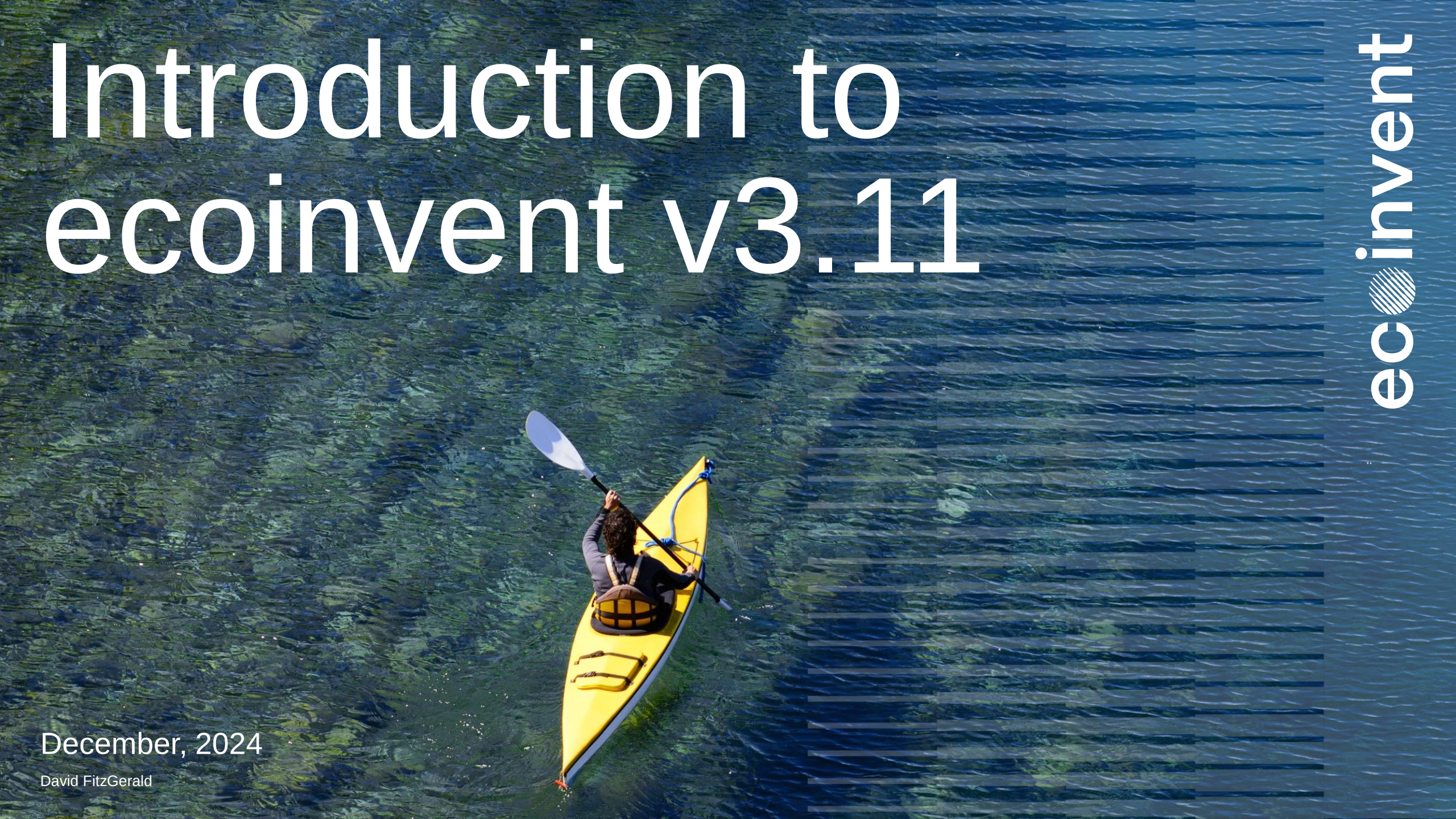
Introduction to ecoinvent v3.11



December, 2024

David FitzGerald

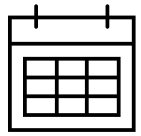
Agenda

01	ecoinvent & Database
02	Contents and Features of Version 3.11
02.1	Sectorial Updates
02.2	Other Updates and Features

