



## Social Hot Spots Database in openLCA

### Quick overview

Version:

Date: September 2013

Authors: Andreas Ciroth

Özlem Duyan

In collaboration with New Earth

**Content**

- 1 The Social Hot Spots Database ..... 3
  - 1.1 Ordering in nexus, downloading ..... 3
  - 1.2 Importing in openLCA..... 4
- 2 Using and understanding the SHDB in openLCA ..... 5
  - 2.1 One single process..... 6
  - 2.2 A product system as a complete life cycle model ..... 9
    - 2.2.1 Developing an impact assessment method..... 14
    - 2.2.2 The analysis of the product system..... 16
  - 2.3 Linking the SHDB with other data in openLCA ..... 19
  - 2.4 SHDB in openLCA: tips, known issues, further reading..... 20
- 3 References..... 21
- 4 Contact ..... 22

# 1 The Social Hot Spots Database

The Social Hot Spots Database (often abbreviated as “SHDB”) is at present the only existing, comprehensive database for social assessments over the entire life cycle ([www.socialhotspot.org](http://www.socialhotspot.org)). It is available in openLCA and integrates well with the openLCA modeling environment and also with other databases available in openLCA.

SHDB uses the Global Trade Analysis Project's (GTAP - Version 7) 113-region and 57-sector Input/Output activity model in order to enable geographic-specific product system modeling. Payment of wages provided by the Global IO model combined with estimates of sector- and country-specific wage rates allows users to estimate labor intensity and report results using Life Cycle Attribute Assessment (scope of a product system at risk of or audited for different social risks/issues). The modeling system, used together with social risk level characterizations, allows users to express social risks and opportunities relative to each of over 100 different indicators by sector and country.

- Users of the database in openLCA will be able to do assessments such as the following:
- Select a product category, sold in a given country, and estimate the global supply chain for it, based on GTAP trade data, in a static global IO model (113 regions, 57 sectors each)
- Estimate the worker-hours associated with each of the “country-specific sectors” in the supply chain; this helps identify what we might call “work hotspots” in the supply chain.
- Identify processes with significant worker-hours which are also at elevated risk relative to specific indicators relating to human rights, worker treatment, poverty, community impacts, and governance.

SHDB is, on the other side, a rather special database, therefore also the import and the available data sets deserve some attention and explanation.

## 1.1 Ordering in nexus, downloading

- SHDB is one of the “for purchase” databases in openLCA. The ordering procedure and also the download as nexuspack file is identical to all other for purchase databases on <https://nexus.openlca.org/>. For more information please refer to document “Using nexus and different database in openLCA” on <http://www.openlca.org/resources>. The only difference you may recognize is that the SHDB licence fees are distinguished by country type (OECD, non-OECD, and so forth), therefore you will need to select the appropriate license for your country.

05/07/2013 - 11ofCVGizYiCJqJO

Print order form

Download order part Social Hotspots Database  
Public/Private Sector

State: Can be downloaded

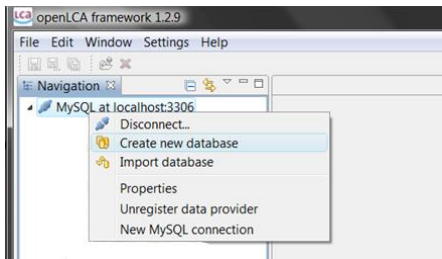
Dataset

Social Hotspots Database Public/Private Sector

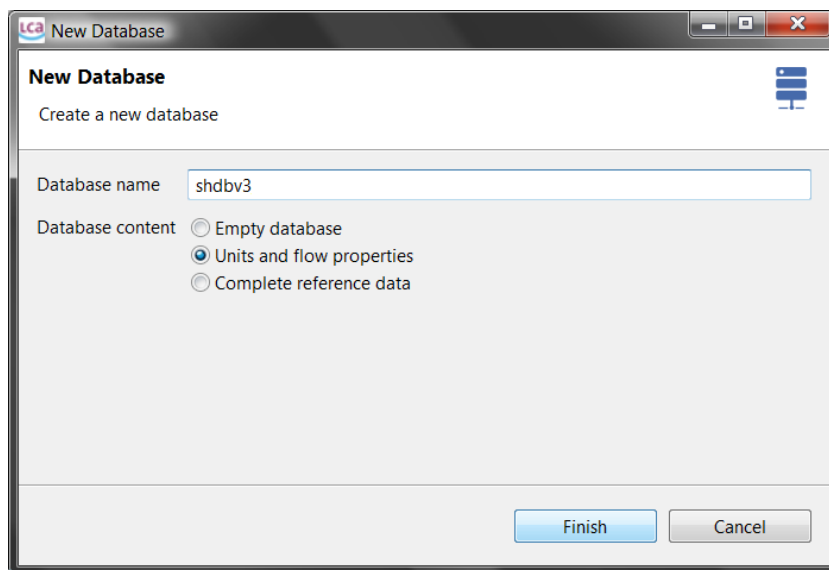
The SHDB download package is rather large (around 210 MB); the download may thus take a while.

## 1.2 Importing in openLCA

Also the import into openLCA works as for other data. Should you not have a database already in openLCA where you want to have the SHDB in, create a new one.



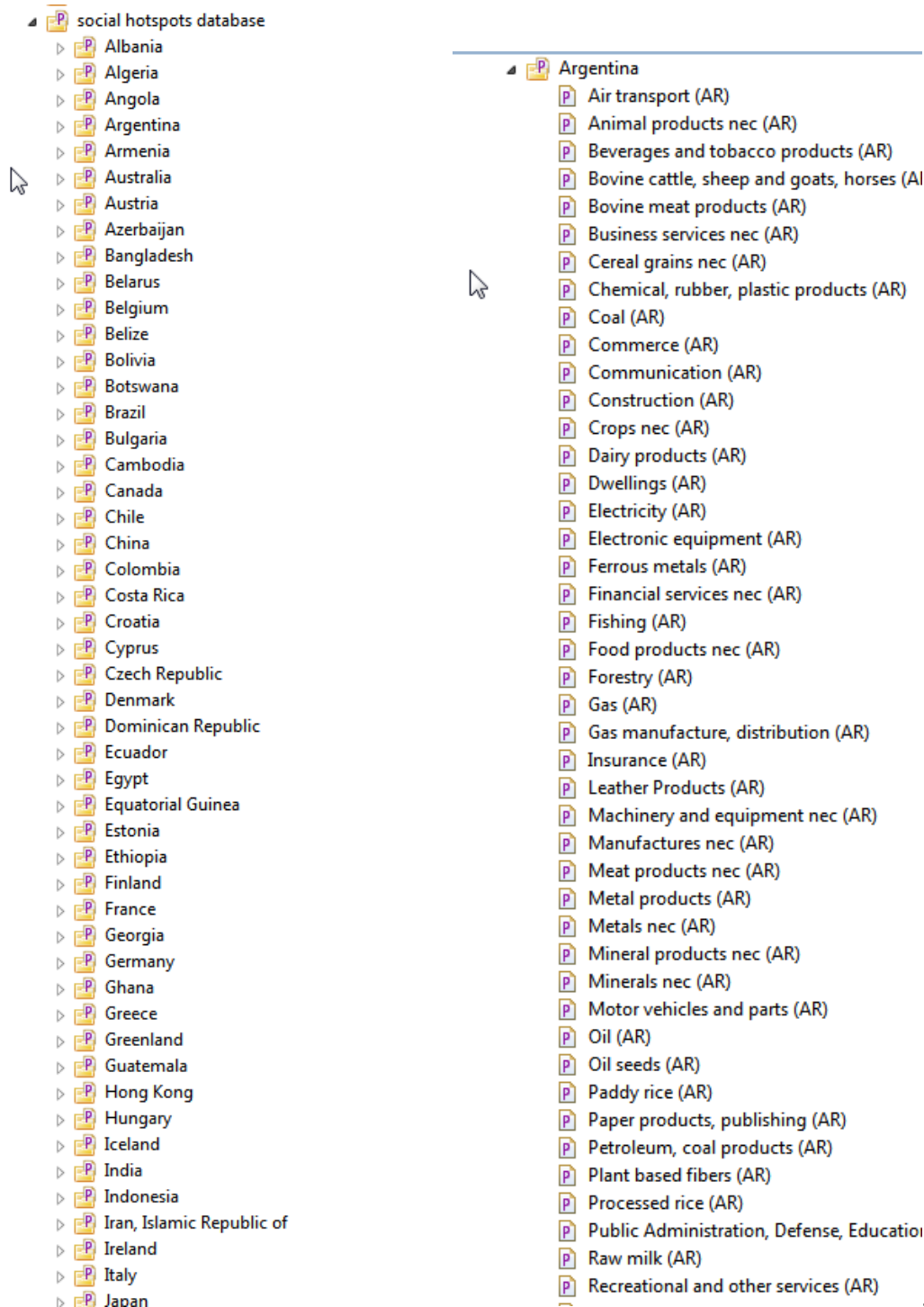
If you want to work with the SHDB alone, you will only need units and flow properties as reference data; however, for other data sets, the other reference data are also useful.



