

ELCD 3.2 in openLCA



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1 ELCD 3.2 – What’s new?

The ELCD 3.2 database contains nine new processes, which are listed in Table 1. In addition, many ELCD 3.2 datasets have been reviewed against the ILCD entry-level data quality requirements in order to provide quality-assured LCI data, so that now 190 of the datasets included in the database are ILCD entry-Level compliant datasets, according to JRC¹. In total, the ELCD 3.2 database contains 503 processes for sectors such as energy, transport and materials production.

Table 1. New process datasets in ELCD 3.2

Process name	Location
Titanium Dioxide, production mix, at plant, Chloride and sulphate processes, > 80% TiO ₂	GLO
Lead sheet mix, production mix, at producer, technology mix, secondary	EU-27
Bentonite granular, sodium activated, Production at plant, 1000 kg of bentonite sodium activated granular with a particle size ranging from 0.5 to 5 mm and a moisture content ranging between 8 and 13%, stored in silo, ready to be shipped in bulk., none	RER
cartonboard sheets; mixed technology; production mix, at plant; 46% primary fibre, 54% recovered fibre (en)	EU-27
corrugated board sheets, production mix, at plant, technology mix, 18% primary fibre, 82 % recycled fibre	EU-27
Bentonite powder, sodium activated, Production at plant, 1000 kg of bentonite sodium activated powder with particle sizes below 74 µm and a moisture content ranging between 8 and 12%, stored in silo, ready to be shipped in bulk., None	RER
Steel tinplate without EoL recycling (collection year 2012/2013), European, production mix, at plant, blast furnace route, 1kg, typical thickness between 0.13 - 0.49 mm. typical width between 600 - 1100 mm.	RER
GCC slurry, Production at plant, Ground Calcium Carbonate (GCC) - slurry, unbleached and uncoated, with a solid content of 75% in the slurry, a CaCO ₃ content of 98% or more, a median particle size ranging typically from 1 to 3 µm, ready to be shipped ...	RER
Porocalce plaster production, Production mix at plant - Southern Italy, Porocalce plaster - Milling and mixing of sand, perlite, expanded glass, calcium hydroxide, 1 kg, Plaster	IT

¹ <http://eplca.jrc.ec.europa.eu/ELCD3/index.xhtml>

2 ELCD 3.2 in openLCA

Several improvements or modifications from the original ILCD package available in the [European Platform for LCA](#) were carried out during the implementation of the database in openLCA:

- Refactoring of categories in all elements of the database: the original ILCD package contained a structure of categories not compliant with the ILCD format and, in many cases, with duplicate folders or inconsistent organization (Figure 1).

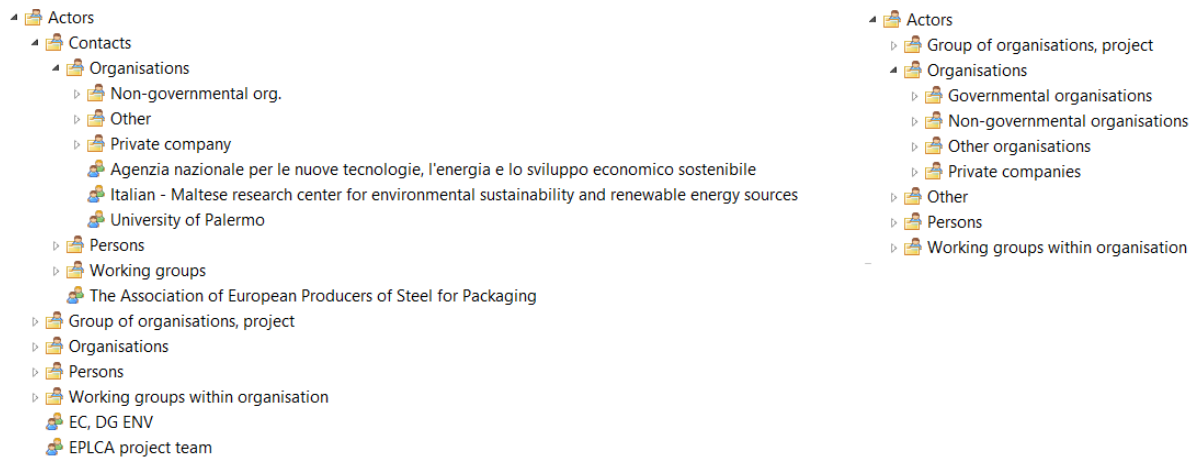


Figure 1. Actors categories in the original ELCD 3.2 database (left) and after refactoring (right), in openLCA 1.4.2