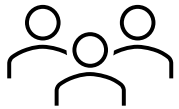
ecoinvent & Database

Our Association

Mission-driven



Founded 20 years ago by leading Swiss research institutions



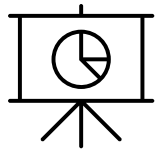
Team of 80+ experts

We publish and maintain a comprehensive life cycle inventory database that provides reliable and transparent information on the environmental impacts of various products and services.

Our Mission

Promote and support the availability of high-quality data

Compile and review the best available data



Publish data in a regularly maintained, transparent database and support users needs

We create and manage background data to support all kinds of environmental studies.

Our Database

Over 25,000 datasets:

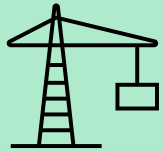
- includes average representations of human activities
- data providers come from industry and industry associations; research institutions and universities; or national initiatives
- data go through internal review for compliancy and consistency; and for external review by competent editors (Editorial Board)
- is trusted by over 8,000 licensees representing tens of thousands of users from more than 80 countries
- is available in many software and tools
- is compliant with the ISO 14 series (amongst others ISO 14040, 14044, and 14048)




The Database Content: Sectors

Over 25,000 unit processes covering a variety of sectors in many regions of the world.

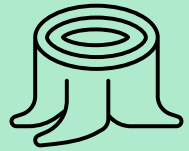
agricultural processes



construction materials

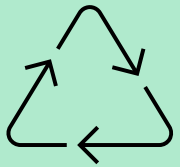
electricity supply

transport



wood products

chemical production



end-of-life processes

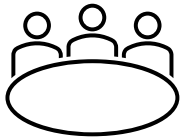
resources extraction

machinery

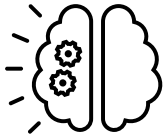
metal products

Our Initiatives

We engage in projects covering format interoperability, dataset creation, database handling, analysis, and distribution, as well as capacity building and awareness raising on a wide range of topics.



Members of Global LCA Data Access (GLAD) network; Leaders of the GLAD EF Mapping project).



Coordinators of the National LCA Database Roadmaps Project with UNEP.

Data providers of the Environmental Footprint Data initiative of the European Commission.