Import the SHDB data pack as described in the “Using nexus and different database in openLCA” document on [www.openlca.org/resources](http://www.openlca.org/resources).

## 2 Using and understanding the SHDB in openLCA

After the import the data sets are available per country and industrial sector:



Each data set consists of flows on the input and on the output side. Typically, flows on the input side are products, and flows on the output side are elementary flows.

## 2.1 One single process

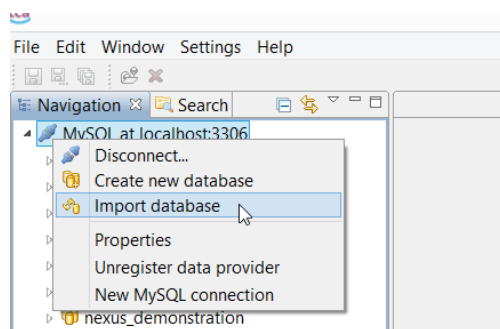
If you do not have SHDB but would like to have a look before deciding to obtain a license, you can download the demo which is helpful for you to understand how it works.




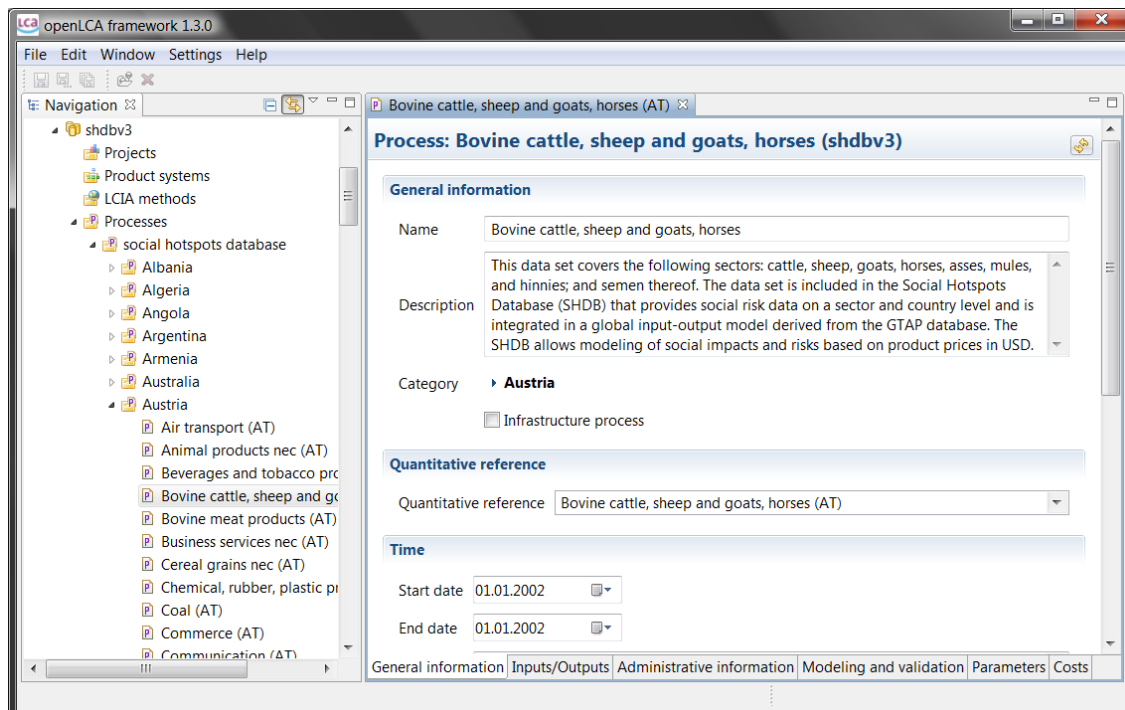
The process set in the demo database is a VERY partial subset of the full SHDB.

Go to openLCA download page: [http://www.openlca.org/download\\_page](http://www.openlca.org/download_page) and download the .olca file of SHDB demo database.

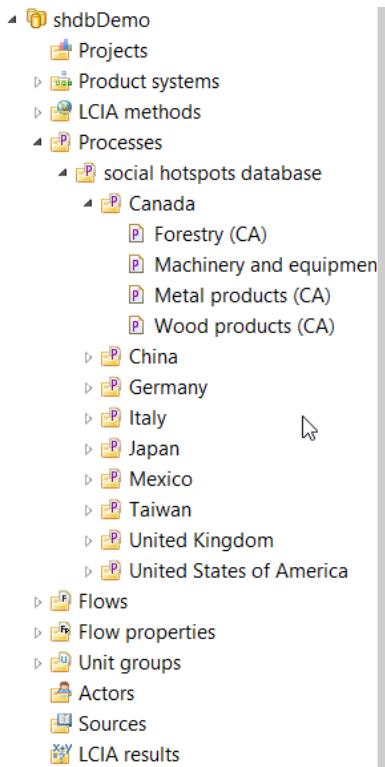
Once you downloaded the .olca file, start openLCA and after connecting to MySQL, right click and choose “Import database” and choose the directory where you saved the .olca file to import.



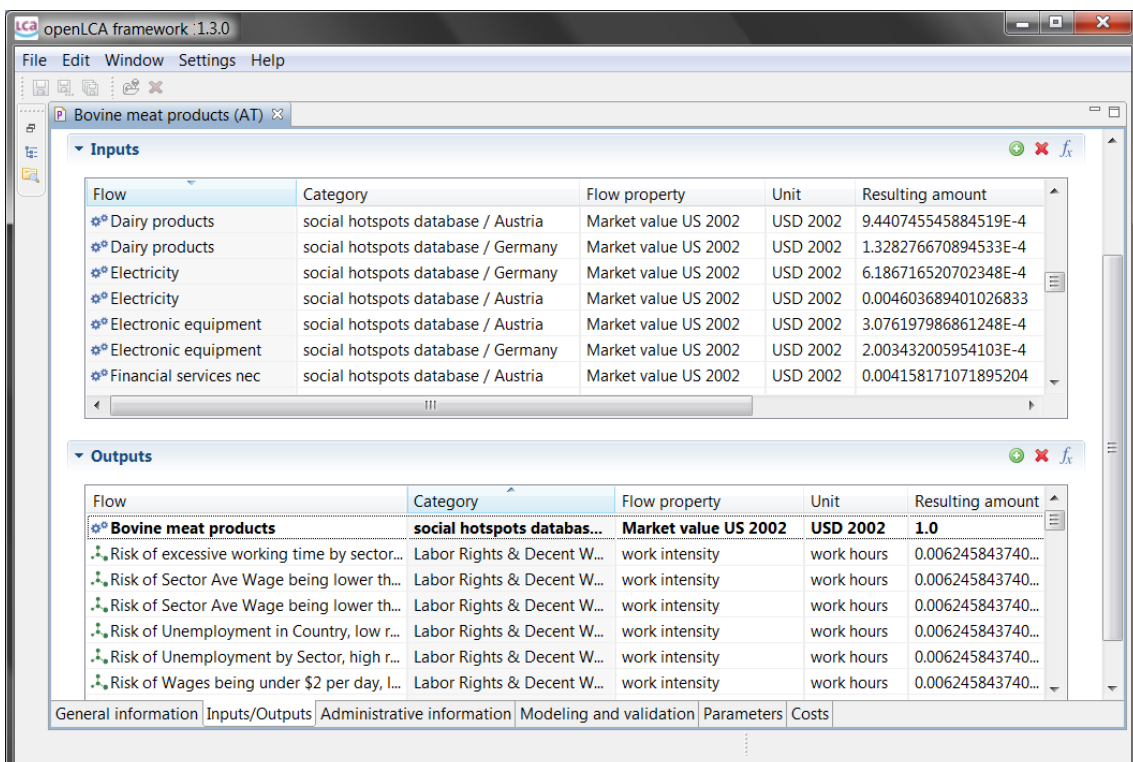
To open a process, navigate through the navigation tree on the left side of the openLCA application by clicking on the small triangles; the processes are the icons with a large ‘P’  Double-click on one of them to open it. E.g., you may go to Processes/Austria and double-click on a process.





As mentioned earlier, in the demo database, process sets are very partial. For this reason on the navigation tree, there will appear certain processes for certain countries.



It will be opened in the editor window on the right side. You can switch through the different tabs on the bottom.



Exchanges of a process are shown in the “Inputs/Outputs” tab. Product flows (flows with the cogwheels icon  ) are linked to other processes; they represent technosphere flows derived from the GTAP model, and are specified in monetary values (USD).

