openLCA 1.4 overview and first steps



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Changelog to version 1:

- option to use openLCA directly from zip files added (p. 17)

- typos corrected

- URL to migration plugin updated to newer version.

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1 Introduction

openLCA is the open source software for Life Cycle Assessment (LCA) and Sustainability Assessment, developed since 2007 by GreenDelta, <u>www.greendelta.com</u>. As open source software, it is freely available, e.g. from the project website, <u>www.openlca.org</u>, without license costs. Version 1.4 was released in June, 2014. This text focusses on this 1.4 version of openLCA, explains first steps in openLCA, including the installation, gives an overview of features, and shows how to migrate databases from the 1.3 version to the new version.

2 Installation

The installation of openLCA is slightly different for Window, Mac and Linux.

2.1 Installation, Windows

For windows, 64 bit and 32 bit versions are available; the following will focus on the 64 bit version. For the installation, you will need administrator rights. In a Windows environment, openLCA has the following hardware requirements:

- 4 GB RAM (32bit), 6 GB RAM (64 bit)
- 500 MB free hard disk space (depending on the databases that you want to use)

As usual in Windows installation, you can select whether openLCA should be used only by the user who installs (i.e. by you), or by anybody working on the computer.

🥴 openLCA Setup	
Choose Users Choose for which users you want to install openLCA.	LCa
Select whether you want to install openLCA for yourself only or for all users Click Next to continue.	of this computer.
Install for anyone using this computer	
 Current user (recommended) 	
↓	
Nullsoft Install System v2.46	Cancel

Figure 1: Setup screen

The following installation steps should be rather self-explanatory.



2.2 Installation, Mac

For Mac, a 64 bit version is available. In a Mac environment, openLCA has the following hardware requirements:

- 64 bit
- 500 MB free hard disk space (depending on the databases that you want to use)
- 6 GB RAM

The openLCA software requires Java in version 8; install Java before beginning with the openLCA installation (Java SE Development Kit for Mac OS available under

http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html).

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	openLCA Version 1.4 Windows 32 bit	Ð			openLCA Version 1.4 Linux 32 bit	Ð	

Figure 2: Installation file for Mac, downloaded from openLCA website

Download the installer file from openIca.org/downloads. Once the download is complete find the program in the "downloads" folder and transfer it into "applications". Double-click on the program to open it. A warning message will appear because the application was downloaded from the internet. Select "open". This message will only appear the first time you open the program.



2.3 First start

After the installation, you can start openLCA. Initially, openLCA does not contain any data, therefore the 'navigation' section on the left is empty.

Ca openLCA 1.4	
File Window Help	
In the second secon	📄 🔄 🌄 🗖 🗖 🟠 Welcome 🛛
R	oper
	High perform Available for Licensed un

Figure 3: Initially empty navigation area in openLCA

To change this, you can either:

- Create a new, empty database; or
- Import an existing database.

2.3.1 Creating a new, empty database

With a right-click in the navigation area, you can create a new database.

II II II III	C New database	
New database	Create a new database Database name FirstDatabase Database type Local Remote Database content Empty database Cunits and flow properties Complete reference data	
	Finish	Cancel

Figure 4: Database creation wizard

For the beginning, it is recommended to create the database with these settings: 'local database', and 'complete reference data'.

After a few seconds, you can have a look at the newly created database:

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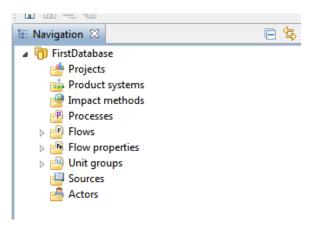


Figure 5: Created database with main navigation tree

These elements in the database will be familiar to you if you have worked with previous versions of openLCA. They will be explained in more detail in the next section.

'Reference data' are especially units and elementary flows. Since we have created the database with reference data, it contains flows and units, which can be seen under the respective categories.

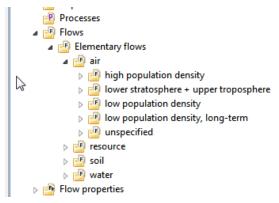


Figure 6: Reference flow categories in the database

The database does not contain any process data sets though, but you can start creating your own processes, using the flows and units that are already present.

2.3.2 Importing an existing database

As a second option, you can import an already existing database. The database can for example be a migrated openLCA 1.3 database (this is explained in section 4), or you can import a database downloaded from the openLCA nexus site, <u>https://nexus.openlca.org/</u>.

For example, we are downloading the ecoinvent 3 'cut-off' database from nexus¹.

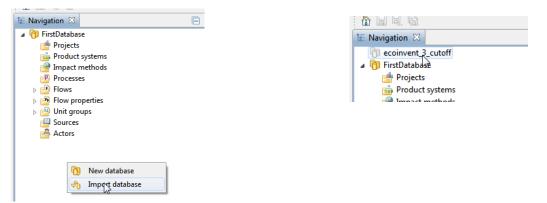
¹ Some of the databases in nexus are for purchase, e.g. the ecoinvent database.

орепьса



Figure 7: downloading the ecoinvent cut-off database from nexus

In order to import the database, select 'import database' from the context menu ...



.. and then select the respective 'zolca' file. Another database will be created; it is deactivated at first. Activate it e.g. with a double-click. Afterwards, you have access to all the processes and any other elements in the database.

