
Type of Scope / M review	ethod(s) of review	Data quality indicators	
Not reviewed			Dataset was not reviewed.
			Subsequent review comments
Reviewer name and instit	tution	Complete	review report
Administrative information	n		
Inputs and Outputs			

.

dataset was exported from OpenLCA in ILCD format

SimaPro — **Documentation discrepancies**

SimaPro offers information provision options for some of the ILCD-EL compliance elements, such as selecting a time period, geography and qualitative evaluation of other compliance elements.

As SimaPro does not provide specific entry fields for the individual compliance elements all necessary information is found in the general comment section within the European Reference Life Cycle Database data sheet, as depicted in Figure 0.5.

Furthermore, there seems to be a transmission error, as all input flows of the modeled process are with a specific United States or North American location and 'North America' was selected from the drop-down menu in geography (see Figure 0.4), the geographical representativeness as documented in the ILCD format is set to GLO (global).

Project	all one care shut		Category	Maturial
Created on	alu can - case study		Last update on	Material
Created on	13.07.2016		Last update on	13.07.2016
Process type	Unit process		Process identifier	Standard000033907900001
Name	alu can, production, at plant			
Status Image	Draft			
Time period	Unspecified			
Geography	North America			
Technology	Average technology			
Representativeness	Estimate			
Multiple output allocation	Not applicable	i		
Substitution allocation	Not applicable			
Cut-off rules	Less than 5% (physical criteria)			
System boundary	First order (only primary flows)			
Boundary with nature	Not applicable			
Infracts ich ine moncene	his			
Relaxing ele • × EL	e/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-490	erhebung × d7-823b-c243b!	Prozess-Datensatz × Pro 5d6 C Q elcd	EL elements in SimaPro zess-Datensatz × + - □ → ☆ 自 ↓ ☆ ❷ ♡ ◎ - ₽ 꽐 Badminton Courts ☆ Achim Achilles ♥ TruthTheory ऒ Jobs - T&E
Relaxing ele EL localhost:8080/Node istbesucht M G-Mail in Li rozess-Information	CD3.2 × Process data set: G × I I daten //datasetdetail/process.xhtml?uuid=607dcbc4-ac80-49@ nkedin III Upwork ∐ Green Jobs . Amazon ⊙ Stadtmobil	erhebung × d7-823b-c243b!	Prozess-Datensatz × Pro 5d6 C Q elcd	zess-Datensatz × + − □ → ☆ 自 ♣ 余 ⊕ ♡ @~ 📲 😫
Relaxing ele EL localhost:8080/Node istbesucht M G-Mail in Li rozess-Information	CD3.2 X Process data set: G X E data 2/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-490 nkedin 2 Upwork H Green Jobs A Amazon S Stadtmobi atzes	erhebung × d7-823b-c243b!	Prozess-Datensatz × Pro 5d6 C Q elcd	zess-Datensatz × + − ♂ → ☆ 自 ♣ 余 ❷ ♡ @~ 📲 🛎
Relaxing ele EL localhost:8080/Node istbesucht M G-Mail in Li rozess-Information	CD3.2 × Process data set: G × Eddata c/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-49k nkedin 🔛 Upwork 🗄 Green Jobs 3. Amazon 💽 Stadtmobil atzes GLO	erhebung × d7-823b-c243b!	Prozess-Datensatz × Pro 5d6 C Q elcd	zess-Datensatz × + − ♂ → ☆ 自 ♣ 余 ❷ ♡ @~ 📲 🛎
Relaxing ele	CD3.2 × Process data set: G × Me daten <pre>c/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-499 nkedin W Upwork II Green Jobs Amazon Stadtmobil atzes GLO alu can, production, at plant Klassenname : Hierarchieebene ILCDCategories: Materials production / Metals and semimetal</pre>	erhebung × d7-823b-c243b: I ĕ LEO № Rec Is	Prozess-Datensatz × Pro 5d6 C C C C C htschreibprüfung C VHS-Ka	zess-Datensatz × + - □ → ☆ 自 + ☆ ❷ ♥ ● ↓ Badminton Courts ≺ Achim Achilles ♥ TruthTheory ⊌ Jobs - T&E
Relaxing ele EL [localhost.8080/Node istbesucht M G-Mail in Li Prozess-Information Informationen des Datens	CD3.2 × Process data set: G × C data c/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-494 nkedn v Upwork d Green Jobs A Amazon Stadtmobil atzes GLO alu can, production, at plant Klassenname : Hierarchieebene ILCDCategories: Materials production / Metals and semimeta TRR- The dataset is valid within the time frame 2015-2020. Dat production does not undergo racical or frequent change, justi of the USA. 10 production sites across the USA were include good TeR. Process - the production process reflects the aver was cast to about 76cm thickness and then rolled into a thin 12-14% of the original sheet is wasted as offcut but is reused machine, where it is redrawn to a dameter of approx. 6 fccm. roming rings, which stretch and thin the cup valls. This entire this process the cup is 6 fccm in diameter and 13cm in height trimmed off the top of the can. Subsequently the can is clean given an out-ward flang at the very top edge, which will be for more magnesium and less manganese, resulting in a stronge rive. The public b. a separate piece of metal / is inserted under in 50 000 cans is usually found to be defective. After the nec- asias for the production process for the production process basis for the production process of the modeled aluminum. In the USS literature and calculated values. Data quality level of [FeR] is ru- used, accounting for 98% mass. Emissions and infrastructure	In the second se	Prozess-Datensatz × Pro 5d6 C Q Q elcd htschreibprofung VHS-Ka M for one year, i.e. based on annual ime valid time frame. Self-assess on, representing approx. 80% off aluminum cans in the USA durin is then cut into a circle (called b) the circular blank is cut, it is puller the height of the cup increases for g and ironing) is done in one con if orining process leaves the can a nted with its label. After the "docs id is added. As the lid needs to cut to a diameter of 5.3cm. the cut to a diameter of 5.3cm	reports. Although aluminum can is a short lived product the technology of ed [TR] quality level is (2) good. GR: The dataset refers to the geographic loca he US-production volume. Therefore, the self-assessed [CR] is considered (2) g the time frame 2015-2020. The process begins with an aluminum ingot which anily, forming the bottom and the sides of the can. Each blank is 14cm in diam initially 3.3cm to 5.7 cm The cup is then pushed against three rings called innous punch stroke, which takes less than a second to complete. At the end lightly ways the top, casting another material loss of about 0.5 cm which is ration" the can is squeezed in slightly at the top to make a neck, and the nec be stronger than the base and sides of the can. the aluminum is alloyed with eart of the light system that the top, casting another material loss of about 0.5 cm which is ration" the can is squeezed in slightly at the top to make a neck, and the nec be stronger than the base and sides of the can. the aluminum is alloyed with east emade properly, they are automatically checked for crack-sta of phinoles, supper flange formed when the can was given its neck is then bent around the base. 10 aluminum can production sites have been surveyed, forming the avers is the production of a 0.5.1 adminer. Discress and products are based by the produces. Data on the process and product are is manganese, 0.4% iron, 0.2% silicon and 0.15% cupper. The beverage can is an and are production sites have been surveyed, forming the avers is manganese. 0.4% iron, 0.2% silicon and 0.15% cupper. The beverage can is manganese. Data is the process and product are based being a relevant flow, is not included. Comp: Mass based cut-off criteria were uded. The self-assessed quality level of [Comp] is considered as a poor (4).