- Selection of quantitative references in those processes without a reference product stated in the original ILCD file.
- Adapt the ELCD datasets to the modelling requirements of openLCA (e.g. selection of quantitative references in those processes without a reference product stated in the original ILCD file, waste modelling, etc.). For further details, see [section 2.3](#).
- Addition of dummy processes and setting of default providers to facilitate the automatic creation of product systems (see [section 2.1](#) for more information).
- Mapping of the elementary flows to openLCA's reference data. This allows to combine different databases from openLCA Nexus in a more consistent way, as well as use the openLCA LCIA methods package available in the openLCA website².

² It should be taken into account that some elementary flows could not be mapped and were added new to the reference data. However, the LCIA methods pack available in the openLCA website might refer to an older version of the reference data, and, thus, not including impact factors for those new flows.

The next sections contain specific information about some of the modifications done, as well as tips and recommendations for the usage of the ELCD 3.2 database in openLCA.

2.1 Dummy processes

Over one hundred “dummy” processes were added to the openLCA version of ELCD 3.2 under the category “Dummy processes” (Figure 2) in order to avoid the creation of misleading linkages when the connections of the product system are added automatically.

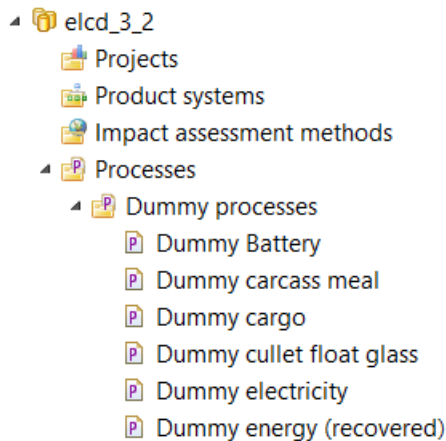


Figure 2. Dummy processes category in the ELCD 3.2 database in openLCA 1.4.2

These “dummy” processes contain no other input or output apart from the reference product and, therefore, no environmental impact. Their reference flows are those product flows which are consumed by some processes in ELCD but are not the reference flow of any process in the database. In previous versions of ELCD in openLCA, when a user selected to add automatically the connections in the product system, meaningless links were created for the mentioned flows due to the lack of a direct supplier or waste treatment within the ELCD database (Figure 3).

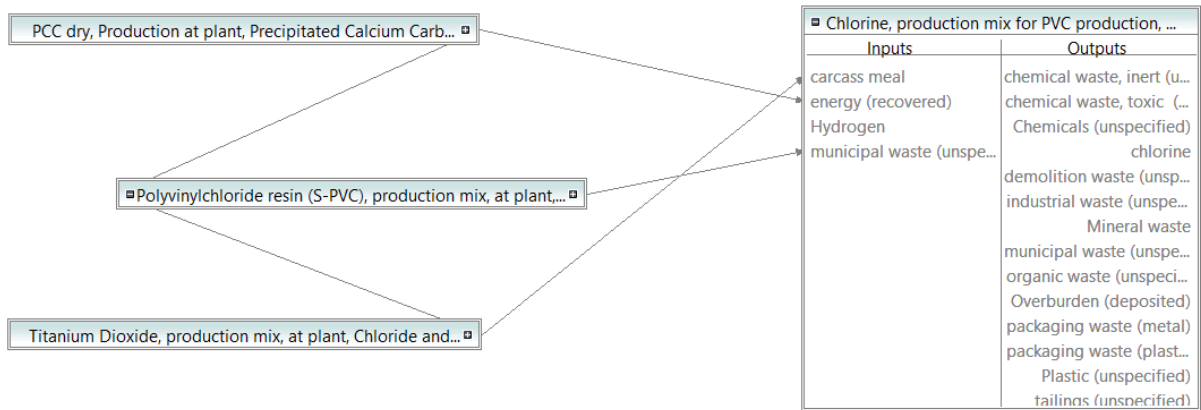


Figure 3. Product system automatically created by openLCA for "Chlorine" produced by "Chlorine, production mix for PVC production, [...] -RER" when no dummy processes are included in the database

In this new version, the dummy processes are selected by openLCA when creating automatically the supply chain (Figure 4). This way, the user will not calculate misleading results and will be more aware of dummy connections. In order to ensure the connection with the dummy processes when creating automatically the product systems, they were set as "default provider" in the exchanges with the mentioned flows as input.

