LCA Commons

Nexus version 2025.3

Database release note for openLCA

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1 Background

The LCA Commons repository provides LCA data in the form of unit or system processes for life cycle inventories and input-output (I/O) repositories. These repositories have been accessed from their website[1] and have been provided as a whole database in zolca format, in which the various repositories have been made compatible for use together with some resolution of validation errors. The database has also been extended in a second version by the addition of more LCIA methods from the openLCA v2.7.5 method pack with the mapping of LCA commons flows to the openLCA methods. A third version has been created for ecoinvent users, where the ecoinvent 3.11 unit processes have been used as bridge processes to some of the CUT-OFF flows in the database.

Since the previous release of LCA Commons by GreenDelta, the LCA Commons team has released several new updates, all of which have now been incorporated into the latest release of the database on Nexus. These include, a new elementary flow system v130 (05.2025), updated LCIA methods for TRACI 2.2 (released 05.2025), ReCiPe 2016, TRACI 2.1, IPCC Global Warming Potential, Cumulative Energy Demand and FEDEFL Inventory Methods. Updated process repositories have been incorporated for the USLCI (released 09.2025), the baseline electricity datasets (2025.2), NIST-construction_materials, US Environmental Protection Agency/Construction and Demolition Debris (CDD) Management, US Environmental Protection Agency/Heavy Equipment Operation, US Forest Service Forest Products Laboratory/Forestry and Forest Products, Argonne National Laboratory/Cement and Concrete, National Energy Technology Laboratory/Coal Extraction datasets. All of these repositories have been cleaned up of errors related to database formatting, made compatible with each other and have been combined in our LCA Commons database release for October 2025.

The legacy repositories have been deleted in this version, those interested in these are advised to work with the 2025.1 release where legacy datasets were marked with 'xx'. The new database includes the latest FEDEFL elementary flow system and old unused flows have been deleted.

The LCA Commons 2025.v3 is released in three zolca files:

Database 1: LCA Commons - 2025.v3.zolca *(with the FEDEFL LCIA methods)*

[1] https://www.lcacommons.gov/lca-collaboration/

Database 2: LCA Commons - 2025v3 with olca 275 methods.zolca *(with the olca 2.7.5 LCIA methods)*

Database 3: LCA Commons - 2025v3 with ecoinvent3.11 cut-off unit processes + olca 275 methods.zolca *(with the olca 2.7.5 LCIA methods)*

2 Repositories included in the LCA Commons database

2.1 Repositories (all versions of databases released on Nexus)

The table below provides an overview of all the repositories in the LCA Commons database. We have updated the repositories released in 2024 and made minor validation fixes.

Table 1: Overview of repositories of processes in the LCA Commons database

Repository	Last Update	Notes, remarks
National Renewable Energy Laboratory/USLCI	09/2025	Updated September 2025
National Energy Technology Laboratory/Coal Extraction	07/2025	Updated July 2025
NIST/Building Systems (models of single and multi-silicon solar panels)	07/2025	Updated July 2025
US Environmental Protection Agency/Heavy Equipment Operation	07/2025	Updated July 2025
US Environmental Protection Agency/Construction and Demolition Debris (CDD) Management	07/2025	Updated July 2025
NIST/Construction Materials	07/2025	Updated July 2025
National Renewable Energy Laboratory/USLCI	07/2025	Updated July 2025
Federal LCA Commons/US Electricity Baseline	07/2025	Updated July 2025
US Forest Service Forest Products Laboratory/Forestry and Forest Products	07/2025	Updated July 2025
Argonne National Laboratory/Cement and Concrete	02/2025	Updated February 2025
CORRIM/Forestry and Forest Products	12/30/2019	Updated June 2025