Relaxing ele (*) X EU (*) Iocalhost.8080/Node istbesucht M G-Mail (*) Li trozess-Information Informationen des Datens ifizierung neine Anmerkungen zum	CD3.2 × Process data set: G × C data c/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-494 nkedn v Upwork d Green Jobs A Amazon Stadtmobil atzes GLO alu can, production, at plant Klassenname : Hierarchieebene ILCDCategories: Materials production / Metals and semimeta TRR- The dataset is valid within the time frame 2015-2020. Dat production does not undergo racical or frequent change, justi of the USA. 10 production sites across the USA were include good TeR. Process - the production process reflects the aver was cast to about 76cm thickness and then rolled into a thin 12-14% of the original sheet is wasted as offcut but is reused machine, where it is redrawn to a dameter of approx. 6 fccm. roming rings, which stretch and thin the cup valls. This entire this process the cup is 6 fccm in diameter and 13cm in height trimmed off the top of the can. Subsequently the can is clean given an out-ward flang at the very top edge, which will be for more magnesium and less manganese, resulting in a stronge rive. The public b. a separate piece of metal / is inserted under in 50 000 cans is usually found to be defective. After the nec- asias for the production process for the production process basis for the production process of the modeled aluminum. In the USS literature and calculated values. Data quality level of [FeR] is ru- used, accounting for 98% mass. Emissions and infrastructure	In the second se	Prozess-Datensatz × Pro 5d6 C Q Q elcd htschreibprofung VHS-Ka M for one year, i.e. based on annual ime valid time frame. Self-assess on, representing approx. 80% off aluminum cans in the USA durin is then cut into a circle (called b) the circular blank is cut, it is puller the height of the cup increases for g and ironing) is done in one con if orining process leaves the can a nted with its label. After the "docs id is added. As the lid needs to cut to a diameter of 5.3cm. the cut to a diameter of 5.3cm	reports. Although aluminum can is a short lived product the technology of editional states of the second states of
Relaxing ele X EU Iccalhost.8080/Node istbesucht M G-Mail Icialhost.8080/Node istbesucht M G-Mail It istersucht M G-Mail ifizierung neine Anmerkungen zum satz	CD3.2 × Process data set: G × Education c/datasetdetail/process.xhtml?uuid=607dcbc4-ac80-49c nkedn W Upwork I Green Jobs A Amazon S Stadtmobil atzes GLO alu can, production , at plant Klassenname: Hierarchieebene ILCDCategories: Materials production / Metals and semimeta TR:- The dataset is valid within the time frame 2015-2020. Dat production does not undergo radical or frequent change, justif of the USA. 10 production sites across the USA were include good. TRe: Process - the production process reflects the aver was cast to about 76cm thickness and then rolled into a thin 12-14% of the original sheet is wasted as offcut but is reused machine, where it is redrawn to a diameter of approx. 6 fccm. ironing migs, which stretch and thin the cup walls. This entife this process the cup is 6 fccm in diameter and 13cm in height trimmed of the top of the can. Subsequently the can is clean given an out-ward flange at the very top edge, which will be foil more magnesism and less magnases, resulting in a stronge ins to 000 cans is usually found to be defective. After the neck and seamed shut. Background data for the production process basis for the production process of the modeled aluminum can cliadmeter. The aluminum base, for beverage cans consists mon industry is the primary user of recycled aluminum. In the USF literature and calculated values. Data quality level of [TR] is usued, accounting for 98% mass. Emissions and infrastructur For all energy calculations the upper calorific value was used quality level of [Cons] is considered (2) good.	In the second se	Prozess-Datensatz × Pro 5d6 C Q Q elcd htschreibprofung VHS-Ka M for one year, i.e. based on annual ime valid time frame. Self-assess on, representing approx. 80% off aluminum cans in the USA durin is then cut into a circle (called b) the circular blank is cut, it is puller the height of the cup increases for g and ironing) is done in one con if orining process leaves the can a nted with its label. After the "docs id is added. As the lid needs to cut to a diameter of 5.3cm. the cut to a diameter of 5.3cm	reports. Although aluminum can is a short lived product the technology of Badminton Courts Achim Achilles TruthTheory Jobs - T&E Badminton Courts Achim Achilles TruthTheory Jobs - T&E Badminton Courts Achim Achilles TruthTheory Jobs - T&E Badminton Courts Achim Achilles Achimed Product the technology of de [TR] quality level is (2) good GR. The dataset refers to the geographic local he US-production volume. Therefore, the self-assessed [GR] is considered (2) g the time frame 2015-2020. The process begins with an aluminum ingut which anil.) forming the bottom and the sides of the can. Each blank is 14cm in diam initially 3.3cm to 5.7 cm The cup is then pushed against three rings called inuous punch stroke, which takes less than a second to complete. At the end lightly way at the top, causing another material loss of about 0.5cm which is ration" the can is squeezed in slightly at the top to make a neck, and the neck be stronger than the base and sides of the can. the aluminum is alloyed with east of the lid is stretched upward slightly and drawn by a machine to form a sa are made properly, they are automatically checked for cracks and the neck base. To aluminum can production sites have been surveyed, forming the avera is the production of 0.5.1 aminto and the pace. Tabout and the avera is mangerse, 0.4% iron, 0.2% silicon and 0.15% cupper. The beverage can is nan process by the process. Data on the process and product are based.
Relaxing ele (*) × EL Calhost.8080/Nod stbesucht M G-Mail (*) L trozess-Information informationen des Datens ifzierung neine Anmerkungen zum satz	CD3.2 × Process data set: G × Education of the constraint of th	In the second se	Prozess-Datensatz × Pro 5d6 C Q Q elcd htschreibprofung VHS-Ka M for one year, i.e. based on annual ime valid time frame. Self-assess on, representing approx. 80% off aluminum cans in the USA durin is then cut into a circle (called b) the circular blank is cut, it is puller the height of the cup increases for g and ironing) is done in one con if orining process leaves the can a nted with its label. After the "docs id is added. As the lid needs to cut to a diameter of 5.3cm. the cut to a diameter of 5.3cm	reports. Although aluminum can is a short lived product the technology of edition of the strategy of the second se