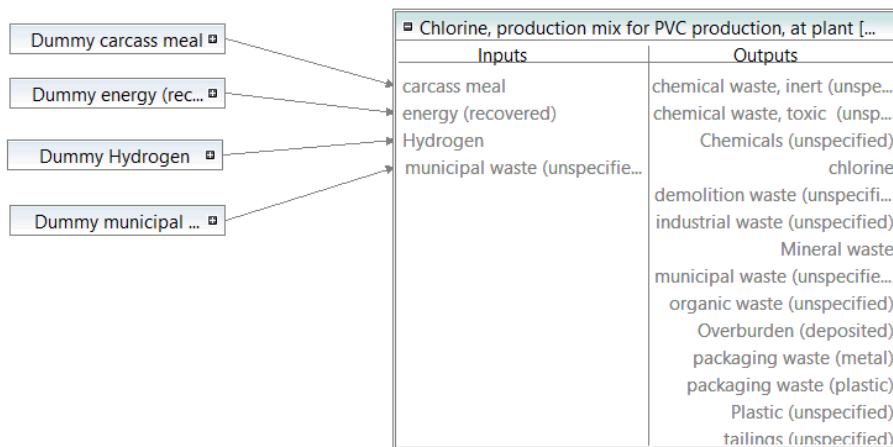


Figure 4. Product system automatically created by openLCA for "Chlorine" produced by "Chlorine, production mix for PVC production, [...] -RER" when dummy processes are included in the database

However, it should be taken into account that it is strongly recommended to avoid creating only automatically the product systems using the ELCD databases in openLCA. Therefore, if you select the "Add connected processes" option in the product system wizard (Figure 5), please remember to check the created linkages in the "Model graph" tab of the product system editor. Likewise, if you use the "Build supply chain" option from the right-click menu with the model graph.

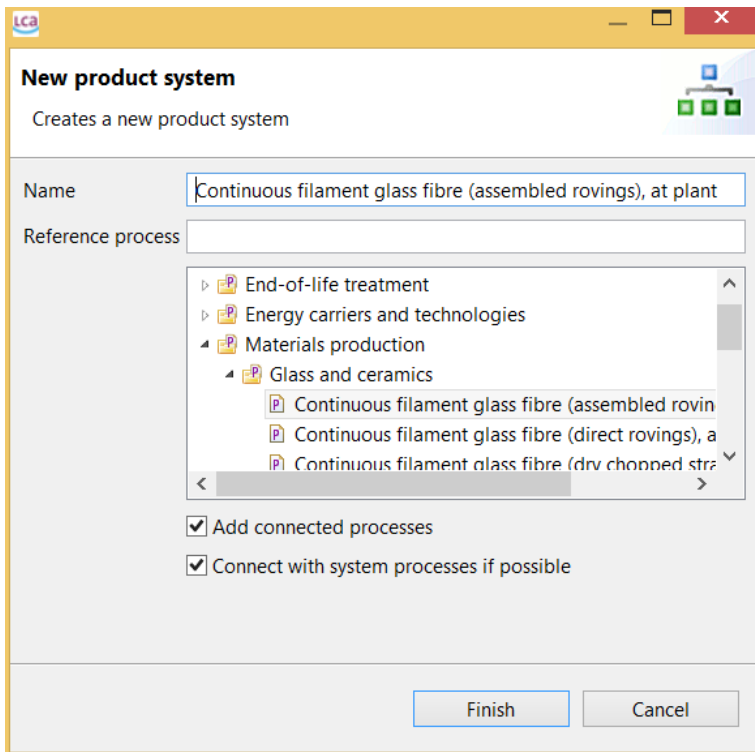


Figure 5. Wizard for creating a product system in openLCA 1.5.0 beta 1

If you want to delete any of the existing connections, right-click on the linking arrow and select “Delete” (Figure 6). For removing multiple connections, you can also right-click on a process or the blank canvass and select “Remove connections”.