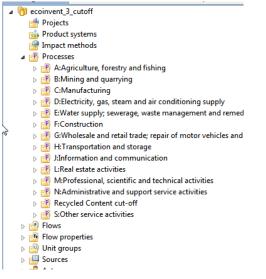


Figure 8: Newly created ecoinvent database, with process data sets

2.3.3 LCIA methods

The databases in nexus do not contain LCIA methods ('impact methods', in the category tree). To add these, download the LCIA method pack from the openLCA download page

(www.openlca.org/downloads).

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LCIA methods
LCIA method pack for openLCA nexus
A comprehensive package of environmental impact assessment methods for use with all different databases available in the nexus system - including ecoinvent 3, GaBi and ELCD. Includes normalisation and weighting as far as this is foreseen by the method. In addition, a pack containing a social LCIA method for use with the Social Hotspots Database is provided. Please observe the license* (Commons Attribution-ShareAlike 4.0 International) while using it. Please provide feedback - thanks in advance!
The environmental LCIA methods pack is available in several versions:
Database for openLCA 1.4 (zolca file, 15 MB), with normalisation and weighting factors.
Database for openLCA 1.3.4 (olca file, 19 MB), with normalisation and weighting factors.
EcoSpold01 (zip archive, 10MB) without normalisation values as the format does not allow this.
The social LCIA method is available in EcoSpold01 (zip archive, 64 kB).

We will import these now into the ecoinvent database, as follows:

Via File / Import we select 'database import':

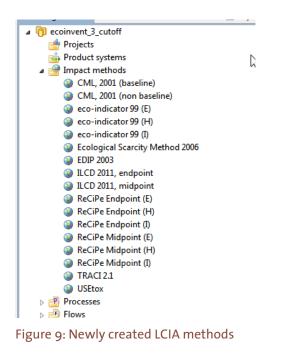
openLCA 1.	4		LG Import	
Window	Help		S inport	
			Select	Ľ
Close	Ctrl+W		Select an import source: type filter text	
Preference			File Import EcoSpold 1 R EcoSpold 2	
			ILCD Network Import Cother Cother Cother Cother	
	Window Save Save As Save All Close Close All Preference Import	Save As Save All Ctrl+Shift+S Close Ctrl+W Close All Ctrl+Shift+W Preferences Import	Window Help Save Ctrl+S Save As Image: Ctrl+Shift+S Close Ctrl+Shift+S Close All Ctrl+Shift+W Preferences Image: Ctrl+Shift+W	Window Help Save As Save As Save All Close Ctrl+Shift+S Close All Ctrl+Shift+W Preferences Import Exposit Sime CSV Intervention Close Ctrl+W Close All Ctrl+Shift+W Preferences Import Exposit

And then select 'from zolca file'.

🥶 Database import	- 0 x
Database import Imports data from an existing database into the active database	
© Existing database	
	~
From exported zolca-File	
C:\Users\ac\Downloads\openLCA_LCIA_methods_1.4.zolca	Browse
S S Sack Next > Finish	Cancel

This import may take a few minutes. When it is finished, the LCIA methods are also available in the database.





3 LCA modelling in openLCA

Core of any LCA modelling is the modelling of the life cycle of the product under study. In openLCA (as in ISO 14040), the life cycle model of a product is called product system, and there are different ways for creating and completing product systems, depending on the database and user preferences.

3.1 Product system creation from a process data set

The first possibility is to create the product system from the process. Open a process data set, go to the page 'general information', and click on 'Create product system'.



electricity, high voltage	, production mix - DE 🛛	LCa		- • •
Process: electricity	r, high voltage, production mix	New product sys		
 General information 		Name	electricity, high voltage, production mix	
Name Description	electricity, high voltage, production mix	_		*
		Description		~
		Filter		
Category	D:Electricity, gas, steam and air conditioning supply	Reference process	electricity, high voltage, production mix - DE electricity, high voltage, production mix - DK electricity, high voltage, production mix - ENTSO-E	^
Version Last change	00.00.00 🛞 🛞		electricity, high voltage, production mix - ES electricity, high voltage, production mix - FI	-
Infrastructure process			Add connected processes	•
	Create product system		Connect with system processes if possible	
▼ Quantitative refere	nce			
Quantitative reference	e 🔯 electricity, high voltage (DE)		Finish	Cancel

Figure 10: Product system creation wizard, here started from a process data set

Checking 'add connected processes' in the product system wizard will make openLCA connect those processes that have the same products, for the same locations, and where the units of the flows can be converted. For many databases, such as the ecoinvent database, these criteria clearly identify the delivering process; however, usually the default provider processes are specified, for the inputs of processes (check the sheet inputs/outputs for processes).

ocess: electricity, high voltage, production mix						
▼ Inputs						
Flow	Category	Flow property	Unit	A	Uncertainty	Default provider
🔅 electricity, high voltage - DE	351:Electric power generati	Energy	kWh	0.2	none	electricity production, lignite - DE
A electricity, high voltage DE	251 Electric newer generati	Enormy	L/M/b	0.1	nono	electricity production, bard coal, DE

Figure 11: Default provider: electricity production, in the process data set inputs/outputs

The model graph in the product system shows the connected processes. These connections can be edited (deleted, expanded for new product providers) and processes can be entirely deleted from the product system if they have no connections in the life cycle any more.