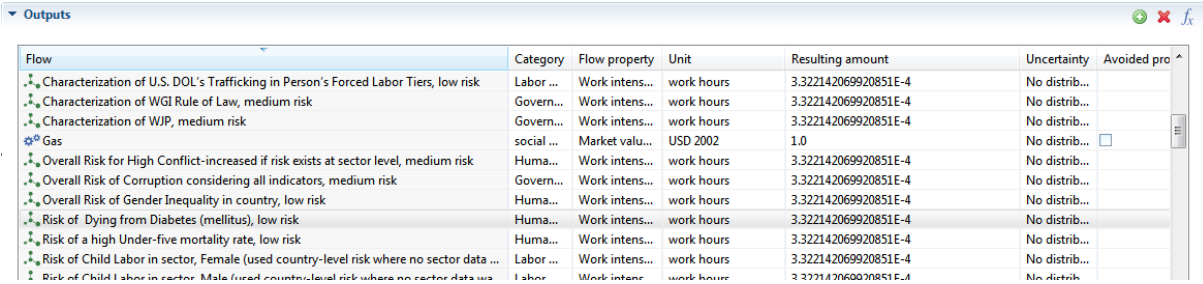
Social aspects are modeled as elementary flows (flows with the green icon  ) on the output side (emission) in worker hours.












All flows are scaled to the reference flow (this is the bold flow in the output table) which is expressed in 1 USD.

All other flows are expressed in relation to this reference value, even qualitative ones. This is done following the ‘SHDB worker hours model’: The worker hours spent in a certain sector (SHDB speaks of ‘country specific sectors, CSS’, [Benoît Norris et al. 2012]), is calculated as overall wages in a CSS divided by average hourly wages in the same CSS, of course for the same time interval. All indicators for each CSS are expressed in the worker hours of this CSS. This leads to the initially surprising result that one CSS may for example have the indicator “Risk of Dying from Diabetes (mellitus), low risk” expressed in 3.32E-4 worker hours, as well as all other indicators relevant for this CSS.

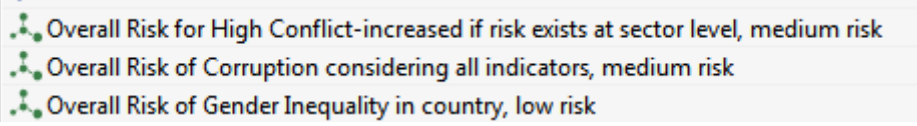
The obvious benefit of this is that the worker hours are quantitative and allow, as a so-called “activity variable” [Norris 2006], [Ciroth 2012] (Benoit-Norris, 2013) aggregation of all indicators over the entire life cycle.

When imported into openLCA, the CSS becomes a process data set. Also here, the indicators are expressed in worker hours, each with the same value:



Flow	Category	Flow property	Unit	Resulting amount	Uncertainty	Avoided pro
 Characterization of U.S. DOL's Trafficking in Person's Forced Labor Tiers, low risk	Labor ...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Characterization of WGI Rule of Law, medium risk	Govern...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Characterization of WJP, medium risk	Govern...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Gas	social ...	Market valu...	USD 2002	1.0	No distrib...	<input type="checkbox"/>
 Overall Risk for High Conflict-increased if risk exists at sector level, medium risk	Huma...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Overall Risk of Corruption considering all indicators, medium risk	Govern...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Overall Risk of Gender Inequality in country, low risk	Huma...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Risk of Dying from Diabetes (mellitus), low risk	Huma...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Risk of a high Under-five mortality rate, low risk	Huma...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Risk of Child Labor in sector, Female (used country-level risk where no sector data ...	Labor ...	Work intens...	work hours	3.322142069920851E-4	No distrib...	
 Risk of Child Labor in sector, Male (used country-level risk where no sector data wa	Labor ...	Work intens...	work hours	3.322142069920851E-4	No distrib...	

Differences between processes (and the original CSS) exist because the indicators are already assessed when they obtain the quantitative worker hours: the example process shown above has a medium risk for corruption, and a low risk of gender inequality.

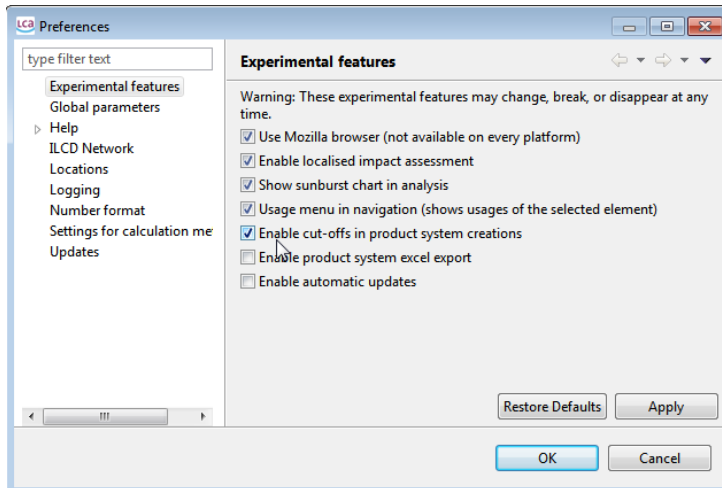


In LCA terminology, the flow ‘Overall Risk of Corruption considering all indicators, low risk’ does not exist for this process. Therefore, although all flows have the same worker hour values for this process, the process gets a different social evaluation since the flows that are relevant differ from one process to another.

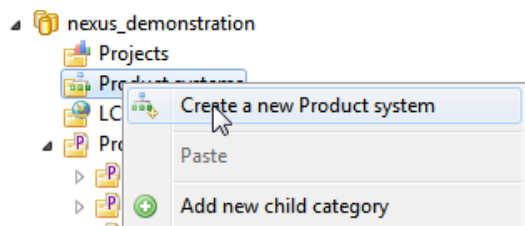


## 2.2 A product system as a complete life cycle model

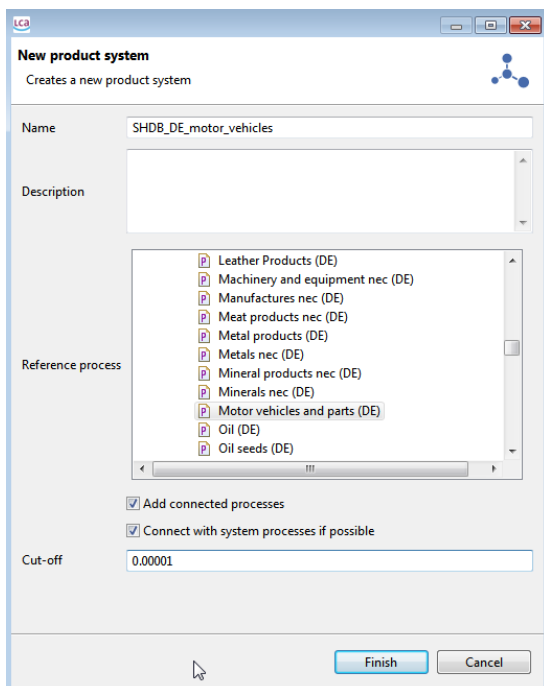
For a complete life cycle model, we need to create a product system. Before we do so, we should set a cut-off criterion for the model, in the openLCA preferences page (file/preferences):



Then we create a product system..