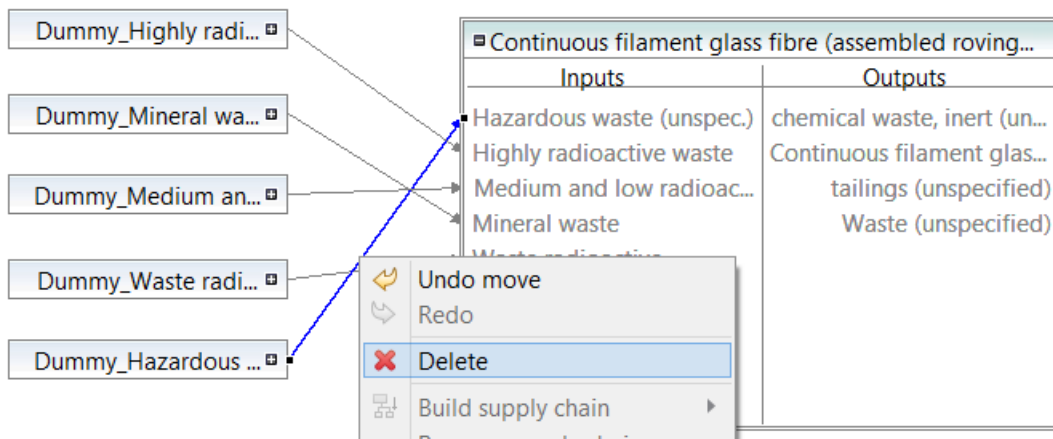


Figure 6. Deleting a connection in the “Model graph” tab of the product system in openLCA 1.4.2

If you want to search for different providers/recipients, right-click on the process box and select “Search providers for” or “Search recipients for” and the flow that you want to connect (Figure 7).

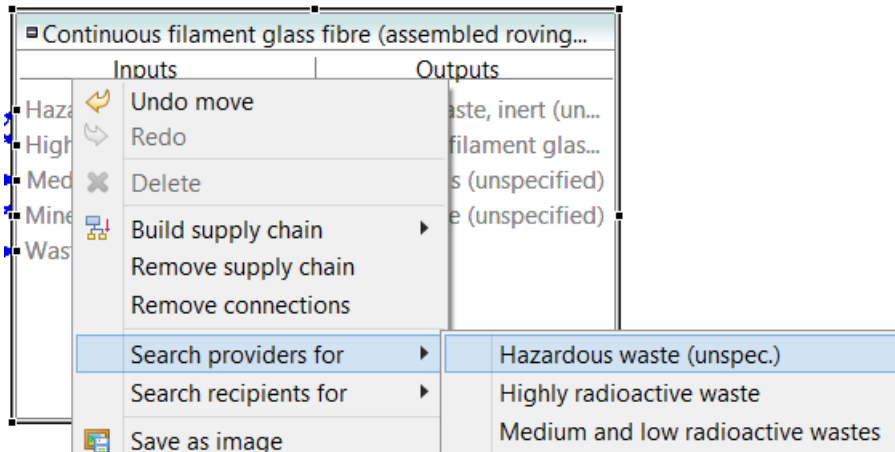


Figure 7. Searching for providers in the “Model graph” tab of the product system in openLCA 1.5.0 beta 1

If you plan to repeat the same connections in several product systems, you can also set the desired providers as default within the process editor in order to ensure that the connections created automatically with the “Add connected processes” or “Build supply chain” functions are correct.

2.2 Transport modelling

The way transport processes are modelled in the ELCD database is very different from the approach followed by e.g. the ecoinvent database. This might be caused because many of the datasets in ELCD were created using the LCA software GaBi, which requires a manual modelling of the product systems and allows to create connections between flows with different names or reference IDs. Most of the transport processes in ELCD contain usually a “cargo” or “excavated material” flow both as input and output. This way of modelling allows the user to create the desired transport routes connecting one transport process after the other. The idea in GaBi is then to link the input flow to the material that needs to be transported (e.g. output in a production plant) and the output flow to the material in the location where it was transported (e.g. input to the retailer), as shown in Figure 8.