Documentation of ILCD-EL requirements

The ILCD-EL compliance requirements are summarised in Table 0.1, where the items that can be validated automatically using a software tool (available at http://eplca.jrc.ec.europa.eu/?p=1406) are marked with **A** and items that need to be checked manually by the reviewer are marked with \mathbf{M} . As format and nomenclature are automatically checked by the ILCD validation tool (available at https://bitbucket.org/okusche/ilcdvalidationtool/downloads), the following section merely provides a detailed explanation of the points to be manually checked. Some screenshots for each reviewed software tool are given to indicate where the information should be provided within the dataset.

Table 0.1. Overview of ILCD-EL requirements. In the table A stands for automated validation using the ILCD validation tool, while M depicts requirements that need manual, i.e. user, validation

Compliance element	Check	ILCD-EL requirements
Format	Α	Use of ILCD format
Documentation	A M	 Minimum documentation extent specified Based on ISO quality criteria
Nomenclature	Α	 ILCD nomenclature compliant documents (e.g. use of ILCD reference elementary flows) Permission of certain aggregated elementary flows Terminology use not enforced
Data quality	Μ	 In general following ISO quality criteria No minimum data quality required BUT documentation of data necessary, using ISO quality criteria [TeR], [TiR], [GR] to be documented
Method	м	 ISO 14040 and 14044 compliant process-based LCA Methodological ILCD compliance not enforced Applied modelling frameworks and allocation/substitution approaches to be documented
Review	М	 Use of reviewers from registry not required 'Qualified reviewer' required (based on ISO 14025) Qualified independent external reviewer in line with ISO 14044 requirements BUT separate review report is NOT required OR Qualified independent internal reviewer in line with ISO 14044 requirements, BUT separate review report IS required (with the ILCD template/minimum review documentation scope in addition to review documentation provided within the dataset) Review on the unit process level may not be required, depending on data quality claims

[TiR] Time representativeness

GaBi

Documentation of the time representativeness can be found under 'process information', where the reference, i.e. starting year of the dataset and the number of years it is valid can be selected. Additionally, a field is provided where the quality of [TiR] can be described.

		/ Value Minim	m Maximur Standar Commer		
Parameter Formula averagecan		0,013	0 % Weight		
🖉 LCA 🐞 LCC: 0 E	UR 💁 LCWE 🗋 Documentation	1			
Collapse all	Expand all	Adopt info	Highlight EPD fields	Highlight ecoSPOLD fields	ă
Quantitative referen	e .			(*
Type of quantitative reference	Reference flow(s)	v].			
Reference flow(s)	output: alu can, production, at plan input: Aluminum, primary, ingot, at p input: Aluminum, secondary, rolled [input: Transport, combination truck,	plant [Product and Waste Fl Product and Waste Flows]	and a second		
Time representative	iess			(*
Reference year Time representativeness	2015 Data set valid until Data were collected for one year, i.e. b		though aluminum can is a sho¦t	lived product the technology	c
Geography				(*
Meridian	Latitude				
2 - C.S.S.	The dataset refers to the geographic k collection, representing approx. 80% of				1
Geographical representativeness	good.				
	good.				<
representativeness					* *
		aluminum ingot which was	cast to about 76cm thickness	uring the time frame	

	uction, at plant 🕴	
Process: alu	an, production, at plant	
▼ General in	ormation	
Name	alu can, production, at plant	
Description	Production of an aluminum beverage can. USA average production. Training purpose - not accurate assessment of actual alu beverage can production.	~
Category	001_alu-can, case study	
Version	00.00.007 🛞 🛞	
UUID	77a8dbeb-780e-40e9-bf30-39840b121a87	
Last change	2016-07-07T12:11:02+0200	
Infrastructur	process	
	📸 Create product system	
+ Quantitati	e reference	- 11
▼ Time		
Start date	01.01.2015	
End date	01.01.2020	
End date		
Description	Data were collected for one year, i.e. based on annual reports. Although aluminum can is a short lived product the technology of production does not undergo radical or frequent change, justifying the chosen time valid time frame.	
Description		
Description	Self-assessed [TiR] quality level is (2) good.	

[GR] Geographical representativeness

GaBi

Documentation of the geographical representativeness can be found under 'process information'. Specific fields are provided to stipulate geographic coordinates in meridian and latitude. Additionally, a field is provided where the quality and other information regarding [GR] can be stipulated. As one point's coordinates may not reflect the real geographical representativeness very well, we suggest including the applicable geographical location, region or political entity, the quality level of the [GR] and a short description, as stipulated in the notation suggestion box.

🚳 alu can, production, a	t plant <u-bb> [001_alu-can, case study] DB Process *</u-bb>	×
Object Edit View He	lp	
	3 = = = = @ Э ↔ ¾ ✓ ■ ?	
Name Nation V	alu can, production, at plant Source 🗸 u-bb - Unit process, black box	~
Parameter		[
Parameter Formula	/ Value Minimum Maximur Standar Commer	
averagecan	0,013 0 % Weight 0,7 0 %	
Period Constant Period		
Collapse al	Expand all Adopt info Highlight EPD fields Highlight ecoSPOLD fields	de .
Process information		\$ /
Key information		8
Quantitative reference		š
Time representativenes	8	š
Geography	-	(\$
	38 Latitude -77	_
L		_
	The dataset refers to the geographic location of the USA. 10 production sites across the USA were included for data collection, representing approx. 80% of the US-production volume. Therefore, the [GR] is considered good.]	î
l		×
Technological represent	ativeness	۲
Mathematical model		۲
Modelling and validat	ion	۲
LCI method and allocati	on	۲
Data sources and handl	ing	۲
Completeness		۲
Validation		۲
	۱	۲
Compliance declaration:	nation	۲
	nacion	-
Compliance declaration: Administrative inform Commissioner and goal	na (kon	8

Figure 0.8. Example of [GR] information provision in GaBi

OpenLCA

Select the correct country, region or political entity that the dataset reflects from the provided drop-down menu, as shown below. OpenLCA also provides a map, where locations can be additionally included as points or polygons. Furthermore, we suggest providing additional information in the description box.

General inform	ation
lame	alu can, production, at plant
Description	Production of an aluminum beverage can. USA average production. Training purpose - not accurate assessment of actual alu beverage can production.
Category	001_alu-can, case study
/ersion	00.02.001 💿 🛞
JUID	77a8dbeb-780e-40e9-bf30-39840b121a87
ast change	2016-07-15T10:27:13+0200
nfrastructure pro	icess 🗹
	🔹 Create product system
Quantitative re	ference
Time	
Geography	
ocation 🔍 l	Inited States Minor Outlying Islands
(ML non	0
	production sites across the USA were included for data collection, representing approx. 80% of the production volume. Therefore, the self-assessed [GR] is considered (2) good.
Technology	
	In puts/Outputs Administrative information Modeling and validation Parameters Allocation Social aspects

[TeR] Technological representativeness

GaBi

Documentation of the technological representativeness can be found under 'process information'. It provides the opportunity to describe the technology including its background system, to include related datasets and to state the technical purpose of the process or product. Thus, the suggested notation is divided among the available entry fields, as shown below.