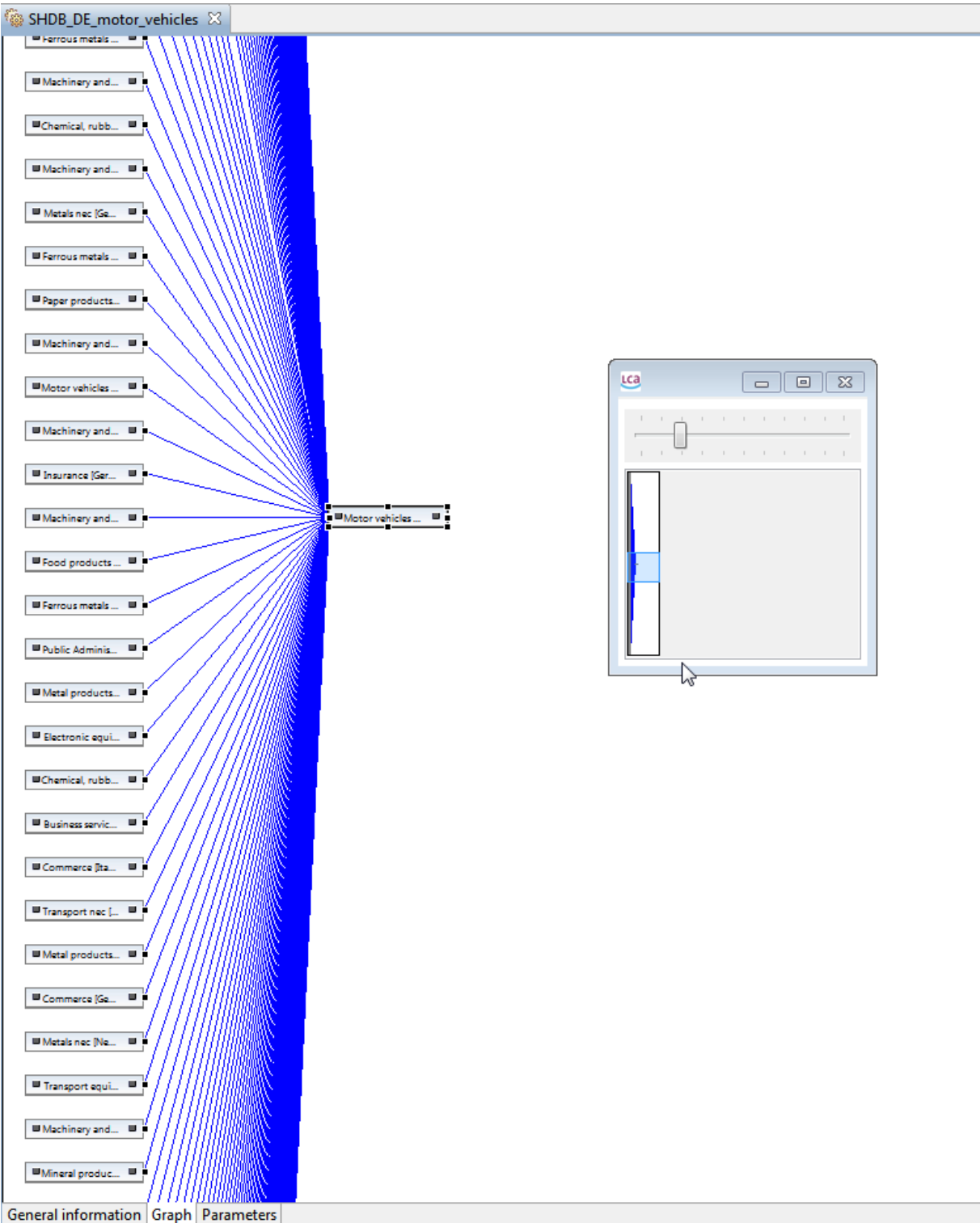


.. enter a cut-off..



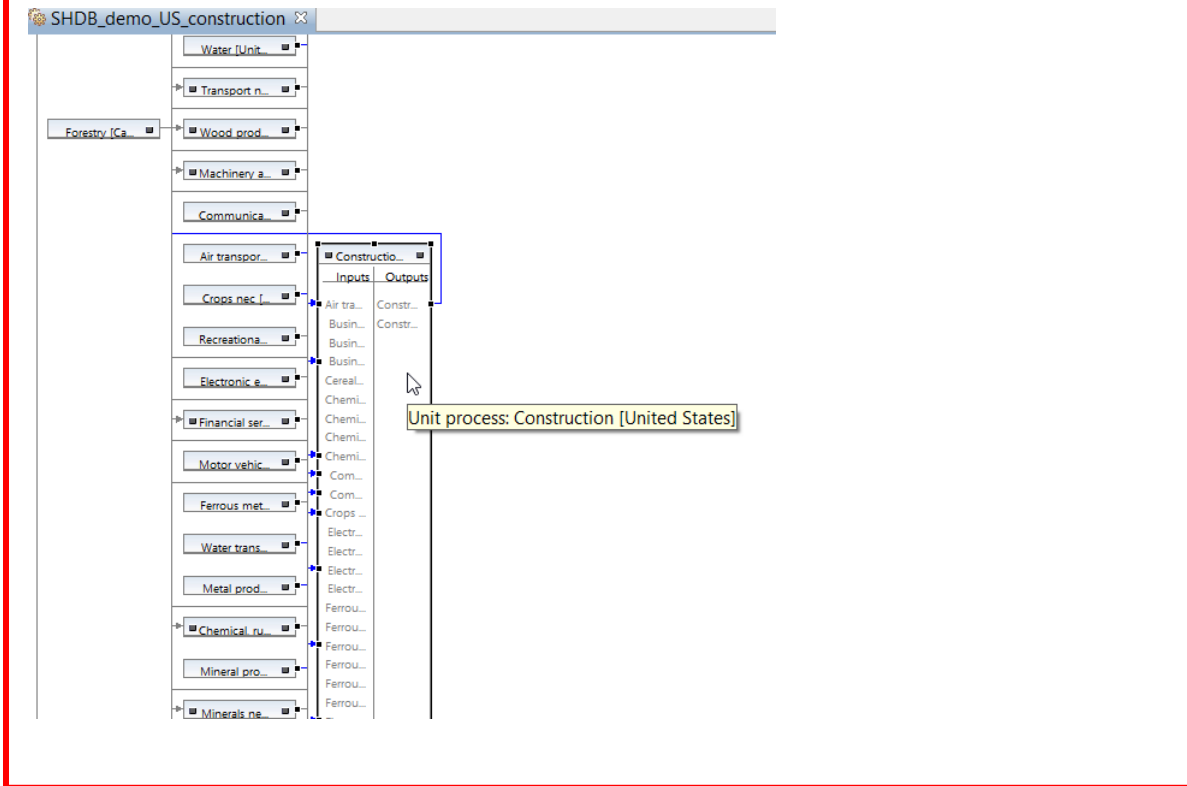
.. and click on 'finish'.

The resulting product system is a typical “IO type” model, with many interconnections between the different processes. For our system, already in the first tier, there are about hundred different processes connected.

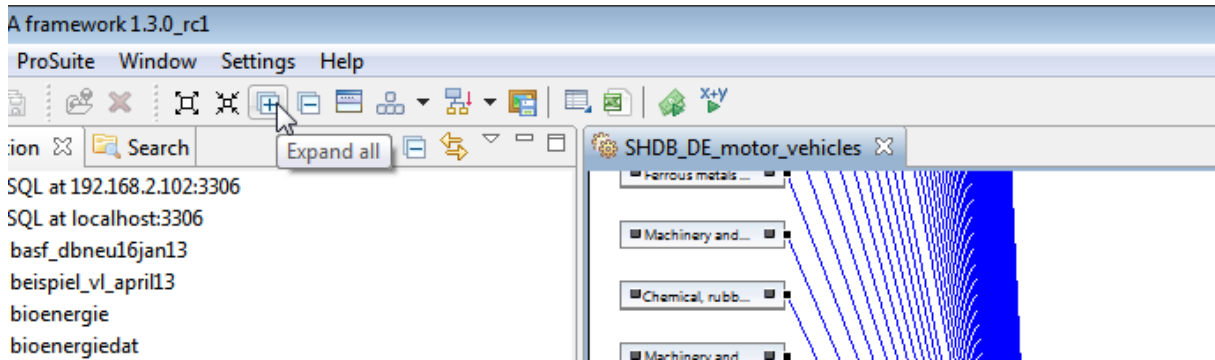


This is also the reason why you should specify a cut-off for the product system.

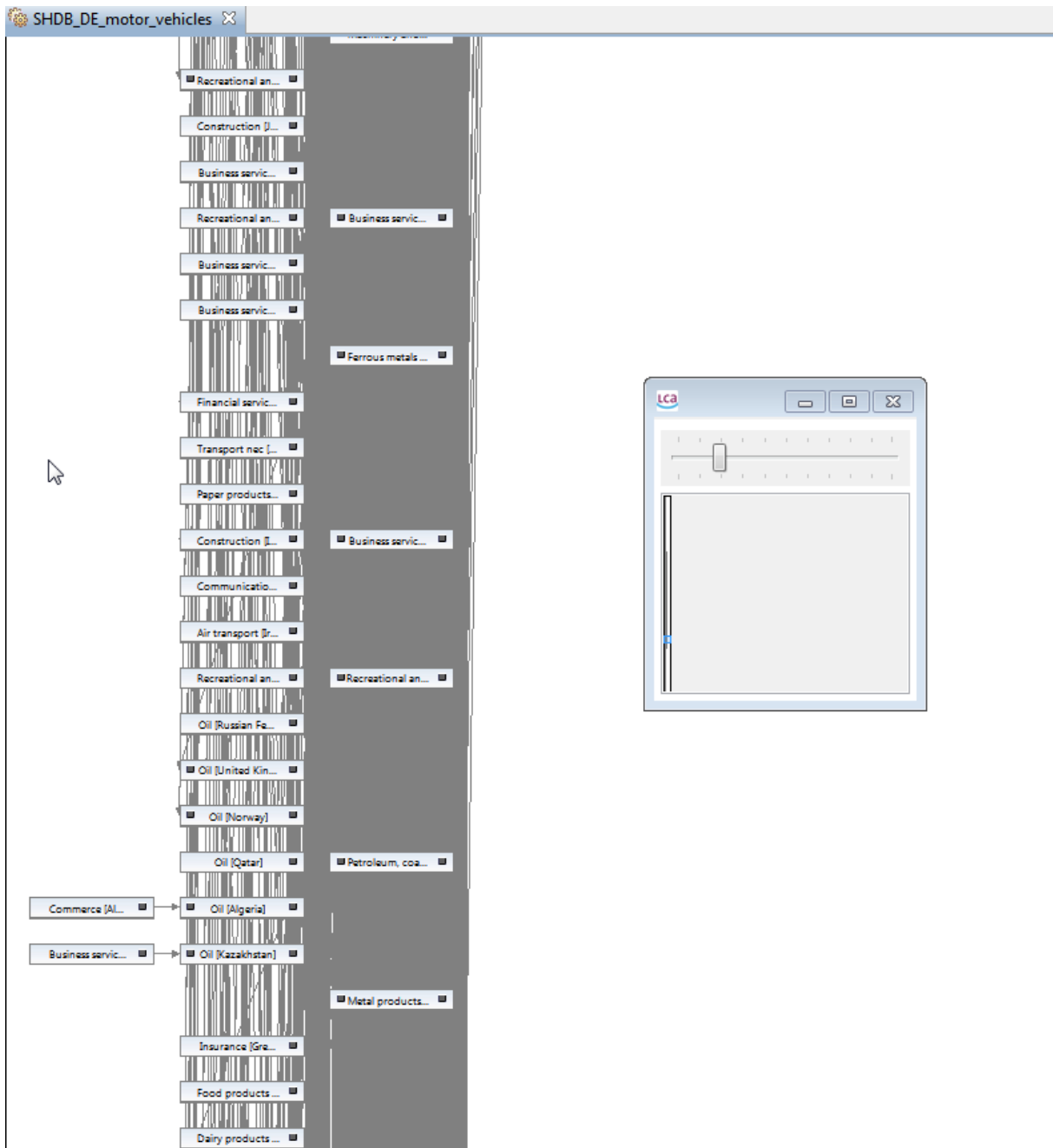
For the demo, unit process “Construction in United States” is chosen and the cut-off criteria is set to 1% which is quite high to prevent reverse engineering. For this reason there will be less interconnection in the process graph.