US Forest Service Forest Products Laboratory/Forestry and Forest Products	11/25/2019	Updated June 2025
Federal LCA Commons/Federal LCA Commons Core Database	09/09/2019	Retained from 2023 release with no updates
Forestry and Forest Products Database	30.05.2025	This repository contains unit- and system-level processes related to the production of traditional and novel forest products from the forest resource stage (A1) to the production of primary and secondary forest products (A3)
National Renewable Energy Laboratory/USLCI – library by NREL	31/03/2025	Updated. New release, but unsure of the FEDEFL version
Federal LCA Commons/US Electricity Baseline	06/27/2024	Updated from library - elci_library present in USLCI repository
Argonne National Laboratory/Cement and Concrete	27/02/2025	Updated. Federal Elementary Flow List (v1.3.0), LCIA Formatter (v1.1.4)
Federal LCA Commons/Elementary Flow List	05/08/2024	Updated. Federal Elementary Flow List (v1.3.0)
US Environmental Protection Agency/Construction and Demolition Debris (CDD) Management	04/18/2023	Updated June 2025.
US Environmental Protection Agency/USEEIO v2.0	05/10/2022	Retained from 2023 release with no updates
NC State Department of Forest Biomaterials/Kraft Pulp	07/24/2018	deleted
University of Washington Design for Environment Laboratory/Field Crop Production	07/24/2018	deleted
University of Arkansas/Swine	05/31/2018	deleted
University of Arkansas/Beef Production	08/08/2018	deleted
National Energy Technology Laboratory/Coal Extraction	08/01/2018	deleted

2.2 LCIA Methods from LCA commons

Table 2: Overview of repositories of LCIA methods provided by LCA Commons

LCIA Method	Date
Federal LCA Commons/TRACI2.2	30/05/2025
Federal LCA Commons/ReCiPe 2016	12/27/2024
Federal LCA Commons/FEDEFL Inventory Methods	12/27/2024
Federal LCA Commons/IPCC Global Warming Potential (8 Impact categories)	12/27/2024
Federal LCA Commons/Cumulative Energy Demand	12/27/2024
Federal LCA Commons/Impact World	12/27/2024
Federal LCA Commons/TRACI 2.1	06/28/2024
ISO21930-LCIA-US (v0.1)	01/06/2024

2.3 Validation

1. To the openLCA validation tool, the logic followed is that, the elementary flows that belong to the category/compartment of "emissions" should be added on the output side and those with the category or compartment of "resources" should be added on the input side. This is in line with the implementation of LCIA methods in the databases on the Nexus platform of databases. At times, this rule is not followed in the LCA Commons database and results in the messages found in Table 3, however the flows were left as is for the moment.

Table 3: Elementary flows added as inputs and outputs

Data set	Message
Water, fresh	elementary flow is used as input and output of processes
Water	elementary flow is used as input and output of processes
Water, fresh	elementary flow is used as input and output of processes
Water, fresh	elementary flow is used as input and output of processes
Coal, lignite	elementary flow is used as input and output of processes
Lead	elementary flow is used as input and output of processes
Halon 1301	elementary flow is used as input and output of processes
Chromium	elementary flow is used as input and output of processes

Natural gas	elementary flow is used as input and output of processes
Manganese	elementary flow is used as input and output of processes
Oxygen	elementary flow is used as input and output of processes
Copper	elementary flow is used as input and output of processes
Methane	elementary flow is used as input and output of processes
Phosphorus	elementary flow is used as input and output of processes
Thallium	elementary flow is used as input and output of processes
Quartz, sand	elementary flow is used as input and output of processes
Zinc	elementary flow is used as input and output of processes
Chloride	elementary flow is used as input and output of processes
Chloride	elementary flow is used as input and output of processes
Coal, anthracite	elementary flow is used as input and output of processes
Sodium(I)	elementary flow is used as input and output of processes
Water, saline	elementary flow is used as input and output of processes
Sodium chloride	elementary flow is used as input and output of processes
Chromium(III)	elementary flow is used as input and output of processes
Crude oil	elementary flow is used as input and output of processes
Sodium sulfate	elementary flow is used as input and output of processes
Water	elementary flow is used as input and output of processes
Hydrogen cyanide	elementary flow is used as input and output of processes
Carbon dioxide	elementary flow is used as input and output of processes
Salts, unspecified	elementary flow is used as input and output of processes
Sodium chloride	elementary flow is used as input and output of processes
Biomass	elementary flow is used as input and output of processes

2. Multifunctional processes in LCA Commons are allocated based on the physical, economic or causal aspects, as set up in the processes of the database, found in the allocation tab. A physical allocation was chosen for these processes. However, for physical allocation to be implemented in the database, the flows across which the impacts are allocated need to have the same units. However, these unit conversions were missing in the downloaded datasets as the product and co-products had different units

(mass and volume with no conversions), so a density was assigned for the flows which resolved these errors and allowed physical allocation.