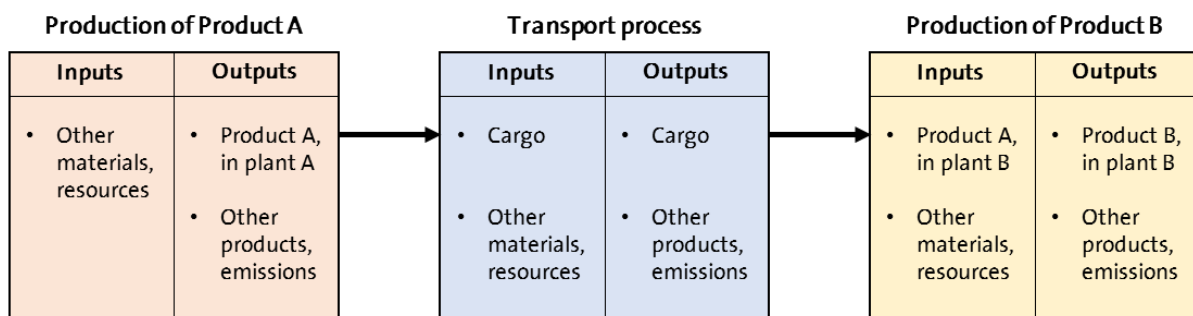


Figure 8. Transport modelling in GaBi and, consequently, in most of the ELCD transport processes

However, openLCA has the requirement that only equal flows can be linked together in the product system. Thus, different modelling approaches should be followed in order to connect the transport systems with the product before and after being transported. Some of the options might be:

- Option 1: Creation of an auxiliary process for connecting the transport phase, the product to be transported and the transported product consumed by the next phase (Figure 9).

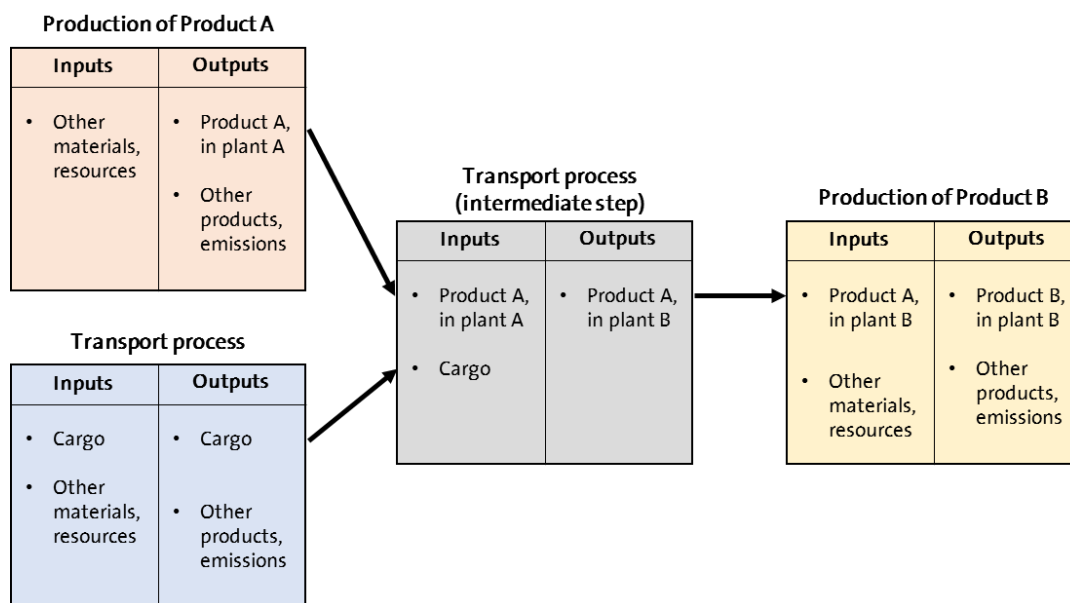


Figure 9. Option 1 suggested for transport modelling using ELCD database in openLCA.

- Option 2: Creation of two auxiliary processes to relate the product with the cargo flow, and vice versa. The new process will contain the flow representing the material to be transported as input and the cargo flow as output, with equal amounts. Likewise, another process with cargo as input and the material at the final destination as output will also be needed (Figure 10).