If you expand all processes in the process graph..



..you see that due to the cut-off, only a few tiers are contained in the model. For example, “oil [Qatar]” is not followed up further, while “Oil [Kazakhstan]” has a connection to business services.

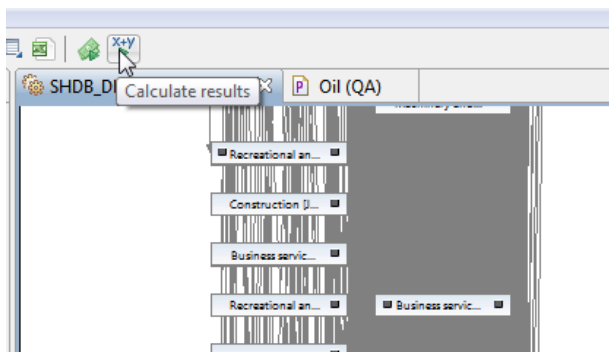


And of course, Oil [Qatar] has connections to many other processes in the database.

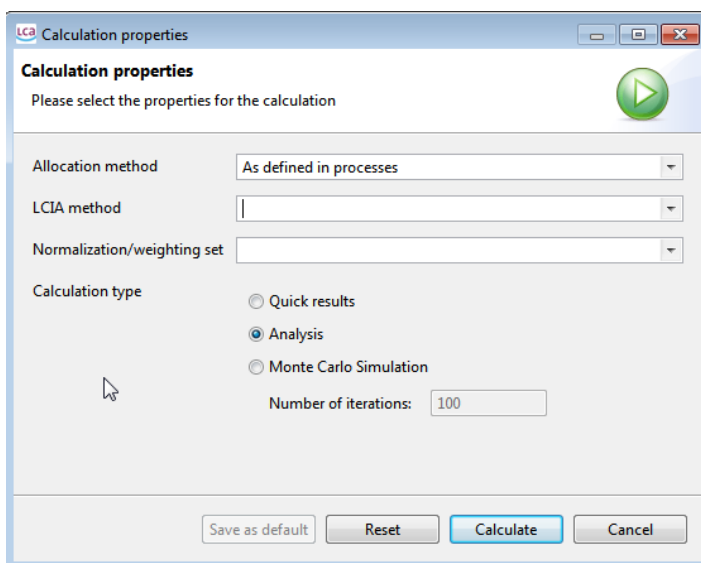
The screenshot shows the configuration for the "Process: Oil (nexus\_demonstration)". Under the "Allocation" section, the "Allocation method" is set to "None". Under the "Inputs" section, there is a table with the following data:

Flow	Category	Flow property	Unit	Resulting
Air transp...	social ...	Market value USD 20...	U...	4.8826851
Air transp...	social ...	Market value USD 20...	U...	2.9977708
Air transp...	social ...	Market value USD 20...	U...	1.6929992
Air transp...	social ...	Market value USD 20...	U...	0.0011106
Air transp...	social ...	Market value USD 20...	U...	1.2298587

If we calculate the product system..



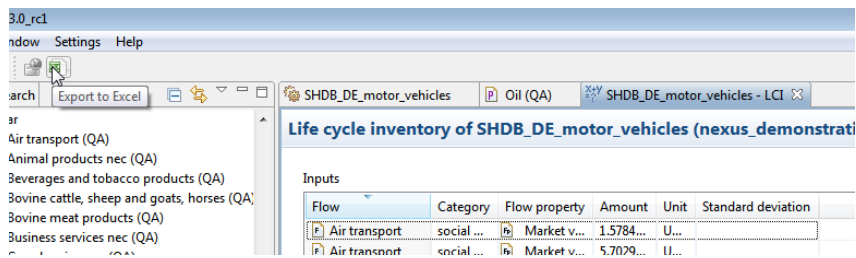
.. we can both do a quick calculation and also an in-depth analysis. An LCIA (life cycle impact assessment method) is not available at this point but since the flows per process already contain the assessment (as low risk, medium risk, high risk) disaggregated results are already available.



The quick results are the “life cycle inventory” of the system:

Inputs						Outputs					
Flow	Category	Flow property	Amount	Unit	Standard deviation	Flow	Category	Flow property	Amount	Unit	Standard deviation
Air transport	social ...	Market v...	1.5784...	U...		Characterization of B...	Govern...	Work int...	0.00147	w...	
Air transport	social ...	Market v...	5.7029...	U...		Characterization of B...	Govern...	Work int...	0.00675	w...	
Air transport	social ...	Market v...	6.2136...	U...		Characterization of B...	Govern...	Work int...	0.07509	w...	
Air transport	social ...	Market v...	0.00025	U...		Characterization of B...	Govern...	Work int...	0.01380	w...	
Air transport	social ...	Market v...	2.4456...	U...		Characterization of Ci...	Huma...	Work int...	0.00581	w...	
Air transport	social ...	Market v...	0.00024	U...		Characterization of Ci...	Huma...	Work int...	0.07396	w...	
Air transport	social ...	Market v...	0.00019	U...		Characterization of Ci...	Huma...	Work int...	0.00608	w...	
Air transport	social ...	Market v...	8.5720...	U...		Characterization of Ci...	Huma...	Work int...	0.00013	w...	
Air transport	social ...	Market v...	8.2259...	U...		Characterization of Ci...	Huma...	Work int...	0.01112	w...	
Air transport	social ...	Market v...	1.6375...	U...		Characterization of Ci...	Huma...	Work int...	0.00581	w...	
Air transport	social ...	Market v...	8.5740...	U...		Characterization of Ci...	Huma...	Work int...	0.07396	w...	
Air transport	social ...	Market v...	7.7590...	U...		Characterization of Ci...	Huma...	Work int...	0.00608	w...	
Air transport	social ...	Market v...	2.1372...	U...		Characterization of Ci...	Huma...	Work int...	0.00013	w...	
Air transport	social ...	Market v...	1.8455...	U...		Characterization of Ci...	Huma...	Work int...	0.01112	w...	
Air transport	social ...	Market v...	1.1861...	U...		Characterization of Cl...	Govern...	Work int...	0.00634	w...	
Air transport	social ...	Market v...	5.2369...	U...		Characterization of Cl...	Govern...	Work int...	0.07455	w...	
Air transport	social ...	Market v...	5.4848...	U...		Characterization of Cl...	Govern...	Work int...	0.00013	w...	
Air transport	social ...	Market v...	7.5990...	U...		Characterization of Cl...	Govern...	Work int...	0.01608	w...	
Air transport	social ...	Market v...	0.00015	U...		Characterization of Cl...	Huma...	Work int...	0.00581	w...	
Air transport	social ...	Market v...	2.4503...	U...		Characterization of Cl...	Huma...	Work int...	0.07396	w...	

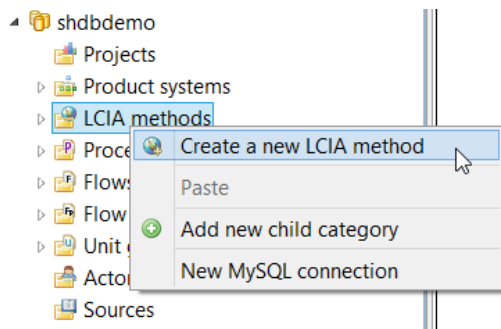
They can be exported to excel for further analysis, and for creating graphs.



The analysis results allow a more in-depth analysis in openLCA. Also they can be exported to excel.

### 2.2.1 Developing an impact assessment method

It is also possible to implement an LCIA method for the SHDB.



As an example, a method is created for demo “Social LCIA method1”.

Impact categories are created with the reference units.