	 alu can, production, at plant 			Source	v u-bi	- Unit process, black box 👘 🗸	
Parameter		1235270 MAS					
Parameter Formula			nur Maximur Standar Commer				
averagecan recruaterial		0,013	0 % Weight -				
	UR 🗞 LCWE 🗋 Documentation	957	0.46				ŕ
Colapse al	Expand al	-		Adopt info	Highlight EPD fields	Highlight ecoSPOLD fields	
Condyste an				Hangs and	right or one des	Thy by is to an out reads	
Geography						8	Ľ
Technological repres	entativeness						
	The cup is then transferred into another on The cup is then pushed against three purch stroke, which takes less than a see the can sightly wavy at the top, causing its label. After the "decoration" the can once the list added. As the list needs to stronger metal. The lid is cut to a diameter metal, is inserted under the rivet and ace usually found to be defective. After the and seamed shut. Background data for th forming the average basis for the product. Product - The product is an average a all	rings called ironing ring cond to complete. At the another material loss of isqueezed in slightly at be stronger than the b ir of 5.3cm, the center used by it. To ensure 5 seck is formed, the can be production process of the mo	s, which stretch and thin the or e end of this process the cup i if about 0.5cm which is trimmer the top to make a neck, and 1 ase and sides of the can, the i of the ki is stretched upward hat the cans are made proper is ready to be filed. Finally, th is taken from the US Life Cyc bled aluminum can.	up walls. This entire operation is 6.6cm in diameter and 13cm is off the top of the can. Subs the neck is given an out-ward slightly and drawn by a mach y, they are automatically the re upper flange formed when is inventory Database. 30 al	h (drawing and ironing) is in height. The drawing a equantly the can is clean flange at the very top ed magnesium and less man ne to formla rivet. The pu- ded for cracks and pinho the can was given its neo uminum can production sit	done in one continuous nd ironing process leaves di and then imprinted with gn, which will be folded over ganeter, resulting in a al tab, a separate piece of es. One in 50 000 cans is is then bent around the lid es have been surveyed,	
	d ^P RNA: Aluminum, primary, ingot, at pla d ^P RNA: Aluminum, secondary, rolled <i>cu</i> d ^P US: Transport, combination truck, des	bb> (Other Aluminum)	Rolling and Drawing)				
Included data sets	R, Add						

Figure 0.10. Example of [TeR] information provision in GaBi

 ★ Welcome P ALU can 0.5L - US ⊗ Process: ALU can 0.5L > General information > Quantitative reference > Time > Geography ▼ Technology Description Process - the production process reflects the average production of aluminum can the USA during the time frame 2015-2020. The process begins with an aluminum in 	
 General information Quantitative reference Time Geography Technology Description Process - the production process reflects the average production of aluminum can 	
 Quantitative reference Time Geography Technology Description Process – the production process reflects the average production of aluminum can 	
 Time Geography Technology Description Process – the production process reflects the average production of aluminum can 	
 Geography Technology Description Process – the production process reflects the average production of aluminum can 	
 Technology Description Process – the production process reflects the average production of aluminum can 	
Description Process – the production process reflects the average production of aluminum can	
which was cast to about 76cm thickness and then rolled into a thin sheet. The sheet then cut into a circle (called blank), forming the bottom and the sides of the can. E blank is 14cm in diameter. 12-14% of the original sheet is wasted as offcut but is re as scrap. After the circular blank is cut, it is pulled up to form a cup with 9cm in	ngot et is iach
	N
General information Inputs/Outputs Administrative in Modeling and vali Parameters Allocatio	n [»] 1

[Repre] Representativeness (overall)

Representativeness refers to a qualitative assessment of the degree to which the dataset reflects the true population of interest, i.e. geographical, time-related and technological representativeness. Thus, representativeness [Repre], as intended in ISO standards, is merely a qualitative description of the previously assessed [GR], [TiR] and [TeR] and how well these fit the studied system at hand and the goal and scope definition of the study. Thus, by providing the time-related, technological and geographical representatives ([GR], [TiR], [TeR]), the overall dataset representativeness is already covered.

[P] Precision and [U] Uncertainty

GaBi

The standard deviation can be provided for each individual flow within a modeled process, as depicted below.

			\$P 28	V I	= 4)	Icon			
lame	Nation v alu can, production, at plant				_	_	Source	~ u-66	- Unit process, black box	~
Parameter	Formula	1	Value	Minimum N	tavimus Cl	andar C	and a second			
averagecan	Politica		0,013		0		eight (
recmaterial			0,7		0					
🖗 LCA 🔣	LCC: 0 EUR 🌭 LCWE 🗋 Docum	entation								
ompleteness		/								
inputs										
Parameter F	Flow	Quantity	Amount	Factor	Unit	Track	Standard deviation	Origin	Comment	
		A	0.0000					-		
temp_olc	Aluminum, primary, ingot, at pla	a Plasse	0,0039	1	kg	х	5%	(No statement)	
	Aluminum, primary, ingot, at pla Aluminum, secondary, rolled [Pr		0,0039	1	kg	x x	5 % 6 %	(No statement (No statement		
temp_ok		A Masse	0,0091			x			5	
temp_ok	Aluminum, secondary, rolled [Pr Transport, combination truck, di	A Masse	0,0091	1	kg	x	6 %	No statement	5	
temp_ok	Aluminum, secondary, rolled [Pr Aluminum, combination truck, di Flow	A Masse	0,0091	1	kg t*km	X X	6 %	No statement	5	
temp_ok	Aluminum, secondary, rolled [Pr Aluminum, combination truck, di Flow	A Masse Goods transp Quantity	0,0091 0,013	1	kg t*km Unit	X X	6 % 3 %	(No statement (No statement		
temp_ok	Aluminum, secondary, rolled [Pr Transport, combination truck, di Now Flow	A Masse Goods transp Quantity	0,0091 e 0,013 Amount	1 1 Factor	kg t*km Unit	X X Tr <mark>x</mark> Sta	6 % 3 %	(No statement (No statement	Comment	

Figure 0.12. Example of [P] information provision in GaBi

OpenLCA

Data uncertainty can be provided for each input and output flow, as well as all parametres used (global, input and dependent parametres) in OpenLCA, as illustrated below.

									O X 1.23
Flow	Category	Amount	Unit	Cests	Uncertainty	Provider	Pedigree un	Desc	
F.e Transport, combination truck	Product and Waste Flo	1000*0.016	🚍 kg"km		none Edi	t			
Fe Aluminum, primary, ingot, at					none				
Re Aluminum, secondary, rolled	Product and Waste Flo	18*recycledalu	9		none	P Alumini			
Outputs	Category	Amount	Unit	Costs/Reve	Uncertainty	Aunidad per	Pedigree un	Derr	O X 123
Fa ALU can 0.5L	Case study - beer bottle	1.0	tem(s)	CANTO MENE	none	Another pro-	reagree on	0.696	
En ALU can - Reference flow	Case study - beer bottle	1.0	tem(s)		none				
Er Aluminium waste	Case study - beer bottl		g		none				

Figure 0.13. Example of [P] information provision in OpenLCA. Edit uncertainty for each of the input and output processes and parametres of the dataset

Inputs								0	× 1.23
Flow	Category	Amount	Unit	Costs	Uncertainty	Provider	Pedigree un	Desc	
F. Transport, combination truck,	Product and Waste Flo	1000*0.016	📟 kg*km		none Edit	t			
F. Aluminum, primary, ingot, at	Product and Waste Flo	18*(1-recycle	en g		none				
Fe Aluminum, secondary, rolled .	🕝 Uncertainty			×	none	P Alumini			
	Uncertainty distribution	Normal distrib	bution	~					
	Mean 1	0.000							
Outputs	Standard deviation 5	0						•	× 1.23
oupus								· · · ·	× 1.20
Flow				e	Uncertainty	Avoided pro	Pedigree un	Desc	
Fe ALU can 0.5L					none	Avoided pro	reargree and	Desem	
Fe ALU can - Reference flow					none				
Fr Aluminium waste	ОК	Те	st	ancel	none				

Figure 0.14. A pop-up window opens, where an uncertainty distribution may be chosen from the drop-down menu and according parametres may be chosen. Subsequently, a test can be run on the distribution