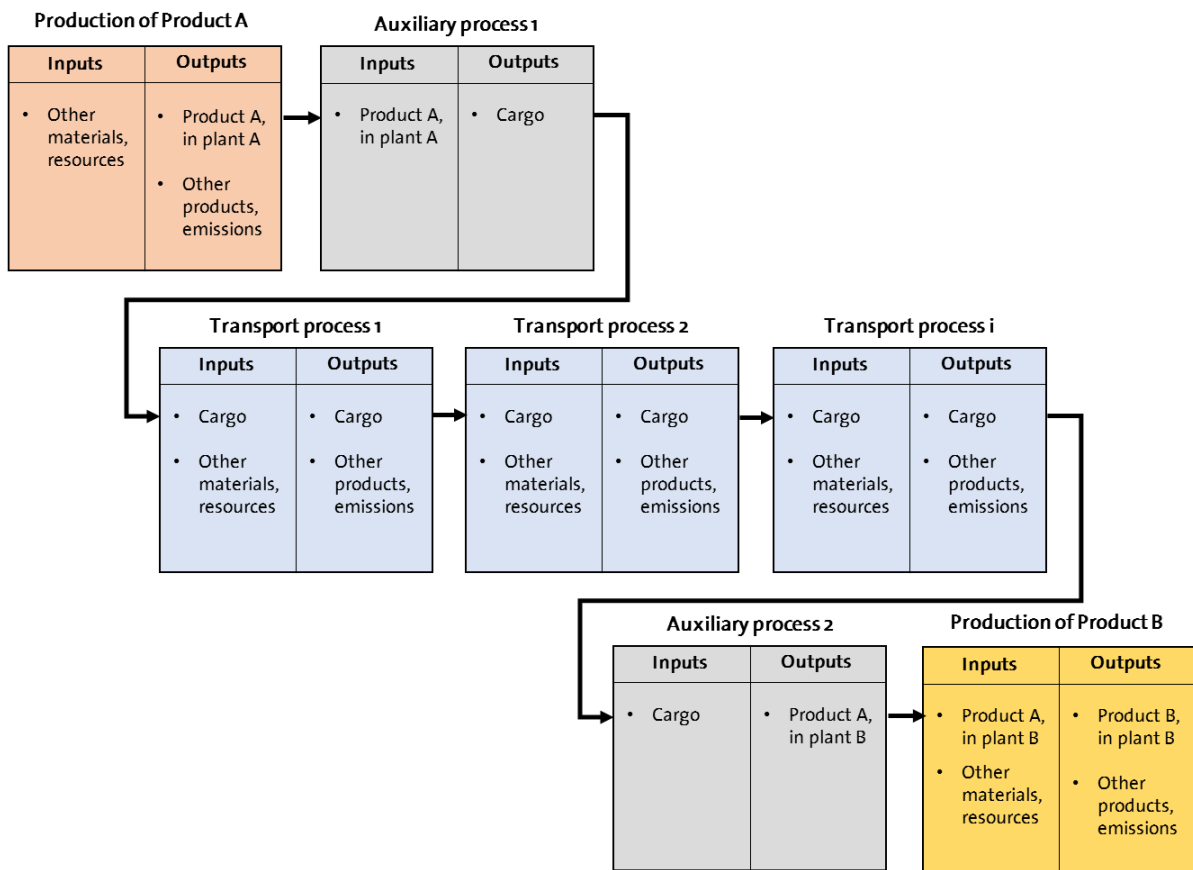


Figure 10. Option 2 suggested for transport modelling using ELCD database in openLCA.

- Option 3:** Include the transport in the production/use/disposal process dataset. This approach will be similar to the transport modelling followed in other databases such as ecoinvent. The cargo flow added as input in the correspondent process with amount equal to the product to be transported will have as provider the last transport process of the chain you created. Consequently, the product in the e.g. manufacturing process will not represent the “product, at plant” but “product, at destination”. This will be connected to the next process of the LCA directly. The cargo input flow of the first transport process in the chain you created will remain unconnected (Figure 11). By default, it is connected to a “Dummy” process (i.e. no impact associated with it; it will contain only the cargo flow as output), in order to avoid the cargo input flow to be listed in the inventory results. In addition, this prevents the existence of loops within the same transport process, leading to errors in the calculation (i.e. the provider for the cargo input is the cargo output of the same process).