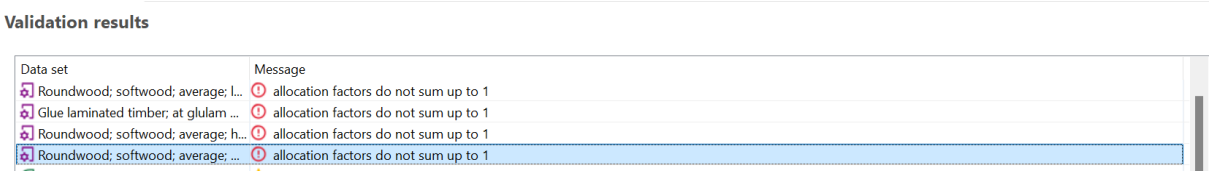


Figure 1: Allocation issues due to the inconsistence of units

Flow	Mass (kg)	Volume (m3)
Bark; softwood; average; low intensity management	420	1
Glue laminated timber; at glulam mill	500	1
Bark; softwood; average; high intensity management	450	1
Bark; softwood; average; med intensity management	445	1

The processes were downloaded as provided by the repositories on the website, and fixed for issues that make them incompatible with the openLCA software. However, certain issues were left behind. Some of these are detailed here.

- Some supply chains in the database are truncated and are meant to be completed with datasets as they develop new ones. In databases 1 and 2 these are left as provided by the LCA Commons repository, in database 3 which is accessible to users with an ecoinvent license, these flows have been connected to ecoinvent.
- When processes with no linked providers are calculated, these truncated product/waste flows will show up in the inventory calculations instead of characterized elementary flows. When it is important to the user, they can consider completing the supply chain themselves.
- When a user runs a calculation, they should ensure that they choose an appropriate allocation method

3 LCA Commons database mapped to openLCA elementary flow system

This sections discusses the implementation of the database "LCA Commons – 2025 v3 with olca 275 methods.zolca" . The LCA Commons database has an elementary flow list custom to it, the FEDEFL List. The flow list, on the request of several clients, was integrated with the openLCA LCIA method pack version 2.7.5. This was done by mapping the elementary flow list from FEDEFL to olca methods by a comparison of the name, CAS number, chemical formula and impact factors of each flow in the database.

1. *Note: The databases 2 and database 3 comes only with the openLCA methods, and not the LCA Commons methods found in the first file (LCA Commons – 2025 v3.zolca).*
2. *Note: At the moment users cannot update the method pack themselves, this will be resolved with the next release.*

3.1 Mapping process

For the database to be properly compatible with the openLCA LCIA method pack, the flows from the FEDEFL List must be mapped to a valid flow in the openLCA method. The FEDEFL system (note: after combining all the repositories) has 332133 elementary flows and 129 flow categories or compartments. The latest available openLCA LCIA method pack 2.7.5 (*as of August 2025*), has 60870 elementary flows and 33 flow categories or compartments. The elementary flows of the LCA Commons database has a much more granular approach to setting up flow categories for a particular elementary flow. On exploration it was understood that this meant that more than one FEDEFL elementary flow would be suitable for mapping to a particular one in the openLCA LCIA method pack.

To optimise the effort that is required for the mapping, the flows were categoriesed into those that are:

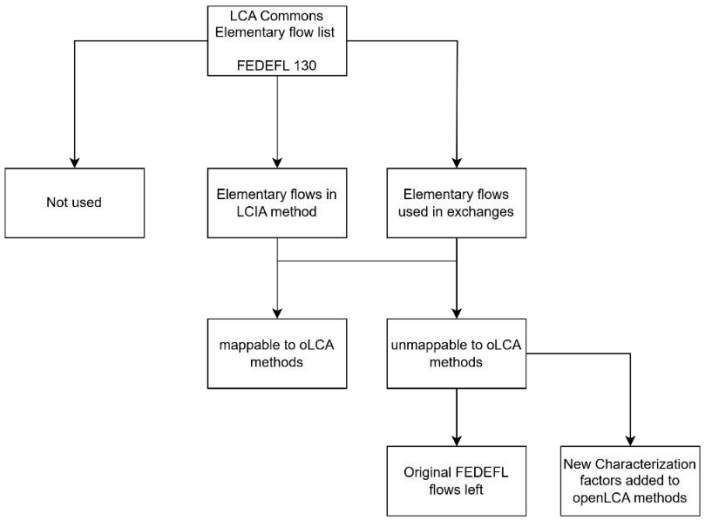
1. Flows characterized in the LCA Commons database in an LCIA method,
2. Flows used in exchanges
3. Flows that are not used in either any LCIA methods or exchanges across the LCA Commons database.