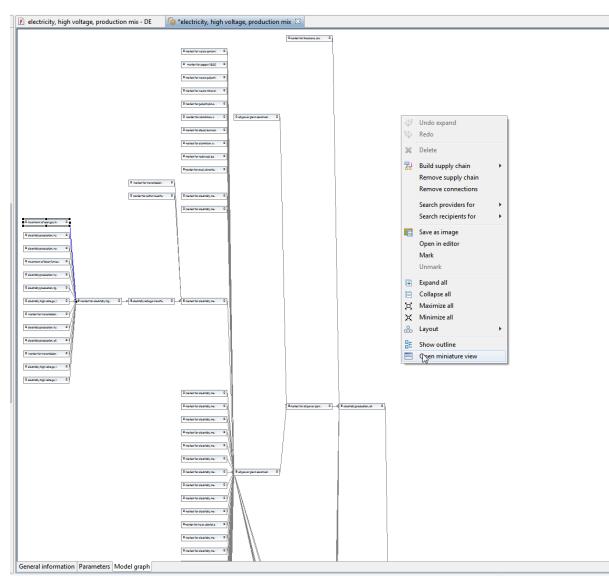


Figure 12: The model graph of a product system showing some few connected processes. The menu on the right is available via a right-click

Clicking on 'calculate' in the product system general information tab calculates the life cycle; you can select an LCIA method and a normalisation set if available and relevant. You can further choose between quick results and an analysis which provides more detailed results.



General info	rmation			
Name Description	electricity, high voltage, produc	ction mix		
2 comparent	ĺ	Calculation properties		
		Calculation properties Please select the properties for	r the calculation	
Version (Last change	00.00.000 ⊙ 💿	Allocation method Impact assessment method Normalization/weighting set	None ReCiPe Midpoint (E) World ReCiPe Midpoint (E)	-
Reference		Calculation type	Quick results	
Process	electricity, high voltage,		Analysis	
Product	🌼 electricity, high voltage (Monte Carlo Simulation	
Flow property	Energy		Number of iterations: 100]
Unit	🔟 kWh			
Target amoun	t 1.0			
			re as default Reset Calculate	Cancel

Figure 13: Different options for the calculation of a product system

The results are provided in several sheets, which are often self-explanatory.



Impact category 📑 Terres	trial ecotoxicity	
Contribution	Process	Amount
27.84%	electricity production, hard coal - DE	1.49556E
19.79%	electricity production, lignite - DE	1.06307E
12.41%	electricity production, oil - DE	6.66604E
06.11%	copper production, primary - RoW	3.28259E
05.11%	rape seed production, Swiss integrated production, intensive - CH	2.74372E
03.93%	heat and power co-generation, wood chips, 6400kW thermal, with extensive em	2.10939E
03.63%	treatment of drilling waste, landfarming - CH	1.95141E
03.24%	copper production, primary - RAS	1.74058E
02.72%	copper production, primary - RLA	1.46163E

Figure 14: Sheet 'process contribution' (cropped) as an example for product system analysis results

•

Result	contributions			
ocatio	'n	Amount	Unit	
_	Germany	3.44957E-5	kg 1,4-DB eq	
	Rest-of-World	6.25836E-6	kg 1,4-DB eq	
	Switzerland	5.22442E-6	kg 1,4-DB eq	
	Asia	1.74601E-6	kg 1,4-DB eq	
	Latin America and the Caribbean	1.46370E-6	kg 1,4-DB eq	
	Global	1.46219E-6	kg 1,4-DB eq	
	Europe	4.91101E-7	kg 1,4-DB eq	
	Durrian Enderation	A 67002E 7	ka 1 4 DP ca	

Map (beta)

Impact categories Perrestrial ecotoxicity

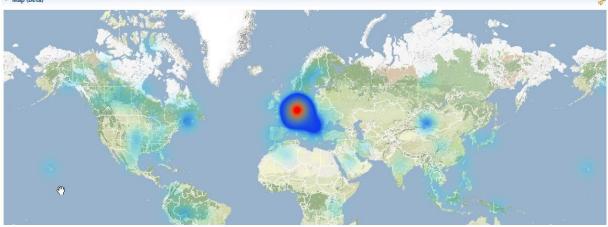
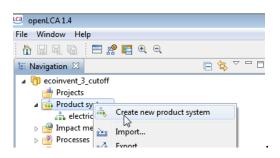


Figure 15: Sheet 'locations' (cropped) as an example for product system analysis results

3.2 Product system creation as new product system

As a second option, a product system can also be created from the product systems category:





In addition to the creation of a product system from a process data set, a reference process needs to be selected here. By entering text into the "Filter" field, you can narrow down the selection which helps to identify the suitable process.