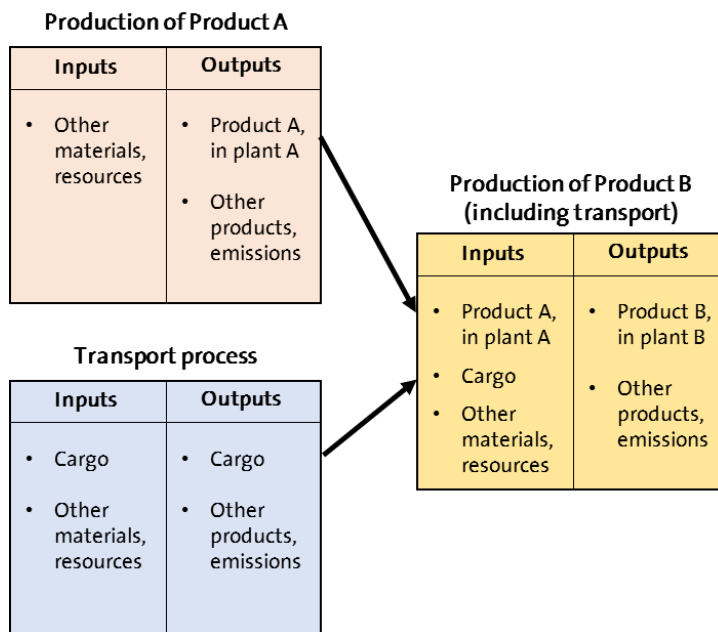


Figure 11. Option 3 suggested for transport modelling using ELCD database in openLCA.

2.3 Waste modelling

Although most of the processes in the ELCD database are defined as system processes in openLCA, they are actually in many cases “Partly terminated systems”. That means that they are aggregated datasets with at least one product flow, apart from the reference flow, as input or output that needs further modelling (Figure 9). As specified by the ILCD format, these datasets might “include relevant amounts of waste flows for which the waste management has not been modelled yet”.

▼ Outputs				
Flow	Category	Flow proper...	Unit	Amount
⚙️ chlorine	Materials production/Inorganic chemicals	Mass	kg	1.0
⚙️ Wood	Production residues in life cycle/Waste for recovery	Mass	kg	2.7969E-5
⚙️ Wooden pallet (EURO)	Production residues in life cycle/Waste for recovery	Mass	kg	9.30863E-11
⚙️ Plastic (unspecified)	Production residues in life cycle/Waste for recovery	Mass	kg	4.50248E-4
⚙️ Chemicals (unspecified)	Production residues in life cycle/Waste for recovery	Mass	kg	0.007583844
⚙️ Waste paper	Production residues in life cycle/Waste for recovery	Mass	kg	1.7765E-9
🗑️ demolition waste (unspec...	Wastes/Construction waste	Mass	kg	5.11583E-7
🗑️ tailings (unspecified)	Wastes/Mining waste	Mass	kg	3.18443E-5
🗑️ chemical waste, toxic (un...	Wastes/Production residues	Mass	kg	0.004200282

Figure 12. Excerpt of waste output exchanges in the process “Chlorine, production mix for PVC production, at plant-RER” existing originally in the ELCD 3.2 database

In the original ELCD datasets, the wastes³ generated in a process were included as positive outputs, and waste treatment processes had the waste to be treated as a positive input. In order to meet current openLCA requirements⁴ (i.e. there should always be an output product flow as quantitative reference in the process; processes cannot be added downstream of the reference process in the product system), some modifications were applied during the implementation of the ELCD database in openLCA. These are:

1. Wastes not consumed as raw materials in any process of the ELCD database (i.e. only produced): They were moved from the output to the input side of the generating process with the sign changed.
2. Wastes also consumed as raw materials in at least one process of the ELCD database: they were kept as outputs with the same amount in the processes generating them, and as inputs in the process consuming them.
3. Wastes treated in a waste treatment process: if they were the reference flow of the dataset, they were moved to the output side of the waste treatment dataset with changed sign (i.e. negative sign) and selected as quantitative reference.

How should the wastes be connected to the correspondent waste treatment in openLCA?