Categories 1 and 2 were the focus of the mapping effort. And category 3 was excluded.

The data mapping of flows is based on the information provided by the databases concerning these flows. The information includes the flow name, CAS Number and synonyms. Based on a match found between one of these criteria the flow name can be matched. Similarly, there must be a mapping performed based on the flow compartment. The flow + flow compartment combination leads to flows being characterized with a specific value in the impact categories of LCIA methods. In addition to these criteria, when the mapping was not straightforward, an additonal impact factor criteria was used, to ensure that the elementary flows had a matching impact factor in the LCIA methods of the respective databases.

Amongst the flows in categories 1 and 2, there were flows that were mappable and unmappabble. The criteria for 'mappability', was whether the flows were found using the name/synonym/CAS number approach; and if not, its usage in an LCIA method was checked (*Note: the method had to be a non-FEDEFL specific, such as the FEDEFL inventory flows*). When a match was not found using either of these criteria, the original FEDEFL flows were left behind with the characterization factors from LCA commons but parameterized. They can be easily added to an openLCA LCIA method when found relevant. Even when a match was found with the name/CAS number approach, it was further verified that the flows had atleast one matching impact factor.

The names were matched based on the names and synonyms in the respective databases and further expanded based on the pubchem list of synonyms. The CAS numbers were based only on those available in the two databases.



4 LCA commons and ecoinvent 3.11 integration

The ecoinvent database, was integrated into the LCA commons database with olca 275 methods, so that the elementary flows from ecoinvent could be considered in the LCA Commons methods. The ecoinvent database has been mapped to the openLCA methods already, and therefore was incorporated directly into the LCA Commons database with olca 275 methods.

Note: This version of the database comes only with the openLCA methods, and not the LCA Commons LCIA methods found in database 1(LCA Commons – 2025 v3.zolca).

4.1 Background information: Units, flow properties and geography

In general, the units and flow properties of the latest FEDEFL list have been made compatible with the openLCA methods by the LCA Commons team. The ecoinvent 3.11 implementation in openLCA is also built with the same system. The units and flow properties of some flows differed from each other and this was made uniform, by adding additional flow properties to the LCA Commons flows to account for the units of the ecoinvent counterpart flows.

The locations or geographies in the ecoinvent database were mapped to those of LCA Commons 2025.3 and assigned the same UUID, so that the LCA Commons locations/codes were valid in the final database.

4.2 Connecting ecoinvent providers to cut-off flows from LCAC

The LCA Commons database includes product flows, whose provider is not available. About half of these flows provided by the USDA represents farm datasets that do not exist within the LCA Commons (i.e., they are left for future work). For the remaining flows, we looked for providers in the ecoinvent database (version 3.11, cut-off, unit processes). We created a second version of LCA Commons for openLCA, in which some of those flows have been linked to suitable ecoinvent processes. The (provider) processes have been selected by flow name proximity and location. For flows named 'CUTOFF...' (in LCA Commons) we usually selected the 'market for' option of ecoinvent to include the transportation; otherwise we used the production, but in case more than one type of production process is available in ecoinvent, we selected again the "market for" option.

Note: New bridge processes can be created by the user by imitating the structure set up in the bridge processes folder and any bridge processes can be modified or deleted.

The link between the two databases is done via the so-called bridge processes (all stored in the dedicated folder 'ei311_LCAC Bridge processes'). These processes includes the ecoinvent 3.11 flows as inputs (with the related provider) and the LCA Commons flow (without provider) as outputs. This trick allows to keep all the information (flow UUIDs, location etc.) from the two databases. This version of the LCA commons database is accessible only to openLCA users that hold an ecoinvent licence.

5 Contact

Nexus is run by GreenDelta GmbH, and LCA Commons on Nexus is provided by GreenDelta. For contact and inquiries, please refer to:

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