Contents and Features of v3.11

Contents and Features of Version 3.11

Sectorial updates

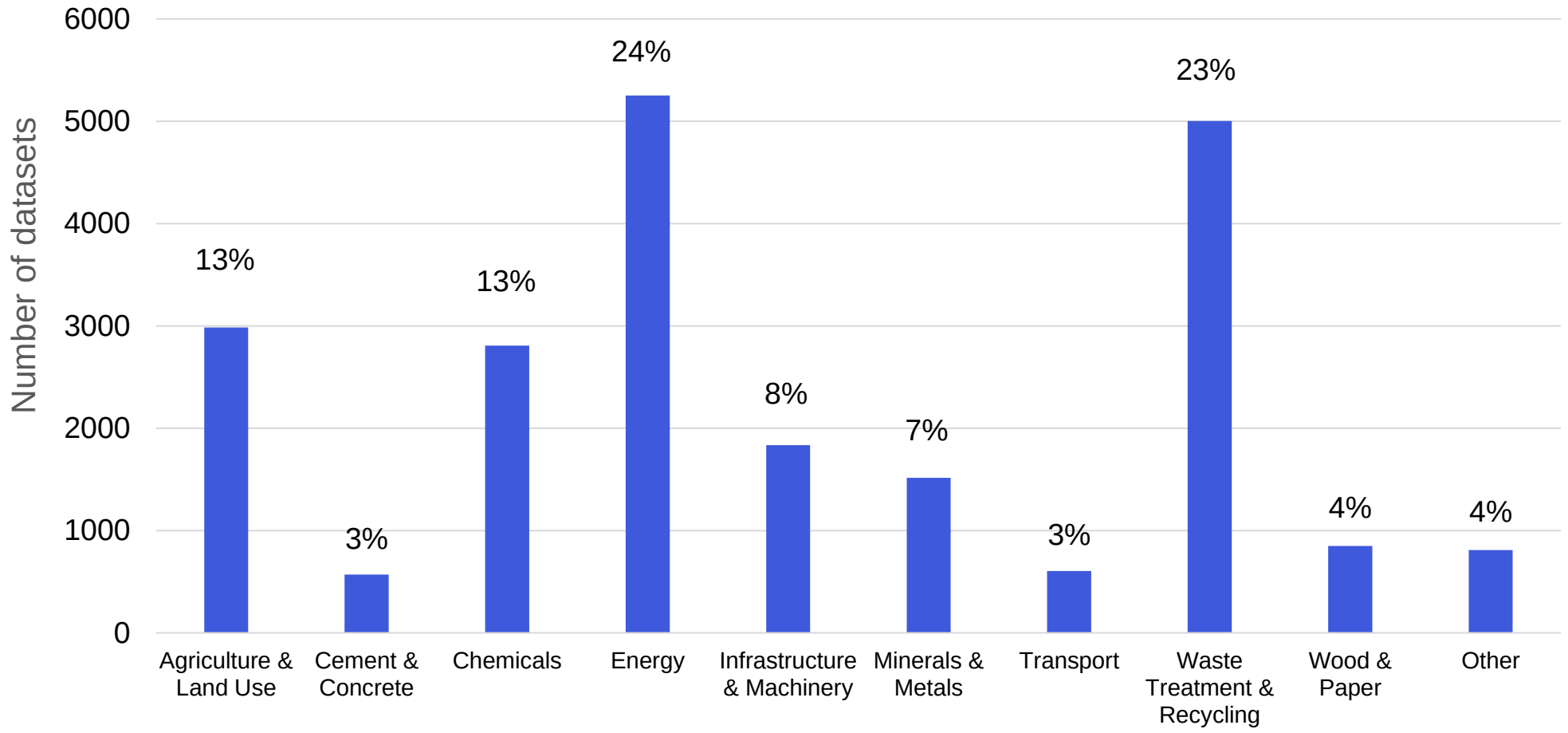
- Fuels
- Electricity
- Chemicals
- Batteries
- Wastes
- Agriculture
- Construction
- Pulp and paper
- Metals
- Transport