Name	Reference unit
Child Labor	CL med rh
Collective bargaining etc	CB med rh
Corruption	CO med rh
Drinking Water	DW med rh
Excessive Working Time	EW med rh
Forced Labor	FL med rh
Gender Equity	GE med rh
High Conflict	HC med rh
Hospital Beds	HB med rh
Improved Sanitation	IS med rh
Indigenous Rights	IR med rh
Injuries & Fatalities	IF med rh
Legal System	LS med rh
Migrant Labor	ML med rh
Poverty Wage1	PW1 med rh
Poverty Wage2	PW2 med rh
Poverty Wage3	PW3 med rh
Toxics & Hazards	TH med rh

For each category LCIA factors are given from low to very high risk. The screenshot below shows only one category:

Flow	Category	Flow property	Unit	Value	Uncertainty
⚠ Risk of Sector Ave Wage being lower than Country's Minimum Wage, high risk	Labor Rights & Decent Work / Wag...	Work intensity	work hours	5.00000	none
⚠ Risk of Sector Ave Wage being lower than Country's Minimum Wage, low risk	Labor Rights & Decent Work / Wag...	Work intensity	work hours	0.01000	none
⚠ Risk of Sector Ave Wage being lower than Country's Minimum Wage, medium risk	Labor Rights & Decent Work / Wag...	Work intensity	work hours	1.00000	none
⚠ Risk of Sector Ave Wage being lower than Country's Minimum Wage, undefined risk l...	Labor Rights & Decent Work / Wag...	Work intensity	work hours	0.00000	none
⚠ Risk of Sector Ave Wage being lower than Country's Minimum Wage, very high risk	Labor Rights & Decent Work / Wag...	Work intensity	work hours	10.00000	none

The method then can be used in the calculation. It is of course not really an LCIA method in the pure sense but rather an interpretation method; the mathematical approach is identical to an LCIA method.

Calculation properties

Please select the properties for the calculation

Allocation method: As defined in processes

LCIA method: Social LCIA method1

Normalization/weighting set: [Empty]

Calculation type:
 

- Quick results
- Analysis
- Monte Carlo Simulation

 Number of iterations: 100

Buttons: Save as default, Reset, Calculate, Cancel

## 2.2.2 The analysis of the product system

The analysis of the product system will be opened in the editor where you have access to different analysis tools such as general information, process contributions, grouping, locations, sun burst diagram, Sankey diagram.

On “General information” tab, you can export the complete results to MS Excel and see the flow and impact contributions ordered by hot spots or total contributions.

On the “LCI Total” tab depending on the cut-off that you set for modeling the product system, the results might contain also products, on the input side. The impacts are available as flows, on the output side.

**LCI - Total**

Inputs				
Flow	Category	Subcategory	Unit	Result
Air transport	social hotspots database	Algeria	USD 2002	4.03977E-6
Air transport	social hotspots database	Argentina	USD 2002	5.26525E-7
Air transport	social hotspots database	Australia	USD 2002	2.36862E-5
Air transport	social hotspots database	Austria	USD 2002	0.00020
Air transport	social hotspots database	Bangladesh	USD 2002	5.28549E-9
Air transport	social hotspots database	Belarus	USD 2002	6.34320E-8
Air transport	social hotspots database	Belgium	USD 2002	4.89623E-5
Air transport	social hotspots database	Belize	USD 2002	6.36796E-8
Air transport	social hotspots database	Bolivia	USD 2002	1.31100E-8
Air transport	social hotspots database	Botswana	USD 2002	9.63808E-7
Air transport	social hotspots database	Brazil	USD 2002	1.12937E-5
Air transport	social hotspots database	Bulgaria	USD 2002	1.60539E-7
Air transport	social hotspots database	Cambodia	USD 2002	2.20487E-8
Air transport	social hotspots database	Canada	USD 2002	1.19153E-5
Air transport	social hotspots database	Chile	USD 2002	2.95843E-6
Air transport	social hotspots database	China	USD 2002	7.79414E-5
Air transport	social hotspots database	Colombia	USD 2002	5.94063E-7
Air transport	social hotspots database	Costa Rica	USD 2002	2.51773E-8

Outputs				
Flow	Category	Subcategory	Unit	Result
Characterization of ILO's Forced Labor Regional Estimates, very high risk	Labor Rights & Decent Work	Forced Labor	work hours	0.00237
Characterization of Indigenous Population, high risk	Human Rights	Indigenous Rights	work hours	0.01337
Characterization of Indigenous Population, low risk	Human Rights	Indigenous Rights	work hours	0.07738
Characterization of Indigenous Population, medium risk	Human Rights	Indigenous Rights	work hours	0.00585
Characterization of Indigenous Population, very high risk	Human Rights	Indigenous Rights	work hours	0.00094
Characterization of large land holdings, high risk	Community Infrastructure	Smallholder v. Commercial Farms	work hours	0.00010
Characterization of large land holdings, low risk	Community Infrastructure	Smallholder v. Commercial Farms	work hours	0.00014
Characterization of large land holdings, medium risk	Community Infrastructure	Smallholder v. Commercial Farms	work hours	1.19199E-5
Characterization of large land holdings, no data	Community Infrastructure	Smallholder v. Commercial Farms	work hours	3.93627E-5
Characterization of People Under Threat Score, high risk	Human Rights	High Conflict Zones	work hours	0.01518
Characterization of People Under Threat Score, no data	Human Rights	High Conflict Zones	work hours	0.08226
Characterization of People Under Threat Score, very high risk	Human Rights	High Conflict Zones	work hours	8.87536E-5
Characterization of population that are immigrants, high risk	Labor Rights & Decent Work	Migrant Workers	work hours	0.07342
Characterization of population that are immigrants, low risk	Labor Rights & Decent Work	Migrant Workers	work hours	0.01724
Characterization of population that are immigrants, medium risk	Labor Rights & Decent Work	Migrant Workers	work hours	0.00435
Characterization of population that are immigrants, no data	Labor Rights & Decent Work	Migrant Workers	work hours	0.00072
Characterization of population that are immigrants, very high risk	Labor Rights & Decent Work	Migrant Workers	work hours	0.00180

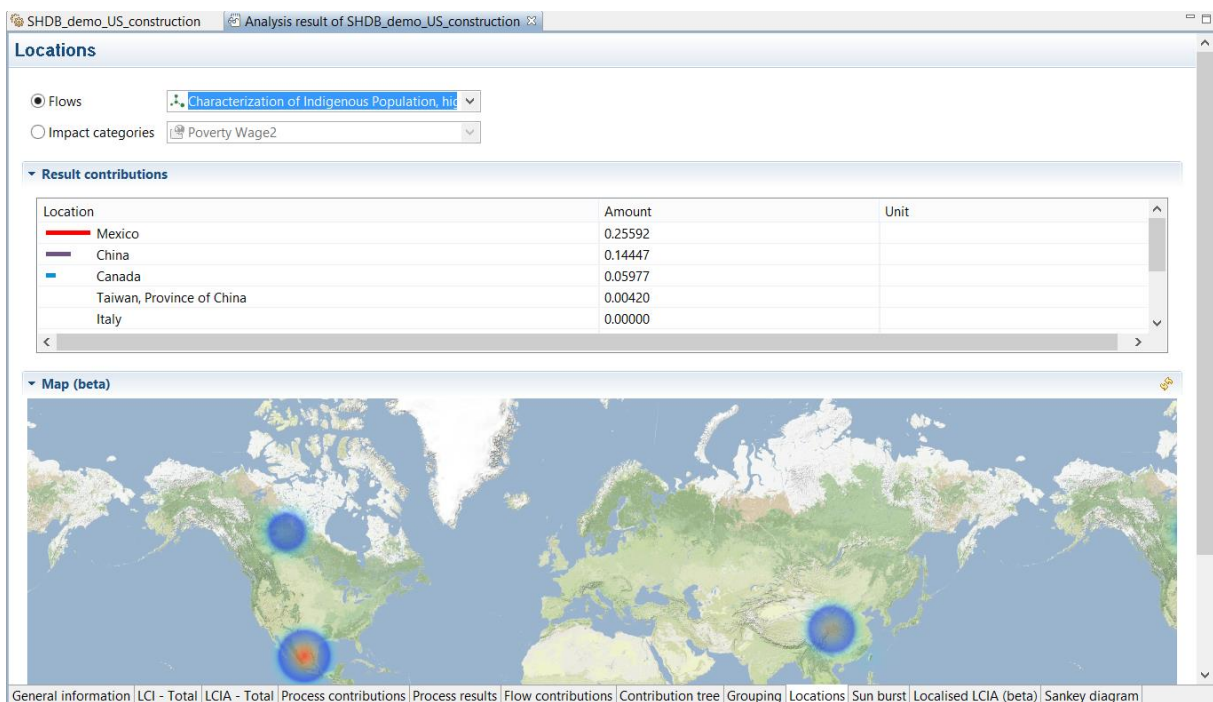


On the “Process contributions” tab the information of the percentage contribution to selected risk and also to selected impact category can be seen in detail.