- **Wastes not considered as raw material by any process** (thus, included in openLCA as negative inputs) can be connected to the waste treatment by selecting this as provider in the product system. This is the same way of modelling wastes as in the ecoinvent 3 database. As the flow has negative sign both in the process which generates it and in the waste treatment, the impacts of the treating the waste will be added to the overall result of the system. It might be possible that there is not waste treatment with reference flow equal to the waste generated in the process. However, this can be solved by creating auxiliary processes matching the waste generated with the correspondent waste treatment (e.g. “Natrium oxide – Hazardous waste for disposal” could be treated by the process with “Hazardous waste (unspec.)” as reference) (Figure 12).

³ In this section, “waste” refers to all non-elementary flows included in the “Production residues of the life cycle” and “Deposited goods” categories within the ELCD database.

⁴ Modifications in the openLCA core are planned for future versions of the software in order to allow more flexible modelling.

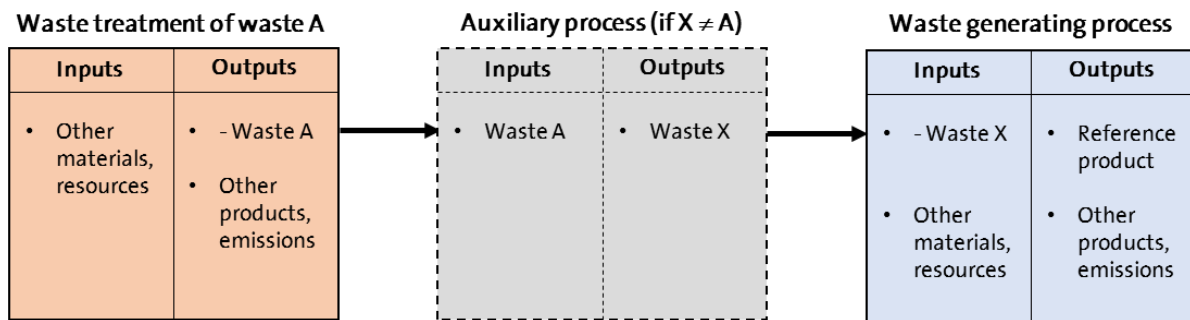


Figure 13. Connection of wastes to the correspondent waste treatment if they are not considered as valuable substance by any process using ELCD 3.2 in openLCA.

Note: “Dummy” processes created by GreenDelta during the implementation were set as default providers of the wastes included as inputs in the processes. This intends to reduce the creation of misleading connections in the product system when selecting the available features of creating automatically the supply chains. You can change the default providers in the process datasets or create different connections in the model graph. See [section 2.1](#) for more details.

- **Wastes which can be considered either as wastes or as by-products** (i.e. they are valuable substances for other process), can be linked to the waste treatment if necessary by selecting the check box “avoided product” in the process generating them (Figure 13). That way, the software will consider them as negative inputs, and consequently the results will be equal as in the previous case. Unfortunately, it is currently not possible to set a default provider for avoided products, so the waste treatment should be linked/checked in the model graph.

Outputs						
Flow	Category	Amount	Unit	Costs/Rev...	Uncertainty	Avoided product
Magnesium	Materials/Metals	1.00000	kg		none	
Water vapour	air/unspecified	0.00123	kg		none	
Water (waste water, untreated)	Production residues in life cycle	0.00698	kg		none	<input checked="" type="checkbox"/>

Figure 14. Selection as “avoided product” of a waste, which in some datasets is consumed as raw material, in order to link it to the correspondent waste treatment process.

How should the wastes considered as a valuable substance in other process be connected to the correspondent provider in openLCA?

You can connect the consumed waste to the desired provider in the same way as for other intermediate product of the dataset, for instance by selecting “Search providers for” in the

model graph and add and connect the desired process. Please, remember to set the allocation method and factors if a multi-output process is used as provider. By default, like in the case of the wastes to be treated, the “dummy” processes created by GreenDelta have been set as providers. You can change the default provider within the process dataset, or select a different provider in the model graph of the product system.

3 Feedback & Contact

If you have other questions not addressed by this report, need further clarifications on any of the points commented, or have comments about the ELCD 3.2 database in openLCA, please contact us:

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