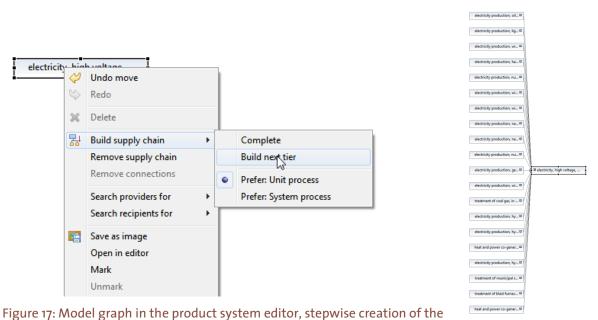
LCa	
New product sys	
Name	ps_test
Description	~ ~
Filter	electrici
Reference process	 C:Manufacturing D:Electricity, gas, steam and air conditioning supply P. 35:Electricity, ags, steam and air conditioning supply P. electricity, high voltage, aluminium industry, production mix - GLO P. electricity, high voltage, for Swiss Federal Railways, production mix - GLO P. electricity, high voltage, production mix - AT P. electricity, high voltage, production mix - AT M. and connected processes Connect with system processes if possible
	Finish Cancel

Figure 16: Second possibility for product system creation: as a new product system, not starting directly from a process data set. The reference process needs to be selected, the available processes can be filtered

3.3 Manually connecting processes

As an alternative to the automatic connection of processes, you can also manually connect processes in the model graph of a product system. Right-click on the process, then selecting 'build supply chain', offers both building the complete chain for the process, or only the next tier.





supply chain, here: Next tier for a selected process. The result, on the right: all products that are on the input side of the process have now a process provider

Selecting 'search providers for' allows you to select the providers for each individual product of the process.

intensifi	_	, arable lan		_					
	6 &	Undo Redo						a)	
	×	Delete							
	뭚	Build supply chain Remove supply chain Remove connections		•					
		Search providers for		▶ ca	lcium nitrate - GLO	0			
		Search recipients for		• dir	ying of feed grain	- GLO			
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Select prov	lucis							0)	
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market	for c	alcium nitrat 🛛						c)	
			1.	intensifi	ation, arable la	n			
			1	incentaint					

Figure 18: Model graph in the product system editor, stepwise creation of the supply chain, here: selecting the provider process for each product individually,

a): selecting the input product; b): selecting the provider; c): effect: calcium nitrate is connected to the process.



4 Migrating data and models from openLCA 1.3

Via a plugin that is available for the 1.3.4 version of openLCA, you can migrate complete databases from 1.3.4 "olca" format into the new "zolca" format.

The plugin is directly available in the openLCA plugin manager of openLCA 1.3.

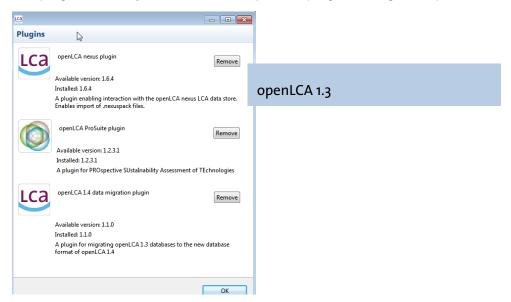


Figure 19: Plugin manager in openLCA 1.3.4: data migration plugin

If it is installed (in openLCA 1.3), you can export an existing database via the export wizard...

Lea Export	
Select	2
Select an export destination:	
type filter text	
 K LCIA methods - EcoSpold 1 Processes - EcoSpold 1 ILCD Actors Flow properties 	
Flows Flows Processes Product systems Sources	openLCA 1.3
 ILCD Network Export ILCD Network Export openLCA 1.4 	*
< Back Next > Finish	Cancel

Figure 20: Export option in openLCA 1.3.4 with installed data migration plugin: openLCA 1.4 database

... to a database in the 1.4 "zolca" format, which, in turn, can be imported into openLCA 1.4 via the import wizard of openLCA 1.4



G Import Select	
Select an import source: type filter text	
 ■ LCD § SimaPro CSV ILCD Network Import ILCD Network Import ILCD Network Import ✓ Other ☑ Database Import 	openLCA 1.4
< Back Next > Fini	sh Cancel

Figure 21: Database import in openLCA 1.4 in the import wizard

The database will then be imported and be available as one new, additional database in openLCA.

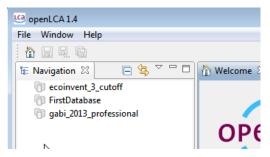


Figure 22: After the import, the database is available in openLCA

In some (IT) environments, users may be prevented from installing the plugin – if this is the case for you, you can manually download the plugin from

<u>https://nexus.openlca.org/updatesite/plugins/org.openlca.xolca.db.upgrade_1.3.o.jar</u>. Shut down openLCA, and then copy the plugin in the "dropins" folder of the openLCA installation which is usually located in a Windows system at [user_name]/AppData/Local/openLCA. The location can be modified during the installation procedure.



→ →		▼ 4; d.	ropins durchsuchen		_	۶
Datei Bearbeiten Ansicht Extras ? Organisieren → In Bibliothek aufnehmen → Freigeben für →	Ne	euer Ordner				?
 openLCA bin configuration data dropins jre licenses p2 plugins share 	•	Name com.greendelta.excel.annotationdriven_1 datahub.1.6.4.jar org.openIca.prosuite_1.2.3.1.jar org.openIca.xolca.db.upgrade_1.2.0.jar	Änderungsdatum 06.01.2014 11:54 19.12.2013 10:21 06.01.2014 11:54 04.06.2014 18:04	Typ Executable Jar File Executable Jar File Executable Jar File Executable Jar File	Grö	iße 1 3.58 5.01 5.13
4 Elemente	Ŧ	•				

Figure 23: Dropins folder where the plugins are located

Then, restart openLCA and the plugin will be extracted and can be used afterwards.