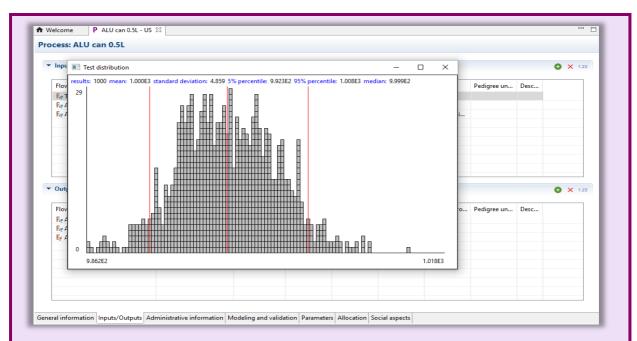


Figure 0.15. The test run of the distribution provides the above result

* Inputs										0 ×
Flow		Category	Amount	Unit	Costs	Uncertainty			ovider	Pedigree un
EgTra	nsport, combination truck	Product and Waste Flo	1000*0.016	🗂 kg'km		normal: mean	n=1.00E3 sigma=5	.00		
	minum, primary, ingot, at					none		1		
Fe Alu	minum, secondary, rolled	Product and Waste Flo	18*recycledalu	9		none		P	Alumini	
-										
-										
e										
 Outpu 	6									0 ×
Flow		Category	Amount	Unit	Costs/Reve-	Uncertainty	Avoided pro	Pedigree	e un Desc	ine .
	J can 0.5L	Case study - beer bottle	1.0	📼 ltem(s)		none				
	J can - Reference flow	Case study - beer bottle	1.0	item(s)		none	0			
Er Alu	minium waste	Case study - beer bottl	2.0	9		none				

Name	Value	Uncertainty	Description
averagecan	0.013	none	Weight of an average aluminum can in the USA.Unit [kg]
Input parame	ters		_
Name	Value	Uncertainty	Description
recycledalu	0.5	none	Part of aluminium needed for a can that comes from recycled alu
Dependent p	arameters		
Name	Formula	Value	Description
			ormation Modeling and validation Parameters Allocation Social aspects

[Compl] Completeness

GaBi

Information on completeness may be provided under the 'data sources and handling' tab in GaBi (not under 'completeness'). The tab provides a number of additional fields where data collection and handling may be further described in more detail.

Object Edit View H		e 🗂 🕁 👾		2				
	alu can, production, at plant		V	·		20102 V 1048	- Unit process, black box	
Parameter	and card in approach of brain					• • 0	· orac process, oldox box	1
Parameter Formula		/ Value	Minimum Maxim	ur Standard deviation	Commer			
averagecan		0,013		0 %	Weight			
recmaterial	_	0,7		0 %				~
🖉 LCA 🛼 LCC: O EUR	R 🥱 LCWL 🗋 Documentat	ion						
Collapse all	Expand all			[Adogt info	Highlight EPD fields	Highlight ecoSPOLD fields	
Technological represent	tativeness						8	^
Mathematical model							8	
Modelling and valida	tion						8	
LCI method and allocat	ion						(\$	
Data sources and hand	ling							
Data cut-off and completeness principles	Mass based cut-off criteria were u Emissions and infrastructure are no The quality level is considered as p	t included. Electricity an	mass. d transport are	included.			^	
							~	
Deviation from data cut- off and completeness principles / explanations	none						^	
							~	
Data selection and combination principles							^	
							~	
Deviation from data selection and combination							^	
principles / explanations								

Figure 0.18. Example of [Comp] provision in GaBi

OpenLCA

Information on the completeness level of a process dataset can be provided in the 'Modelling and validation' tab under the corresponding menu point, as depicted below.

Process: ALU car	1 0.5L		Î
 Modeling and value 	lidation		
Process type	P Unit process	~	
LCI method	attributional	^	
		~	
Modeling constant	ts For all energy calculations the upper calorific value was used. Thus, for the calculation of energy consumption from methane the upper calorific value of 55.5 MJ/kg was used.	^	
Data completenes:	Mass based cut-off criteria were used, accounting for 98% mass. Emissions and infrastructure are not included. Electricity and transport are included. The quality level is considered as poor (4).	~	
		×	
Data selection		^	
eneral information In	puts/Outputs Administrative information Modeling and validation Parameters Allocation Social asp		~
		_	_

[Cons] Consistency

GaBi

The entry provided here on modelling constants, as part of the ILCD-EL element [Cons], is purely for illustrative purposes and is not actually included in the provided dataset.

Name Nation	 alu can, produc 	the stalet		,		Source		u-bb - Unit process	black have	\sim
Parameter		winy as prairie				Surce	Ť	u-bo - unit process	, black box	× _
Parameter Formul	a	1	Value	Minimum Maxim	ur Standard deviation	Commer				
averagecan	-		0,013		0 %	Weight				
recmaterial			0,7		0 %					
🖉 LCA 👗 LCC: 01	EUR 🗞 LCWE	Documentation								
Collapse al	Expand all				Adopt info	High	light EPD fields	Highlight	ecoSPOLD field	ds
	1									VI.
										-
	n									^
election and combination										^
election and combination										^
election and combination										Ŷ
election and combinations incipies / explanations	For all energy of	calculations the upper calorific	value was u	used. Thus, for the	calculation of energy	consumption fi	rom methane th	e upper calorific val	ue of 55.5	~ ~
election and combinations incipies / explanations	For all energy of		value was u	used. Thus, for the	calculation of energy	consumption fi	ion methane th	e upper calorific val	ue of 55.5	~ ~ ~
election and combinations incipies / explanations	For all energy of		value was u	used. Thus, for the	calculation of energy	consumption fi	rom methane th	e upper calorific val	ue of 55.5	· · · · ·
election and combinations incipies / explanations	For all energy of		value was u	used. Thus, for the	calculation of energy	consumption fi	iom methane th	e upper calorific val	ue of 55.5	
velection and combinatio principles / explanations Data treatment and exitrapolations principles	For all energy of		value was u	used. Thus, for the	calculation of energy	consumption fi	iom methane th	e upper calorific val	ue of \$5.5	
Deviation from data selection and combinatio principles / explanations Data treatment and exitrapolations principles Deviation from data reatment and	For all energy of		value was u	used. Thus, for the	calculation of energy	consumption fi	iom methane th	e upper calorific val	ue of \$5.5	

Figure 0.20. Example of [Cons] provision in GaBi

OpenLCA

The entry provided here on modelling constants, as part of the ILCD-EL element [Cons], is purely for illustrative purposes and is not actually included in the provided dataset.

* Modeling and valid	lation		
Process type	P Unit process	~	
LCI method		~	
Modeling constants	For all energy calculations the upper calorific value was used. Thus, for the calculation of energy consumption from methane the upper calorific value of 55.5 MJ/kg was used. The self-assessed quality level of [Cons] is considered (2) good.	< c	Ĩ
Data completeness	Mass based cut-off criteria were used, accounting for 98% mass. Emissions and infrastructure are not included. Electricity and transport are included. The self-assessed quality level of [Comp] is considered as poor (4).	> <	
· aources		• •	7
	ts/Outputs Administrative information Modeling and validation Parameters Allocation Social aspects		_

[S] Source of data

GaBi

Data sources can be entered from a library. In order to include references that are not yet part of the provided library, new sources can be added, as illustrated below.