Other updates

- Biogenic carbon balancing
- LCIA methods update

Sectorial Updates

Number of Datasets per Sector



Numbers for v3.11 Allocation, cut-off

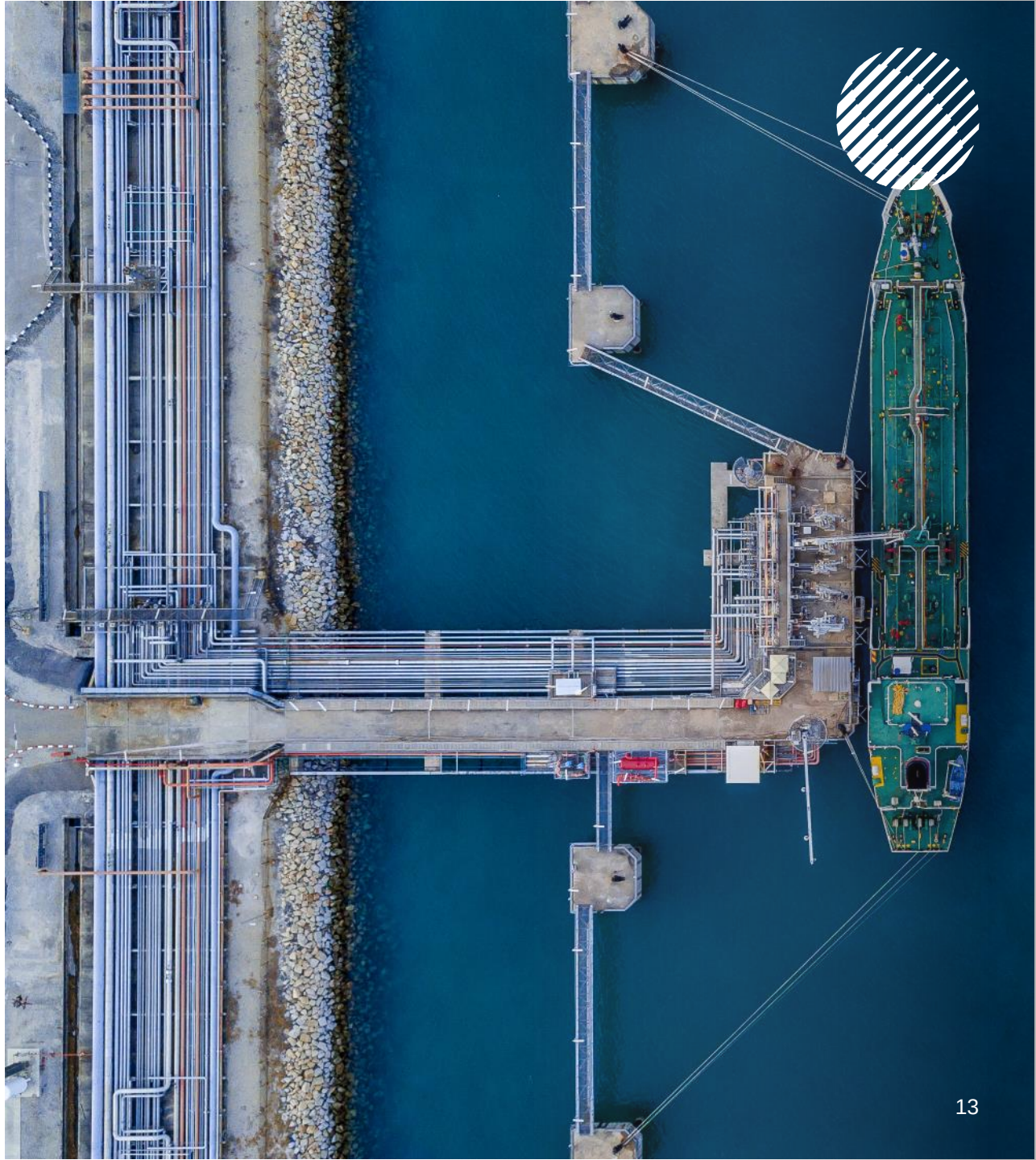
Fuels (1/3)

Oil & Gas

Update of petroleum oil and natural gas supply chains based on **2023 data**

- Reflects the change in supply chains due to the full-scale invasion of Ukraine
- New or updated natural gas (high pressure) supply covering 57 countries and 88% of global consumption
- Updated coverage of 14 LNG-producing countries responsible for 93% of global LNG trade
- Revision of onshore/offshore transport pipeline and LNG shipping distances
- Updates for petroleum oil markets in BR, CO, IN, PE, ZA, Europe, GLO, RNA

Data provider: ESU-services Ltd.