Note: If you want to use both version of openLCA on the same computer, we recommend you use the zip files for openLCA 1.4. They only need to be extracted; openLCA starts with a double click on openIca.exe. Thereby you can have the 1.3 version and the 1.4 version in parallel on the same computer. The data folder is different though, openLCA-data for openLCA 1.3 and openLCA1.4-data for openLCA 1.4. This ensures you can use all databases in parallel.

5 Quality assurance and performance

5.1 Quality assurance

In the development of openLCA 1.4, extensive tests have been performed to verify and validate the software algorithms and overall usage, also by external testers, e.g. by our Italian partner, be-LCA, www.be-LCA.com.

Tests have been performed for example to check

- openLCA results versus SimaPro calculation results
- openLCA results versus ecoinvent system process results

Further, 'constructed' use cases have been used to reflect specific modelling aspects of LCA (allocation, system expansion, uncertainty calculation, parameter usage, ...) which have been calculated in other software systems, including Matlab / Scilab and excel.

Evidently, here is not the space to fully explain all the tests; as an example, a comparison of results some selected results obtained in SimaPro 8.0.3 Multi User Developer and openLCA 1.4 might suffice. More information is available on request (see contact information, below).

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Figure 24 shows a comparison of inventory results for SimaPro and openLCA, for process electricity production mix high voltage, country mix, BE, for ecoinvent 3.0.1, default allocation model. Only those flows are considered where flow names and compartments are identical between SimaPro and openLCA, which is the case for more than 700 flows for the said system. The models have been calculated in both software systems, and then exported from SimaPro via text export (which is limited to exponent and two digits) and from openLCA via excel export.

As the figure shows, results are very similar. The most extreme ratios are still very close to 1 meaning that both software systems calculate almost fully identical results:

Top 5 minimum ratios are shown in table 1; table 2 shows the top 5 maximum ratios.

Table 1: Ratio of results from SimaPro and openLCA in a calculation comparison, 5 lowest

Input	Category	Sub-category	Flow_name	ratio_SP_to_openLCA
ja	resource	land	Transformation, to unknown	0.999999629
ja	resource	land	Transformation, from mineral extraction site	0.999999816
nein	soil	agricultural	Carbaryl	0.999999946
nein	air	high population den	Ethane	0.99999995
nein	soil	agricultural	Nicosulfuron	0.999999953

Table 2: Ratio of results from SimaPro and openLCA in a calculation comparison, 5 highest

Input	Category	Sub-category	Flow_name	ratio_SP_to_openLCA
ja	resource	in ground	Gallium	1.000001574
ja	resource	land	Transformation, to forest	1.000001739
ja	resource	land	Transformation, to shrub land, sclerophyllous	1.000001744
ja	resource	land	Transformation, from dump site, inert materia	1.000003167
ja	resource	land	Transformation, to dump site, inert material la	1.000003167

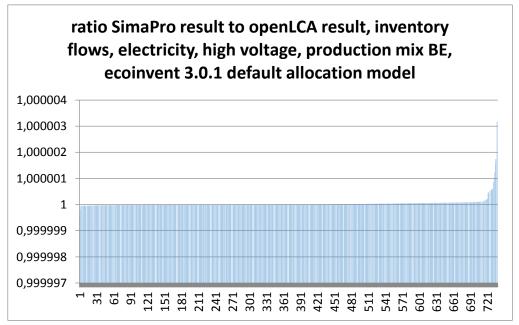


Figure 24: Ratio of calculation results, in ascending order; the x-axis shows the flow number

This is result of a life cycle calculation with about 7,500 unit processes included.



5.2 Performance

Improving the performance also for large life cycle systems was one of the core tasks in the development of openLCA 1.4. Table 3 presents some results (Windows 64 bit version, Windows 8.1, identical, modern notebook computer, calculation of the inventory only), also in comparison to SimaPro 8.

Table 3: openLCA and SimaPro performance comparison in network / analysis calculation

	Time required [se	econds]	Ratio: required time
	openLCA 1.4	SimaPro 8.o.3	SimaPro / openLCA
Ecoinvent 3.0.1 default allocation horn meal p	roduction RoW		
Creating a product system*	10.17		*
Analysing / calculating a product system*	34.26		*
Total**	44.43	95.35	2.17
Ecoinvent 3.0.1 default allocation electricity hi	gh voltage produc	tion mix BE	
Creating a product system*	10.17		*
	(2 nd time: 4.18)		
Analysing / calculating a product system*	33.03		*
Total**	43.20	86.52	2.00
		(2 nd time: 21.73)	

* not available in SimaPro as separate action, always performed when calculating a network in SimaPro ** for openLCA, addition of time for creating and calculating the product system; opening an already created product system in openLCA takes about one second.

SimaPro is used as a benchmark here since it is the only other broadly used LCA software system (at least to our knowledge) that is able to calculate large unit-process based product systems from ecoinvent 3 so far. For the performance tests, the identical computer was used, no other user was interfering with the SimaPro multi-user Developer version; in openLCA, the 'analysis' calculation option was selected which produces results similar to the network calculation in SimaPro which in turn was used for SimaPro.