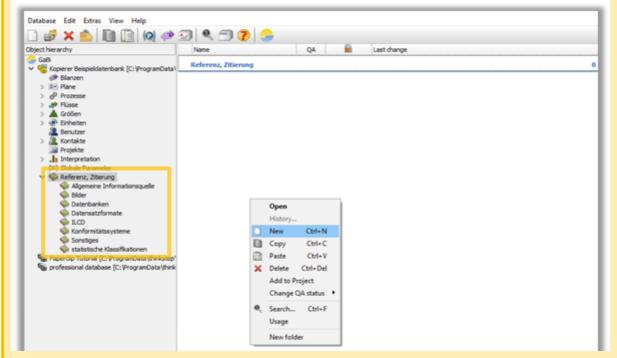


Figure 0.22. Example of [S] provision in GaBi

🗞 Aluminum: Tl	he Element of Sustainability [Referenz, Zitierung] DB Reference, Citati — 🛛 🗙
Object Edit Vi	ew Help
te	
Name	Aluminum: The Element of Sustainability
Source	ainability. A North American Aluminum Industry Sustainability Report. The Aluminum Association, Sept. 2011
Publication type	Other unpublished and grey literature \sim
Belongs to	۹ (۱)
General comment	^
	v
Fiaure 0.23, Cre	eation of a new data source library entry in GaBi

OpenLCA

Data sources can be entered from a library, which includes all known sources from the current database used. In order to include references that are not yet part of the provided sources database, new sources may be created, as illustrated below. Subsequently, the created sources can be selected to provide information on the data sources.

🗄 Navigation 🤝 😁 🗖	P ALU can 0.5L - US	S. Department of Energy, Energy Efficie 2004 22	10	
Database1 ^	Source: .S. Dep	partment of Energy, Energy Efficie 2004		
Product systems Impact assessment methods Global parameters	🖹 General infor	mation		
Processes	Name .	S. Department of Energy, Energy Efficie 2004		
Social indicators	Description		^	
Background data				
> Dunit groups				
V Sources			×.	
S. Department of Energy, Ene	Version 00	0.00.000 🕘 📧		
Andrew J. Baker 1983 Argonne National Laboratory	UUID	568ac4e1-d70f-3aa2-8807-aa44fa458ff7		
Ashland Composite Polymers Association of American Raile	Last change			
Association of Oil Pipelines 20 Aviation Industry Press 2004	➤ Additional infe	ormation		
BioBased Technologies 2009 Center for Transportation Rea:	Doi			
Center for Transportation Resi	Text reference	Aluminum Industry of the Future: Fiscal Year 2004 Annual Report		
Center for Transportation Resi Center for Transportation Resi	Year	2004	1	
Chris Goemans, Athena Institu	Eile	Browse		

Figure 0.24. Example of [S] provision in OpenLCA. Library of sources and creation of a new actor for source reference within the dataset

E Navigation	P *ALU can 0.5L - US □ .S. Department of Energy, Energy Ef ▼ Data source information	
Database1 ^	· Data source information	
Projects	Sampling procedure	
Product systems	Samping procedure	
Impact assessment methods		
Global parameters		
Processes		
Flows		~
Social indicators		1.01
Background data	Data collection period	^
> Flow properties		
> 🖿 Unit groups		
Currencies		
✓ ■ Sources		
S. Department of Energy, Ene		~
Andrew J. Baker 1983		
Argonne National Laboratory	 Process evaluation and validation 	
Ashland Composite Polymers		
Association of American Railn	Reviewer 🚨	~
Association of Oil Pipelines 20		
Aviation Industry Press 2004	Data set other evaluation	<u>^</u>
BioBased Technologies 2009		
Center for Transportation Rea:		
Center for Transportation Rest		
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Chris Goemans, Athena Institu		
Combustion Engineering Inc.		
Conservation Technology Infc	▼ Sources	O ×
CORRIM Reports on Enviornm		
D.A. Kirchgessner 2000	S. Department of Energy, Energy Efficie 2004	Create nev
DOE 2000		
DOE 2000		
>	General information Inputs/Outputs Administrative in Modelin	ng and vali Parameters "2

SimaPro

In SimaPro data sources are found under 'Literature references' on the left, as depicted below. With a right-hand click the user can create a new entry. The sources can then be directly added into the process description, as shown below.

Automation Boom manifestion				
<pre>Share is a start of the st</pre>		E: Literature references		
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Alter and a set of the set of	roduct Systems			-
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Journal: Wood and Science Wolking Not 0			Place of publication: Madison WE US	
			Issue No: TDA	

Figure 0.26. Creating new entries under 'Literature references' in SimaPro

Project.	USLCI	Category	Material	^
Created on	06.07.2016	Last update on	13.07.2016	
Process type	Unit process	Process identifier	Standard000010857000001	
Name	alu can, production, at plant			
Status	Draft			
Image				
Time period	2010 and after			
Geography	North America			
Technology	Average technology			
Representativeness	Estimate			
Multiple output allocation	Not applicable			
Substitution allocation	Not applicable			
Cut-off rules	Less than 5% (physical criteria)			
System boundary	First order (only primary flows)			
Boundary with nature	Not applicable			
Infrastructure process	No			
Date	06.07.2016			
Record				
Generator	Hanna Dura			
External documents URL		Comment		
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Can Manufacturers Institute				
	(Insert line here)			
General reference and sour	CPES .			
Literature reference		Comment		
Can Manufacturers Institute openLCA case study	e			
openLCA case study	(Insert line here)			
Collection method	The data was selected from the 'noedi CA case sh	du' securit and additional information from 'Ca	n Manufacturers Institute", as indicated in the sources.	_
Data treatment	not applicable			
Allocation rules	not applicable			_
Verification				
				_

Method

GaBi

Information on the general LCI method and allocation procedures and possible deviations may be provided in the 'Modelling and validation' tab within the documentation in GaBi, as shown below.

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Figure 0.28. Information provision on methodology, particularly principal LCI method chosen, and allocation procedures when dealing with multifunctionality in GaBi

OpenLCA

Information on the general LCI method employed can be provided within the 'Modelling and validation' tab in OpenLCA, as shown below. Information on allocation procedures are directly provided in the allocation tab in OpenLCA. The user may choose between all available allocation procedures and can provide the appropriate values, as shown below.

Modeling and valid	lation		
Process type	P Unit process	~	
LCI method	attributional	 	
Modeling constants	For all energy calculations the upper calorific value was used. Thus, for the calculation of energy consumption from methane the upper calorific value of 55.5 MJ/kg was used. The self-assessed quality level of [Cons] is considered (2) good.	~	
		\sim	
Data completeness	Mass based cut-off criteria were used, accounting for 98% mass. Emissions and infrastructure are not included. Electricity and transport are included. The self-assessed quality level of [Comp] is considered as poor (4).	^	
Data selection		^	
		\sim	
Data treatment		$\langle \rangle$	
Data source inform	hation		
Process evaluation	and validation		
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Figure 0.29. Example of information provision on methodological considerations, specifically the general LCI method

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Fe ALU can - Reference flow (1.0	e wenight	0.5			0.5	
Causal allocation	Direction	Category	Amount	ALU can	ALU can 0.5L	_
Fe Transport, combination tru			16.00000 kg*	0.5	0.5	
Er Aluminum, primary, ingot, Fr Aluminum, secondary, roll	Input	Product and Product and	9.00000 g 9.00000 g	0.5	0.5	
Er Aluminium waste	Output	Case study	2.00000 g	0.5	0.5	

Review

Modeling and validation		
Data source information		
Process evaluation and	validation	
Reviewer	Hanna Dura	×
Data set other evaluation	The dataset ware reviewed against ILCD EL compliance rules in an independent external review. The following quality criteria were met: [TiR] – good, [GR] – good, [TeR] – poor, [P] – fair, [Comp] – fair, [Repre] – poor, [Cons] – good, [Repro] – good, [S] – fair	< >
Sources		o×

GaBi

GaBi provides entry fields for the validation results of a review process. The type of review as well as scope may be selected from drop-down lists. So far no specific 'ILCD-EL compliance' review type is available. However, the reviewer may depict the quality level of the indicators that are also used for ILCD-EL compliance. Further details on the review as well as the reviewer's name may be provided. Additionally, a number of different reviews may be added.