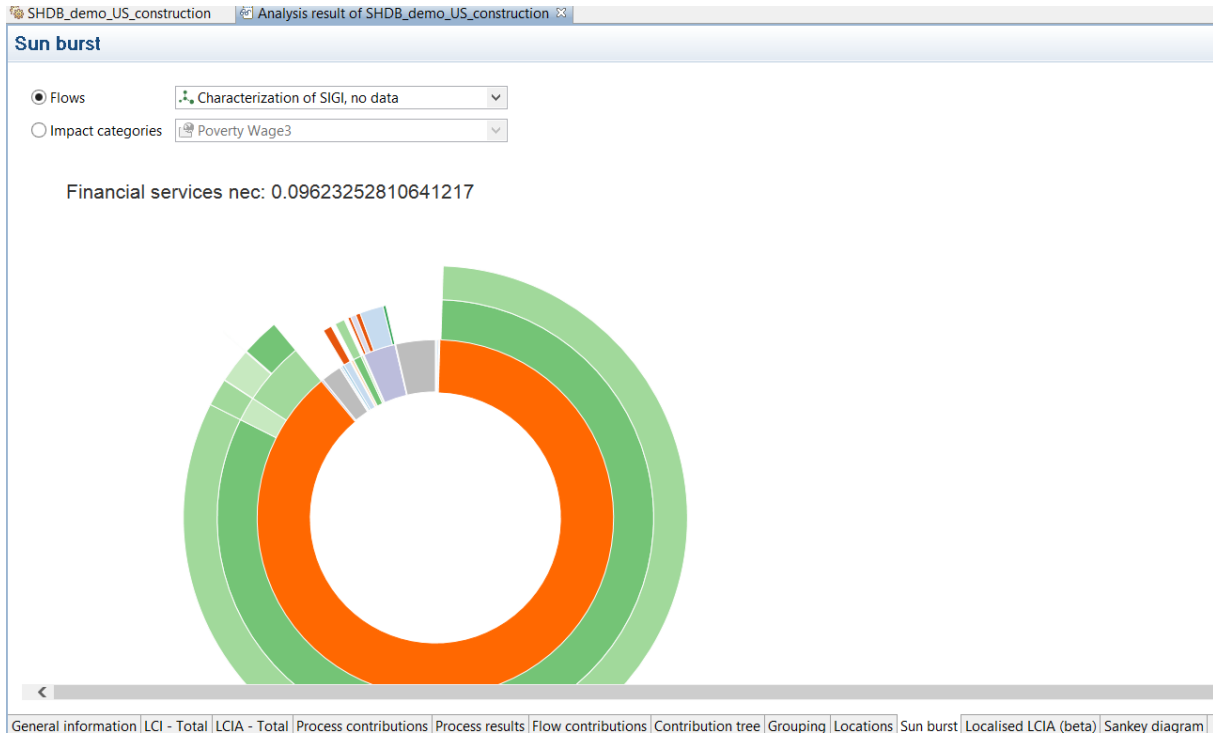
Contribution	Process	Total amount	Single amount	Unit
100.00%	Motor vehicles and parts	0.00234	0.00000	work hours
28.39%	Metals nec	0.00066	0.00027	work hours
16.88%	Transport nec	0.00039	0.00000	work hours
16.37%	Commerce	0.00038	0.00000	work hours
09.46%	Ferrous metals	0.00022	0.00011	work hours
08.83%	Petroleum, coal products	0.00021	0.00000	work hours
08.60%	Motor vehicles and parts	0.00020	0.00012	work hours
08.45%	Transport nec	0.00020	0.00020	work hours
07.69%	Metal products	0.00018	0.00000	work hours
07.37%	Oil	0.00017	9.29952E-6	work hours
06.98%	Commerce	0.00016	0.00016	work hours
06.73%	Ferrous metals	0.00016	0.00000	work hours
06.36%	Minerals nec	0.00015	8.15701E-5	work hours
06.32%	Business services nec	0.00015	0.00000	work hours

On the “Flow contributions” tab the percentage contribution of the associated risk levels for a certain category can be also seen.

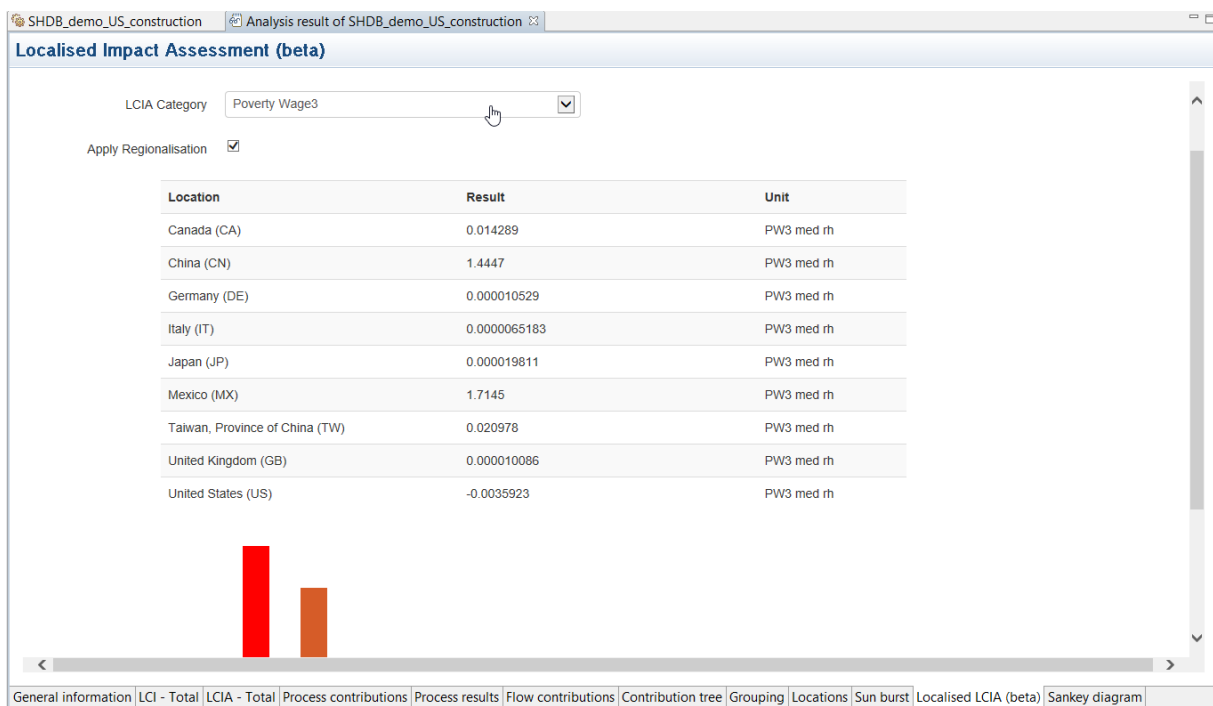
Another feature in openLCA is on “Locations” tab which shows the localized risks and impact categories on a world map.



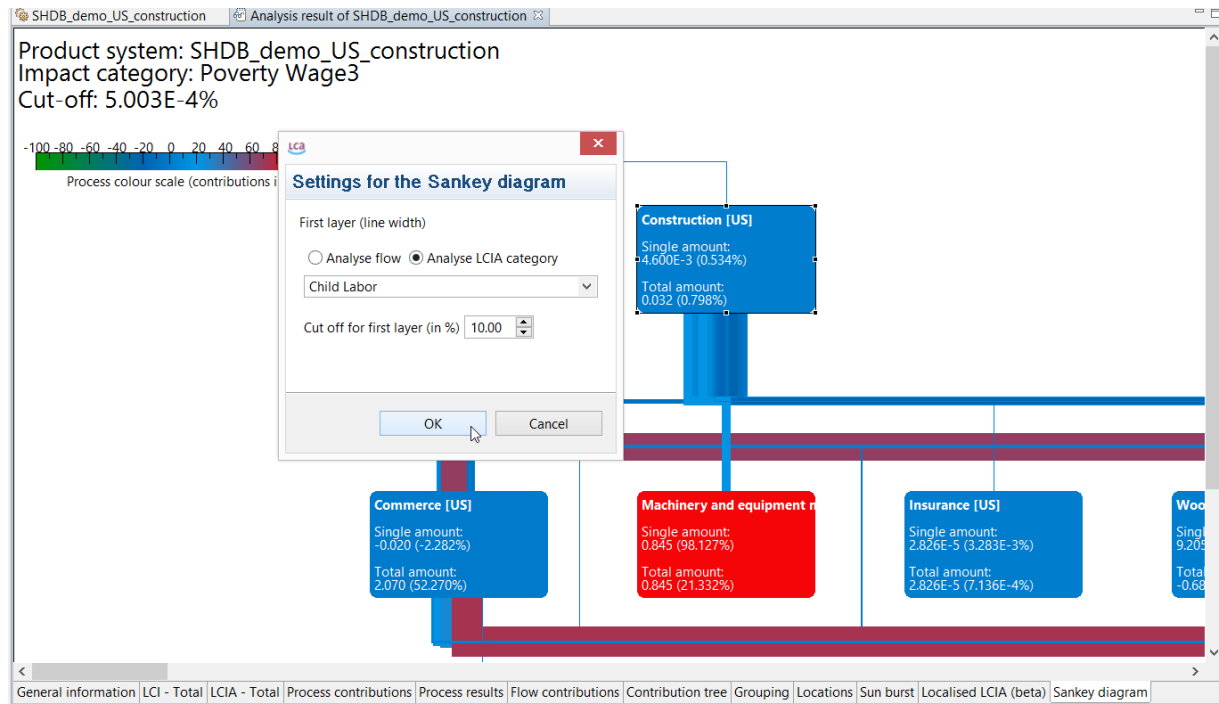
On the tab “Sun burst” you can find the sun burst chart which is a way to visualize hierarchical data. It is a radial space filling visualization technique for displaying tree like structures. Product systems have hierarchical relation to processes. Therefore with the sun burst chart you can visualize flows and impact categories correlating with the process hierarchy.