The table shows that openLCA is at least twice as fast as SimaPro when calculating a large ecoinvent unit process life cycle. This is also shown in the figure below. Both software systems become faster when repeating identical tasks, e.g. when the same product system is deleted and created again, due to caching procedures; in SimaPro, especially a repeated calculation is finished much quicker. In openLCA, a once created product system can be stored; reopening it takes only about one second and saves the time for recreating it. openLCA offers further a 'quick results'



calculation were only main contributors and inventory and impact assessment tables are calculated; this quick calculation is about twice as fast as the analysis calculation (e.g., 17.59 seconds for the electricity product system above).

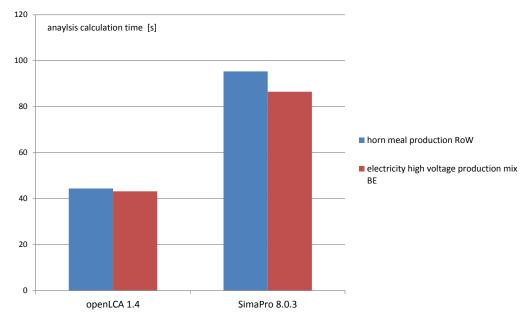


Figure 25: Calculation time comparison, SimaPro (network calculation) and openLCA (product system creation and analysis calculation), on the identical computer, further explanation see text

6 Using openLCA as format converter

6.1 Principles

openLCA 1.4 has many import and export interfaces

Import interfaces are:

- EcoSpoldo1
- EcoSpoldo2
- ILCD
- SimaPro csv
- (and also ILCD datahubs and openLCA 1.3 databases)

Export interfaces are:

- EcoSpoldo1 processes
- EcoSpoldo1 LCIA methods
- EcoSpoldo2 data sets
- ILCD data sets
- Excel templates for processes



• ICLD data hubs

	LC3 Export	
	Select	Z
© Import Select Import ILCD data sets from an ILCD package. Select an import source: type filter text	Select an export destination: type filter text	
⊘ ILCD Network Import ∠ Other ∠ Database Import < Back Next > Finish Cancel	Unit groups ILCD Network Export LCD Network Export CBack Next > Finish	Cancel

Figure 26: openLCA export and import options

Via import and export, openLCA can be used as a format converter. In fact for openLCA, we merged the conversion capabilities of the openLCA format converter in its most recent version 3 with the import and export features of openLCA. Since the introduction of the nexus reference information, the mapping in openLCA (LCA application) was more complete than the mapping available in the format converter.

For many of the import and export options, the conversion is straightforward. As a more complicated example, we will explain how to use openLCA to convert csv files created from SimaPro intoEcoSpoldo2 files that can be read and further processed in the EcoEditor developed for the ecoinvent centre².

6.2 Converting process data sets form SimaPro to EcoSpoldo2 using openLCA

SimaPro CSV export

First step is to select the processes you want to export, in SimaPro:

² This feature was commissioned by the ecoinvent centre, for EcoEditor version 3.3.65.10874 from December 2 2013.

🚊 Material		Zucchini {GLO} production Alloc Def, U	kg	Com
- Agricultural		White asparagus {GLO} production Alloc Def, U	kg	Com
Animal feed		Wheat grain, Swiss integrated production {CH} wheat production, Swiss integrated production, intensiv	e Al kg	Com
Market		Wheat grain, Swiss integrated production {CH} wheat production, Swiss integrated production, extensi	ve A kg	Com
····· Transformation		Wheat grain, organic {RoW} wheat production, organic Alloc Def, U	kg	Com
		Wheat grain, organic {CH} wheat production, organic Alloc Def, U	kg	Com
⊟ · Food		Wheat grain {US} wheat production Alloc Def, U	kg	Com
⊞- Market		Wheat grain {RoW} wheat production Alloc Def, U	kg	Com
Transformation Oilseed meals		Wheat grain {FR} wheat production Alloc Def, U	kg	Com
H Oliseed means Fi⊸ Plant oils		Wheat grain {ES} wheat production Alloc Def, U	kg	Com
		Wheat grain {DE} wheat production Alloc Def, U	kg	Com
Hant production Here plant seeds		Vine tomato {GLO} production Alloc Def, U	kg	Com
		Tomato {GLO} production Alloc Def, U	kg	Com
⊡ Market	=	Sugar, from sugarcane {RoW} cane sugar production with ethanol by-product Alloc Def, U	kg	Com
Infrastructure	-	Sugar, from sugarcane {BR} cane sugar production with ethanol by-product Alloc Def, U	kg	Com
		Sugar, from sugar beet {RoW} beet sugar production Alloc Def, U	kg	Com
⊕ Chemicals		Sugar, from sugar beet {CH} beet sugar production Alloc Def, U	kg	Com
		Strawberry {GLO} production Alloc Def, U	kg	Com
Electronics		Sninach (GLO) I production I Alloc Def 11	ka	Com
⊞. Glass		The LCA study, from which this LCI has been derived, contains detailed descriptions of the system boun		data sourc
🗄 Metals		et al. 2012). The publication is published and freely available with comprehensive supporting information	1:	

Figure 27: Process selection in SimaPro as first step

Open the export wizard under 'File/Export'. Select 'CSV file' as output type, semicolon as format option, and the processes you want to export under 'Selection'. Save the file.