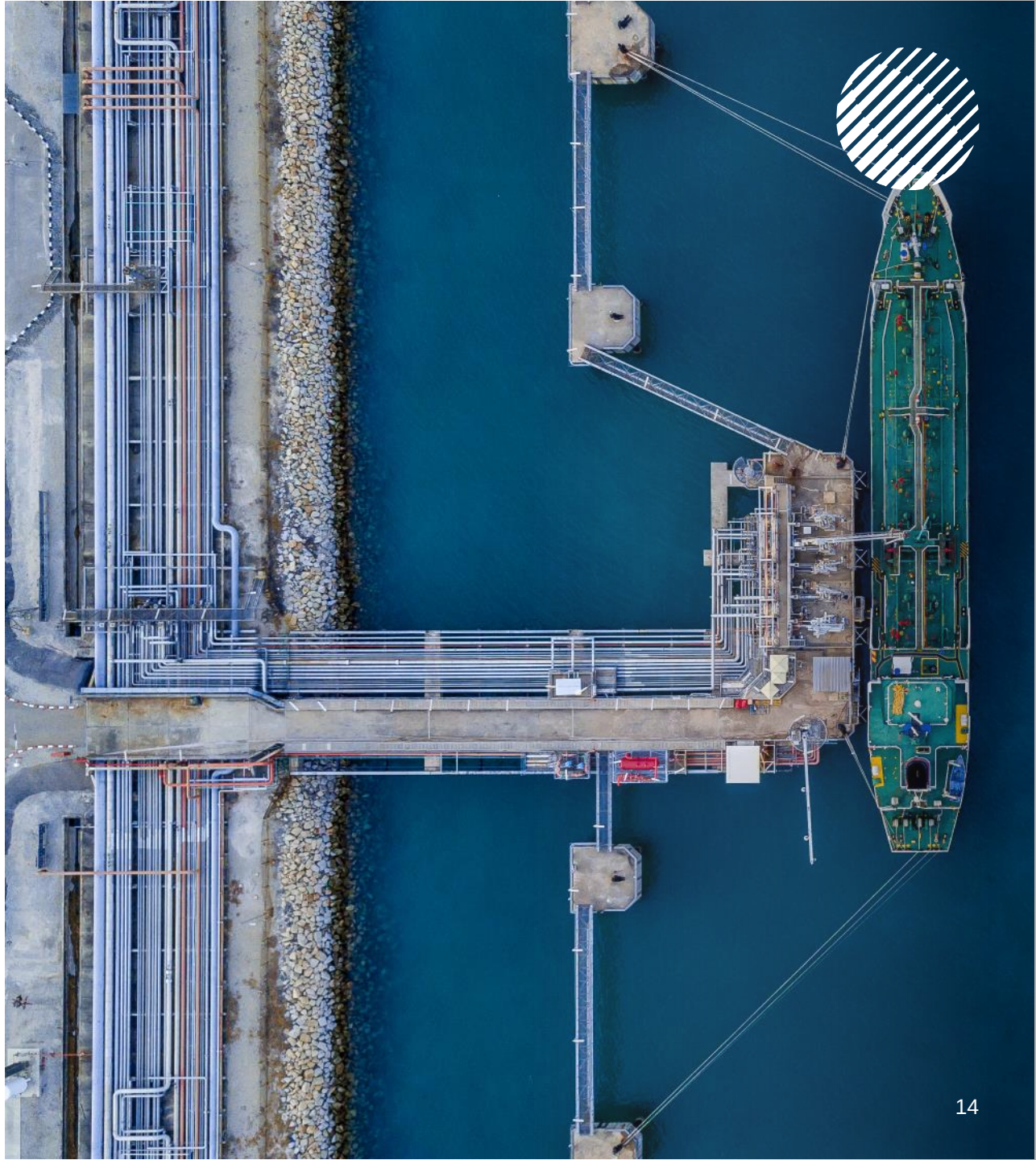
Fuels (2/3)

Natural Gas Liquids

Revision of natural gas liquids fractionation infrastructure and heating assumptions

- The **supply of heat** in the ‘natural gas liquids fractionation’ was revised
- The estimate of **infrastructure requirements** for fractionation has been updated based on plant data
- The assumption for the **density of NGLs** has been updated for NGL production and fractionation datasets

➡ This update has a **downstream effect** where **light hydrocarbons (e.g. ethane, butane, propane)** are used as feedstock, specifically in steam cracking operations.



Fuels (3/3)

Coal

Update of **lignite** and **hard coal** supply chains for **2022**

- Update of **methane** emission factors and production volumes for mining activities
- Regionalization of **hard coal mining in Europe**
- Regionalization of **hard coal markets** in **Europe**, **Japan**, and **South Korea**
- More accurate representation of global trade

→ New high-resolution data in Europe enables more accurate impact assessments for coal consumers. Notable GWP score changes are observed primarily in China, Latin America, and South Africa.