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	Geographical representativeness	Good										
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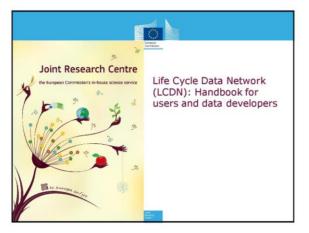
ILCD-EL compliant dataset in SimaPro

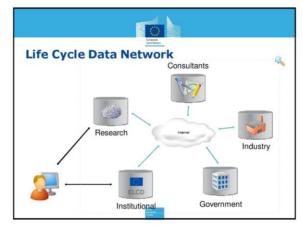
SimaPro does not currently provide individual entry fields for the provision of the ILCD-EL criteria. As detailed in this annex, the best option is to include all information as lined out in sections not covered by specific fields in SimaPro, in the general comment field, as described.

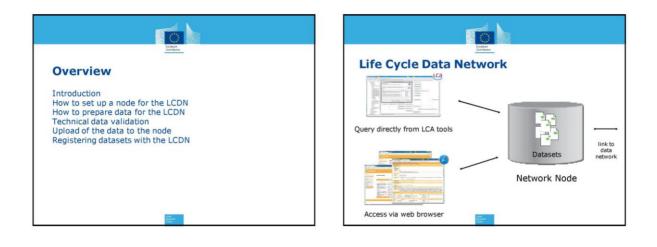
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Johnnent	the technology of production does not undergo rax (GR) The dataset refers to the geographic locator US-production volume. Therefore, the self-assess (TeR) Process - the production process reflects the ingot which was cast to about 7 Kem indicess and Each blank is 3 kem in dameter, 12-14% of the org dameter. The cup is then transferred into another 3.3om to 5.7 cm The cup is then transferred into another 3.3om to 5.7 cm The cup is then pushed against th continuous punch structure. After the "decoration which will be folded over once the list a doled. As then imprinted with its label. After the "decoration which will be folded over once the list a doled. As public is then bert round the lid and seared the transferred in 50 000 cans is usually found to be its neck is then bert round the lid and seared and production sites have been surveyed, forming the Product - The technical purpose of the dataset is 6 cars consists mostly of alumnum with hysically 1% of recycled alumnum. In the USA approx. 63% of Data on the process and product are based on lite Data quality invel of [TeR] is considered poor (4), 6	e average production of aluminum cans in the USA during the time frame 2015-2020. The process begins with an aluminum then rolled into a thin sheet. The sheet is then cut into a circle (called blank), forming the bottom and the sides of the can inal sheet is wasted as officit but is reused as scrap. After the circular blank is cut, is pulled up to form a cup with sion in machine, where it is redreven to a diameter of approx. 6. Son: Smithaneously the height of the cup increases from initially ree rings called ironing rings, which stretch and thin the cup wals. This entire operation (drawing and ironing) is done in one econd to complete. At the end of this process the cup is 6. Son in dameter and 13cm in height. The drawing and ironing using another material loss of about 0. Som which is timmed off the top of the can. Subsequently the cure is certain or the can is squeezed in slightly at the top to make a neck, and the neck is given an out-ward fange at the very top edge, the lot necks to be storninger than the base and sides of the can, the aluminum is alloyed with more magnesium and less is out to a diameter of 5.3cm, the center of the lid is stretched upward slightly and drawin by a machine to form a nivet. The effective. After the neck is formed, the can is ready to be filed. Finally, the upper flange formed when the can use signed average basis for the production process of the modeled aluminum can. he production of 0.5c, aluminum can, with agoros. Jibm height and 6.6 m dameter. The aluminum base, for beverage aluminum cans are rediamed and can be reused by the producters. aluminum cans are rediamed and can be reused by the producters. aluminum cans are rediamed and can be reused by the producters. aluminum cans are rediamed and can be reused by the producters. because energy consumption, being a relevant flow, is not included.				
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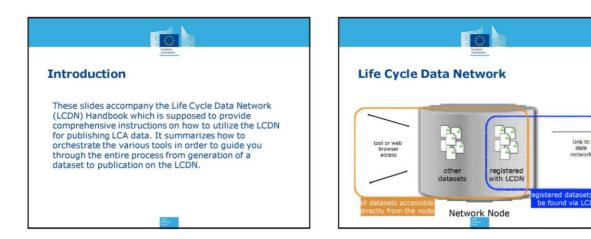
Annex II — LCDN handbook training slides

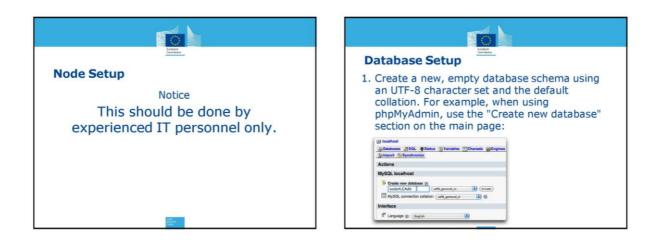
This section contains a set of slides used for training courses, related to the content of this report.

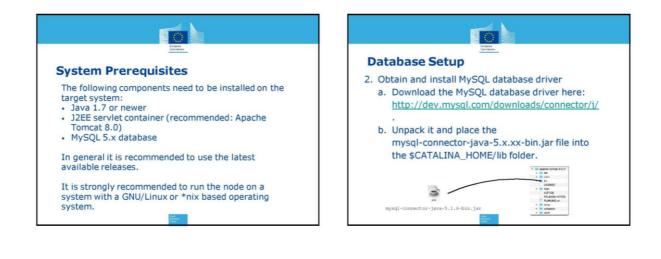






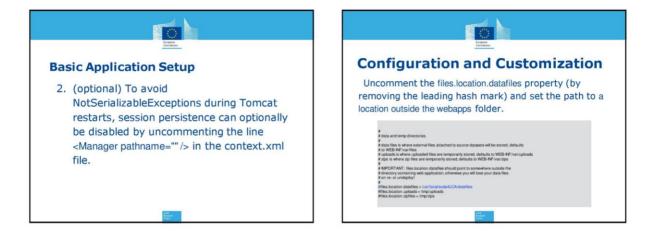




















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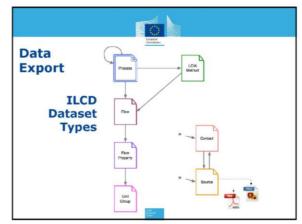
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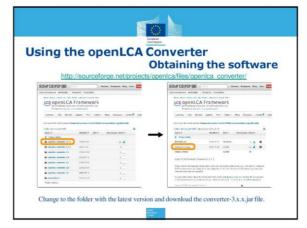