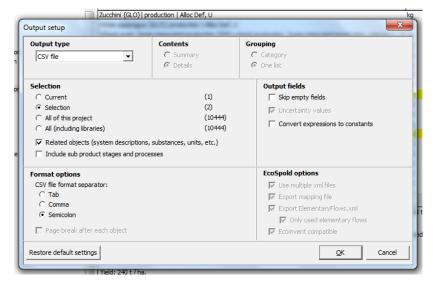
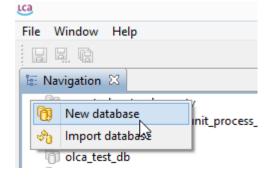


Figure 28: SimaPro csv export options selection for creating the csv files

Import the SimaPro CSV file into openLCA

As a next step, create a new database in openLCA via the context menu in the openLCA navigation view (alternatively, you can use an existing database and open it with a double click):



Create a local database with the option 'Complete reference data' (we need the reference data for mapping flows, units etc.):

🥴 New database	
New database Create a new database	
Database name sp_es2_conversion Database type	
Database content O Empty database Units and flow properties O Complete reference data	
	Finish Cancel

Right click on the database and select 'Import':

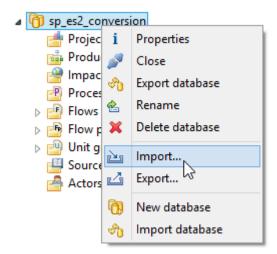


Figure 29: Importing into the database

In the import select 'SimaPro CSV' as import option and select the CSV file you want to import:



Import	
Select Import SimaPro CSV files.	2
Select an import source:	
type filter text	
 <i>i</i> EcoSpold 1	
< Back Next > Finish	Cancel

After the import you will see imported data sets under the same process categories as in SimaPro:

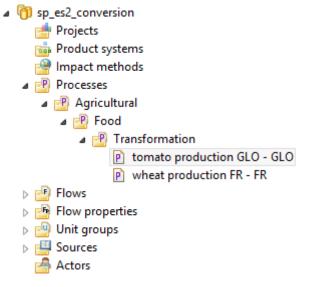


Figure 30: Processes imported in openLCA, as second step in the conversion

Export the processes from openLCA to EcoSpoldo2

Next step is to export the processes to EcoSpoldo2 format. To start this, right click on the database and select 'Export' (figure 31).



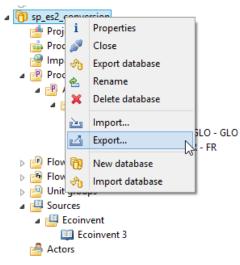


Figure 31: Exporting the processes

In the export wizard, select EcoSpold 2 as export option:

LCa Export	
Select Export processes as EcoSpold 2 activity data sets	
Select an export destination:	
type filter text	
 ▲ EcoSpold ★ EcoSpold 2 ★ Impact methods ★ Processes ▷ Excel ▷ ILCD ▷ ILCD Network Export 	
< Back Next > Finish	Cancel

Select the processes you want to export and an export directory where the files should be written:



LCa	EcoSpold 2 Export	-	□ ×
Select Proc	æsses		
	r an output directory and select the Processes you want ry named EcoSpold02 will be created	to export.	
To directory:	C:\Users\Besitzer\Downloads_00_	Choose di	rectory
⊿ ✔ [gricultural P Food P Transformation P tomato production GLO - GLO P wheat production FR - FR		
	< <u>B</u> ack <u>N</u> ext > <u>Finish</u>	C	ancel

Figure 32: Selecting the processes for export in openLCA

Open the data sets in the EcoEditor

Third step of the conversion is to open the created files in the EcoEditor which reads (a specific version of) the EcoSpoldo2 format. This needs some preparation. The EcoEditor cannot open EcoSpoldo2 files with unknown "master data". Master data are for example flows, sources, units, compartments, locations etc. Thus, you first need to import the master data in the Eco-Editor before you can open the converted files. Select 'Import User Master Data From File' form the menu and select the EcoSpoldo2 file which you want to open:



e ec	oEditor for ecoinvent version 3				
File	Edit View Extras Help				
	New				
	Open Dataset From Database Strg+Umschalttaste+O	ctiv			
	Open Dataset By Reference Product From Database Open Dataset From File				
	Open Dataset From File (without review information)				
	Update Parent of Child Datasets				
<u>@</u>	Update Master Data				
	Force Update Master Data				
	Import User Master Data From File				
1	Validate Datasets F7				