Electricity

Update of all **electricity market mixes** to a more recent year (2021 or 2022).

- Change in data source, shifting from global statistics **from IEA to Enerdata** database
- Markets for **China, India, Brazil,** and **Switzerland** based on data from national statistics representing 2022
- Markets for the **US and Canada** were updated to the year **2022** with more recent data from EPA and StatCAN
- All the other electricity markets mixes have been updated reflecting the situation in **2021 using Enerdata** database

Residual mixes were also updated, reflecting **2023** data.

- Update for EU-28 and Norway, Iceland, and Serbia for the year 2023 (based on Association of Issuing Bodies data)

Chemicals (1/5)

Updated the vinyl chloride (VCM) and polyvinyl chloride (PVC) datasets based on recent industry data collection (2022)

- VCM: average technology:
  - oxychlorination
  - direct chlorination
- PVC: suspension and emulsion polymerization
- Data representativeness for the European production
  - VCM = 68%
  - S-PVC = 73% & E-PVC = 81%
- Data is recontextualized for the Rest-of-World
- Useful for users who operate in the building sector (pipes, window frames, flooring, cables), sports gear, and furniture, among others.

Data providers: European Council of Vinyl Manufacturers (ECVM) & ifeu gGmbH






Chemicals (2/5)

New (**N**) and updated (**U**) European datasets for

- Unsaturated Polyester (UP) and Vinyl Ester (VE) resins based on different compounds:
  - Dicyclopentadiene-based UP resin **(U)**;
  - isophthalic acid-based UP resin **(U)**;
  - maleic UP resin **(U)**;
  - o-phthalic acid-based UP resin **(U)**;
  - recycled polyethylene terephthalate-based UP resin **(N)**;
  - bisphenol A epoxy-based VE resin **(U)**;
- Data is recontextualized for the Rest-of-World
- Useful for users who operate in the construction sector, automotive industry, energy and electrical sector, and others