On the “Localised LCIA” you are able to have localized impact assessment for the selected LCIA Category which is also shown on a bar chart.



On the “Sankey diagram” two information at the same time can be read for selected flow or category: the process contribution represented by colors and upstream contribution share to a process represented by the thickness of the line.



## 2.3 Linking the SHDB with other data in openLCA

So far we have only considered the SHDB “standalone”; it is of course also possible, and often interesting, to combine SHDB with data from other sources. SHDB is based on the economic input-output tables which has advantageous as it takes into account the entire supply chain. However its dependency on cost information raise the question whether different national economic input output tables cause poor level of aggregation.

An approach is proposed as called hybrid EIO-LCA which replaces the price-proportionality assumption with a process based methodology analysis (Paulo Ferrao, Jorge Nhambiu 2010)

This can be done in two main ways.

First, a SHDB process can use other products from other sources. This is a bit interesting since the SHDB claims to already represent a full economy as it is an input output model; therefore, this modeling step requires some thoughts.

Second, SHDB process information can be linked to processes from another source, e.g. ELCD or ecoinvent. If the “other” (non-SHDB) process is a unit process, there is risk to either have two models that are not fully consistent (e.g. a full ecoinvent life cycle model and a full SHDB life cycle model) and/or to double count impacts that are linked to different processes in the non-SHDB life cycle and at the same time reflected in the SHDB model.

## 2.4 SHDB in openLCA: tips, known issues, further reading

### Tips

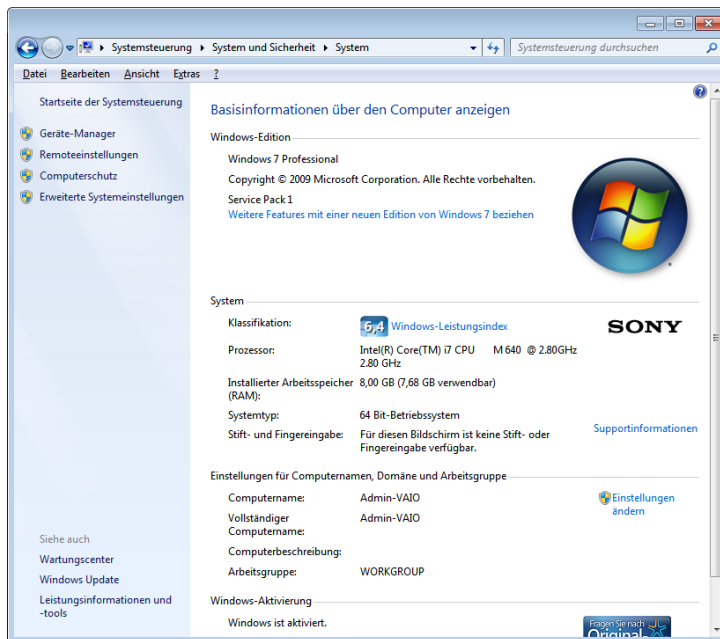
SHDB is a somewhat uncommon LCA database; every single model contains several thousand connections to other processes. It is therefore recommended to

- increase the memory available for openLCA (this is explained here: [http://openlca.org/documentation/index.php/Adapt\\_the\\_RAM\\_allocation](http://openlca.org/documentation/index.php/Adapt_the_RAM_allocation))
- ideally, calculate on a 64 bit computer since on a 32 bit computer the available memory cannot be higher than 2GB.
- Set a cut-off for the product system modeling

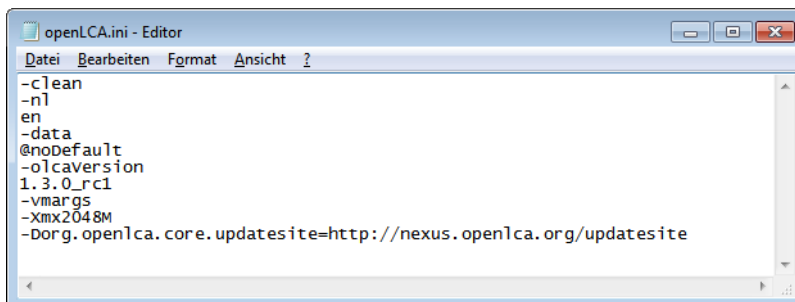
Typical values for the cut-off are 0.0001 or lower. If you have the feeling that meaningful elements are excluded with a specified cut-off, you can of course experiment with different values, in sensitivity analyses.

We have been able to work with the SHDB on a not-too recent computer:

- The computer is a Sony Vaio laptop, about three years old, with Windows 64 bit:



- openLCA is started with 2 GB RAM:



### Known issues:

Speed and performance of using SHDB should not be really a bottleneck for using the SHDB but can certainly be further optimized; this is on our to do list.

Some of the result pages can be further optimized for the SHDB. Especially, the country/region should always be added to the process name. If you have any comments, please let us know.

#### Further reading:

- For social LCA in general:

Andrews, E. S., Barthel, L.-P., Beck, T., Benoit, C., Ciroth, A., Cucuzella, C., Gensch, C.-O., Hérbert, J., Lesage, P., Manhart, A., Mazeau, P., Mazijn, B., Methot, A.-L., Moberg, A., Norris, G., Parent, J., Prakash, S., Reveret, J.-P., Spillemaeckers, S., Ugaya, C. M. L., Valdivia, S., Weidema, B.: UNEP/SETAC Life Cycle Initiative: Guidelines for social life cycle assessment of products, 2009;  
[http://lcinitiative.unep.fr/default.asp?site=lcinit&page\\_id=A8992620-AAAD-4B81-9BAC-A72AEA281CB9](http://lcinitiative.unep.fr/default.asp?site=lcinit&page_id=A8992620-AAAD-4B81-9BAC-A72AEA281CB9)

- For the social hot spots database:

New Earth. 2013. Social Hotspots Database V2. [www.socialhotspot.org](http://www.socialhotspot.org)

Benoît-Norris, C. Data for Social LCA (Editorial). 2013. The International Journal of Life Cycle Assessment, Online First: <http://link.springer.com/content/pdf/10.1007%2Fs11367-013-0644-7.pdf>

Benoit-Norris, C.; Cavan, D.A.; Norris, G. Identifying Social Impacts in Product Supply Chains: Overview and Application of the Social Hotspot Database. Sustainability 2012, 4, 1946-1965, <http://www.mdpi.com/2071-1050/4/9/1946/pdf>.

- For openLCA:

[www.openlca.org](http://www.openlca.org), [www.openlca.org/documentation](http://www.openlca.org/documentation) (the documentation wiki).

### 3 References

Benoît-Norris, C. Data for Social LCA (Editorial). 2013. The International Journal of Life Cycle Assessment, Online First: <http://link.springer.com/content/pdf/10.1007%2Fs11367-013-0644-7.pdf>

Benoît-Norris, C., D. Auliso, G. A. Norris. 2012. Identifying Social Impacts in Product Supply Chains: Overview and Application of the Social Hotspot Database. MDPI, Sustainability. Available online: <http://www.mdpi.com/2071-1050/4/9/1946/xml&ei=TYuTUoqjMurJsQTFqoGYDA&usg=AFQjCNE-yAjiV0ekbY5D8WwF9mqIis99aQ&bvm=bv.56988011,d.cWc&cad=rja>

Norris, G. (2006): Social Impacts in Product Life Cycles: Towards Life Cycle Attribute Assessment. Int J LCA 11: Special Issue 1: 97–104.

Ciroth, A.: Aggregation in Social LCA Case Studies, presentation, SETAC Case Study Symposium Copenhagen, Nov. 26 - 28, [www.greendelta.com/uploads/media/SETAC\\_CPH\\_ac\\_socialaggr.pdf](http://www.greendelta.com/uploads/media/SETAC_CPH_ac_socialaggr.pdf)

Ferrao, P., Nhambiu, J. (2010): A Comparison Between Conventional LCA and Hybrid EIO-LCA: Analyzing Crystal Giftware Contribution to Global Warming Potential, Handbook of Input-Output Economics in Industrial Ecology, 219-230.

## 4 Contact

If you have any questions or comments, please let us know.

GreenDelta GmbH, Müllerstrasse 135, 13349 Berlin, GERMANY

Dr. Andreas Ciroth

[gd@greendelta.com](mailto:gd@greendelta.com)

Tel. +49 30 48 496 - 031 | Fax +49 30 48 496 – 991

**GreenDELTA**