Figure 33: EcoEditor: Importing master data

After this, you should be able to open the data set from an EcoSpoldo2 file:

e e	coEditor for ecoinvent version 3						
File	Edit View Extras Help						
	New	•					
3	Open Dataset From Database Strg+Umschalttaste+O						
3	Open Dataset By Reference Product From Database						
	Open Dataset From File Strg+O						
	Open Dataset From File (without review information)						
	Update Parent of Child Datasets						
	Undate Master Data						
	Update Master Data						
	Force Update Master Data	Turne					
	Import User Master Data From File	Type - ToEnvironment Nitrogen oxides					
1	Validate Datasets F7						
	Submit Datasets For Validation	- FromEnvironment Peat, in ground					
è.	Submit Datasets For Review	- ToEnvironment Dinitrogen monoxide					
2	Submit Datasets For Review (Replace Datasets)	- ToEnvironment Chromium					
	Submit Datasets For Linking	- ToEnvironment Copper					
		- ToEnvironment Phosphate					
	Save Datasets Strg+S	TOERWICHINGIN THORE					
	Save Datasets As	- FromEnvironment Occupation, annual crop					
×	Close Strg+F4	- ToEnvironment Phosphorus					
×	Close All Strg+Umschalttaste+F4	- I oEnvironment Ammonia					
		- ToEnvironment Zinc					
2	Exit Alt+F4	4 - ToEnvironment Folpet					
		4-TOENVIRONMENT Polper					

Figure 34: Opening the datasets in the EcoEditor

Remove/Reset the imported master data

If you want to remove the imported master data in the EcoEditor, go to the installation folder of the EcoEditor under .../Documents/ecoinvent/EcoEditor and remove the XML files under xml/MasterData/Production/user. You may backup this folder before you delete these files.



Conversion issues

Field length

In SimaPro 8 product names can be something like: *Heat, central or small-scale, other than natural gas {Europe without Switzerland}| market for heat, central or small-scale, other than natural gas | Alloc Def, U*

This string has 161 characters but only 120 characters are allowed in the EcoSpoldo2 format and accepted by the EcoEditor:

e ecoEditor f	for ecoin	vent vers	ion 3		-	
File Edit	View	Extras	Help			
		\mathbf{E} ×	b		6 9	
Navigator					ųΧ	Activity Description Modelling and Administrative Exchanges Exchange Properties Parameters
					.	
No activity	datasets	open				
			-			
			6	Error		
			"http:/	http://w	validation emor: Validation failed: Das Bement http://www.EcoInvent.org/EcoSpold02name'ist ungüitig - Der Wert 'Heat, central or small-scale, other than as (Europe without Switzerfand) market for heat, central or small-scale, other than natural gas I Aloc Def. U ist gemäß seinem Datentyp ww.EcoInvent.org/EcoSpold02.T5tmg120 ungültig - De tataschliche Länge ist großer als der MaxLength-Wert (ine 33, position 28126). antact the supplier of the EcoSpold02 document and provide them with this error OK	

Figure 35: Validation error message in the EcoEditor due to a too-long field name that is not allowed in EcoSpoldo2 (now avoided since product names longer than 120 characters are truncated)

Thus, we have to cut names that are longer than 120 characters.

Meta-data mapping

Most of the meta-data are in a different format in SimaPro and EcoSpoldo2 / EcoEditor, e.g.

- Categories: tree in SimaPro <-> flat list that cannot be extended in the EcoEditor
- Time: fixed enumeration in SimaPro <-> start and end date in EcoSpoldo2
- Geography: only five locations in SimaPro
- Contact information: free text in SimaPro <-> structured person tags in EcoSpoldo2
- ...

Some of these issues can be fixed when editing the data set after the export in openLCA or the EcoEditor.



6.3 Conclusions

The conversion example presented above is more complicated than others but it shows some of the issues in any conversion. The current LCA systems do not recognize "each other's" requirements too much, and in this situation the conversion cannot work completely by using "just" a software tool. It will never be possible to convert a free text contact information into structured person tags asking for first name, last name, asf. Therefore, typically, some additional work with the data sets is needed to fully meet strict definitions of target formats or target software systems. Aim of the converter functionality is to cover as much as possible, minimising the need for additional work. Switching from the openLCA format converter to openLCA has improved the conversion due a better meta data conversion and a better mapping database and thereby further reduced the need for additional work.

We are pleased to be part of an ongoing project commissioned by JRC to further improve the mapping and conversion of data sets, specifically to and from EcoSpoldo2 and ILCD.

7 Further reading

This short text cannot cover all aspects of the new openLCA 1.4 version.

More information is available here:

- A more extended description of openLCA and of how to use it for Life Cycle Assessment and sustainability assessment: www.openlca.org/manuals
- An overview of features and new features: <u>www.openlca.org/features</u>
- Examples for usability improvements and changes in openLCA: www.openlca.org/features#usability.
- A more detailed, yet a bit older performance test comparing SimaPro 7.3.3, SimaPro 8.0.0, openLCA 1.3.4 and openLCA 1.4 beta III: www.openlca.org/performance.
- We provide a definition and discussion of open source licenses on the openLCA website, here: www.openlca.org/open-source.

... enjoy! And if you have any feedback, please contact us.



8 Contact

openLCA is developed and managed by GreenDelta in Berlin. If you have any feedback, comments, questions, please let us know.

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Open Source Software for Life Cycle Assessments and for Sustainability Assessment

www.openlca.org





9 Final remark: Big thanks

Finally - big thanks to our supporters and contributors. For the 1.4 version, especially the following institutions provided financial support (incomplete overview):

US EPA



US Department of Agriculture



ecoinvent centre



Fundacion Chile



Joint Research Centre, European Commission (JRC)



Karlsruhe Institute for Technology (KIT)



(if you are also interested in specific features or modifications of openLCA – please let us know. We <u>develop</u> software).