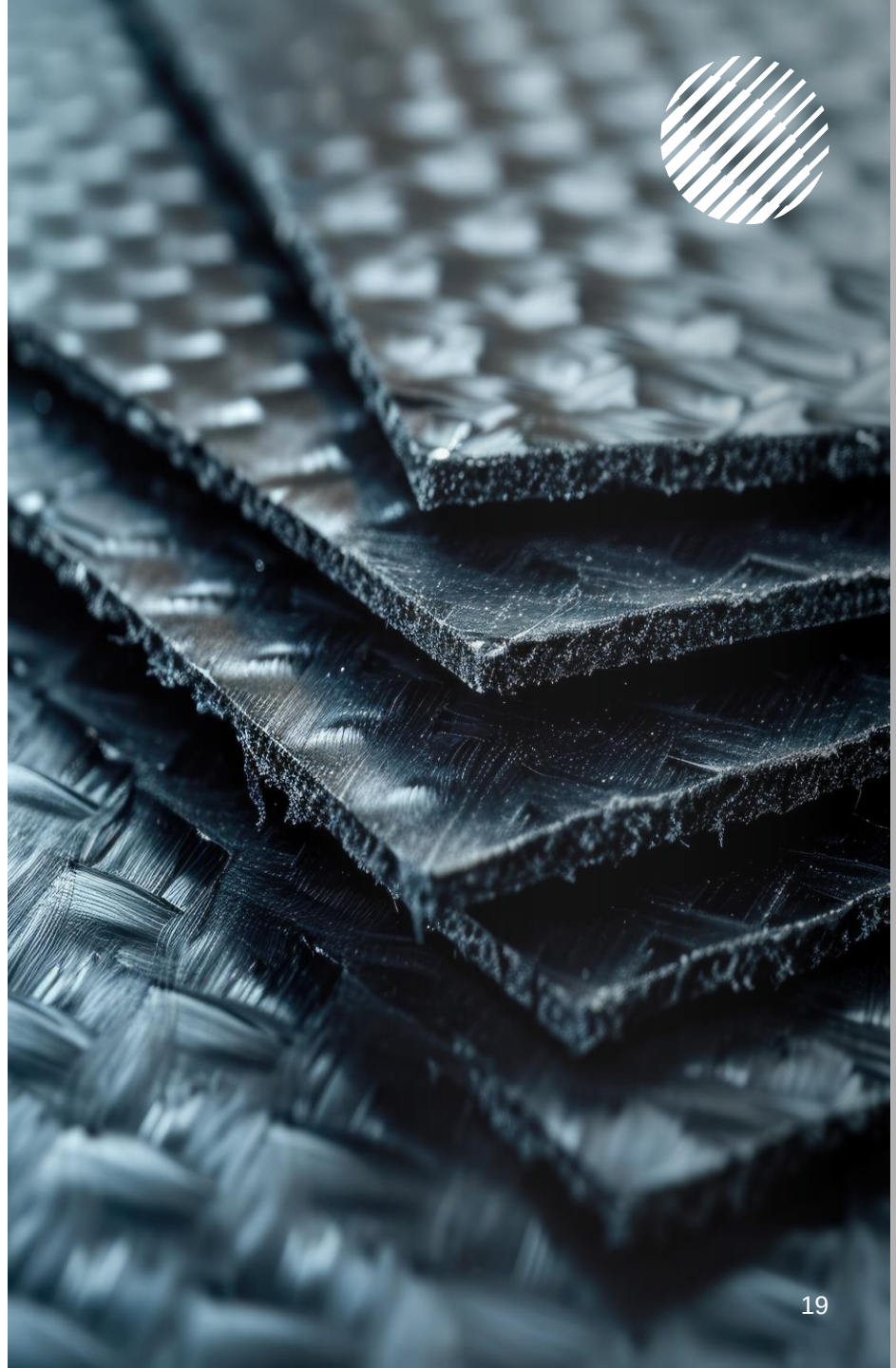
Data provider: European UP/VE Resin Association & EY Climate Change & Sustainability Services NL.

Chemicals (3/5)

New datasets related to composites for France based on data collection between 2019 and 2023

- Includes **new manufacturing processes** not covered in previous versions of the database
  - compression; molding; pultrusion; manual/hand processes; filament winding.
- Data is recontextualized for Europe, North America, Asia, and the Rest-of-World.
  - Users with relevant knowledge are encouraged to use the regional data
- Useful for users who need data on composite production processes.
- Ongoing efforts for more data (e.g., materials & processes).

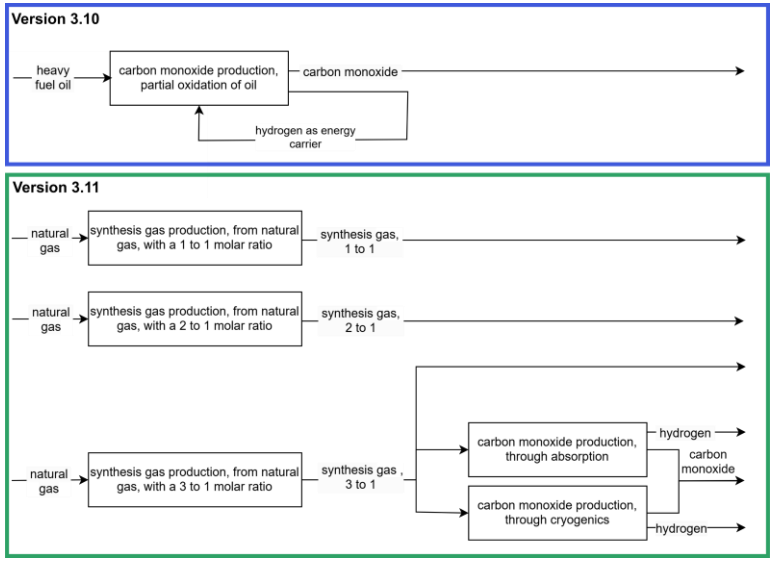
Data providers:
Centre Technique Industriel (IPC) & ADEME