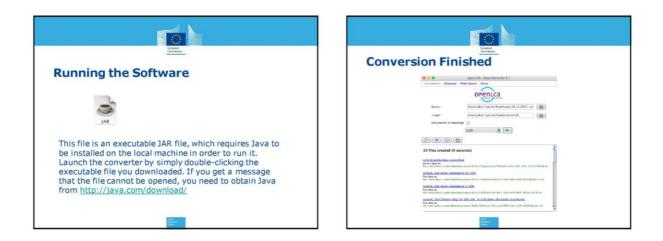




















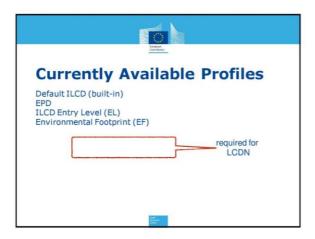
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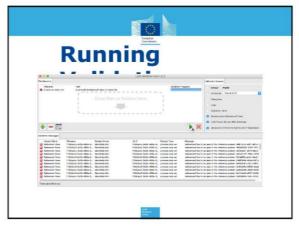


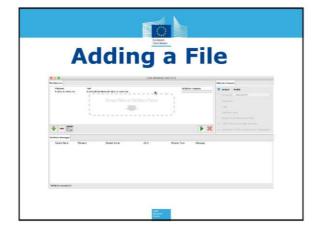




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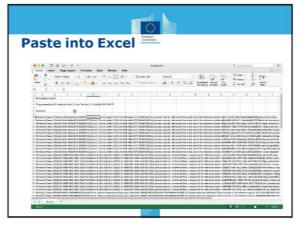


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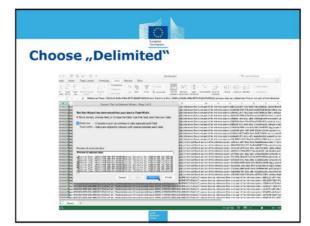


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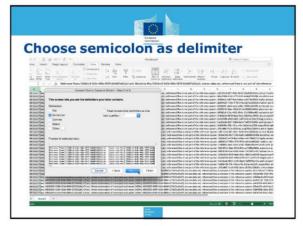


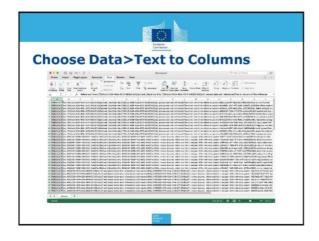


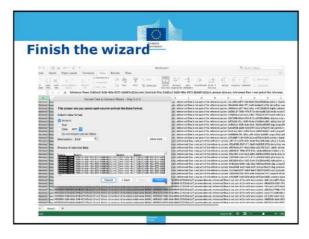


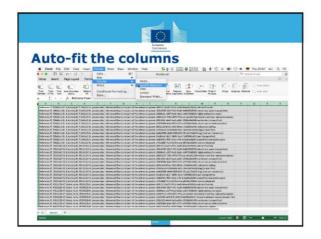


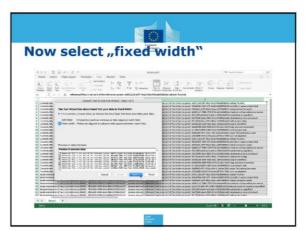


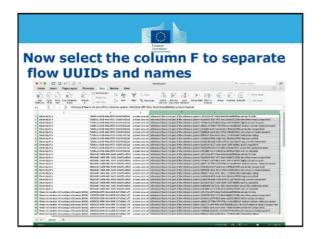


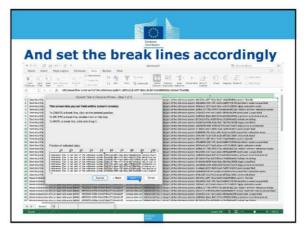




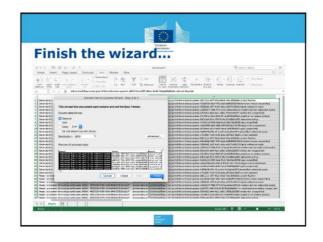








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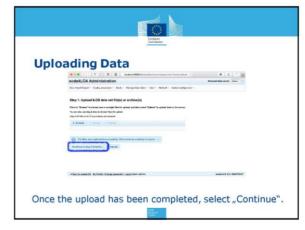
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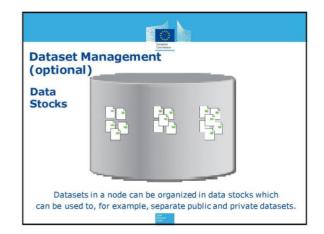




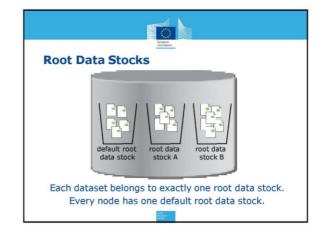
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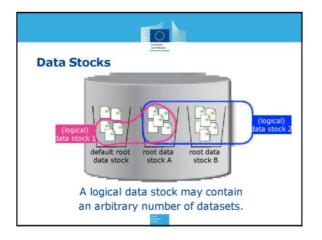


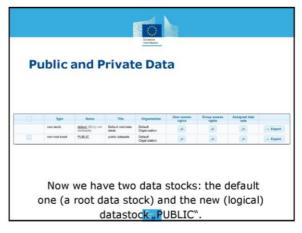
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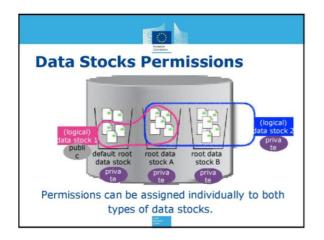


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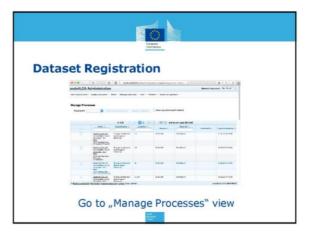




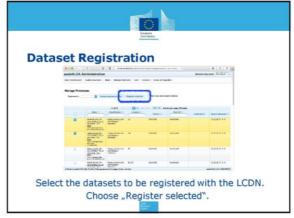


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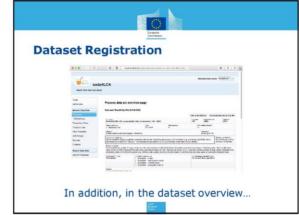






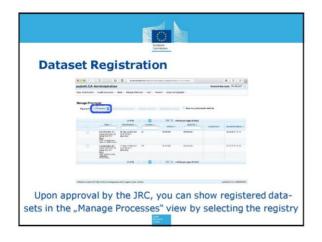














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List of abbreviations and definitions

- DG directorate-general
- EL entry level
- EPLCA European platform on life cycle assessment
- ILCD International Reference Life Cycle Data System
- JRC Joint Research Centre
- LCA life cycle assessment
- LCDN Life Cycle Data Network
- LCI life cycle inventory

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