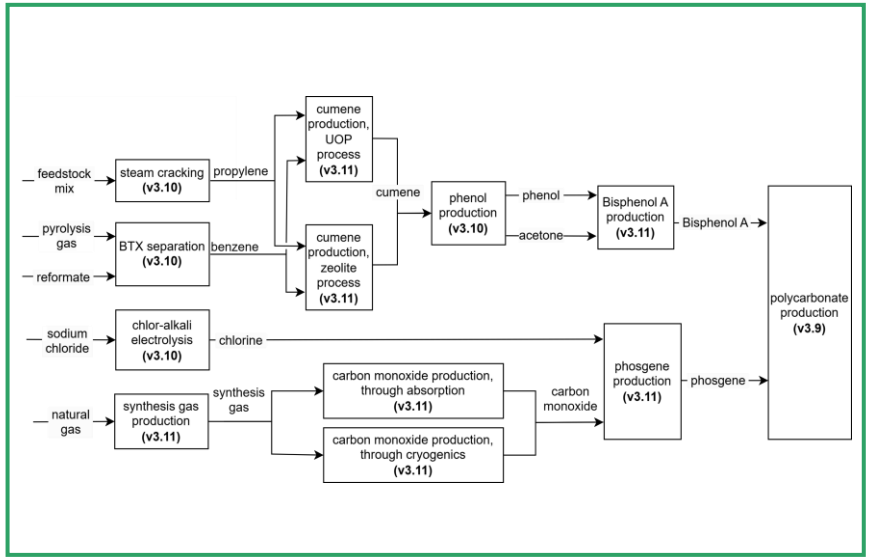


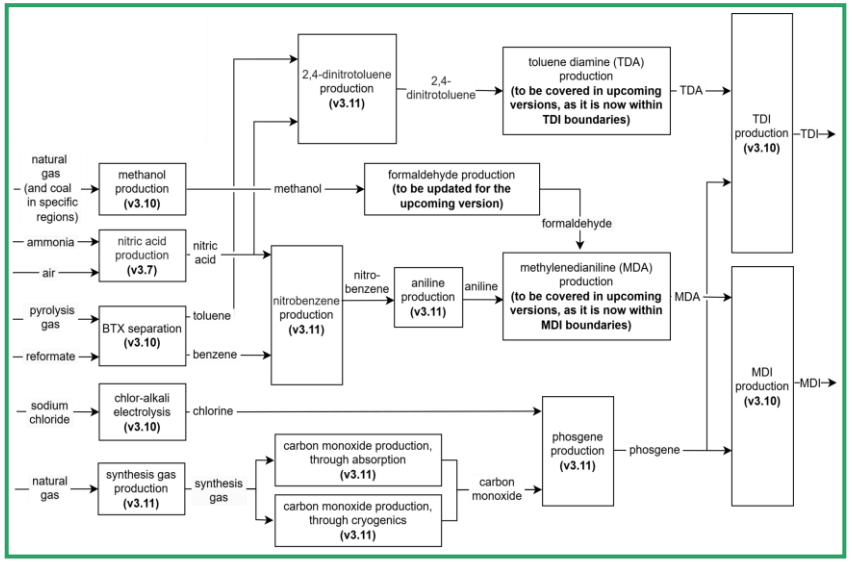
Chemicals (4/5)

Updated datasets based on new references and calculations across **multiple key building blocks**.

- Synthesis gas & carbon monoxide, acetic acid and its esters, acrylic esters, cumene, nitrobenzene, dinitrotoluene, aniline, phosgene, bisphenol A
  - **Example 1:** replaced the carbon monoxide data from the previous version based on the partial oxidation of oil.
- Indirectly affect other key product systems
  - **Example 2:** update of the polycarbonate system, built on top of updates for versions 3.9 and 3.10
  - **Example 3:** key products influence the process system of diisocyanates, and, in turn, polyurethanes
- Useful for users who need high-quality data for chemicals, the automotive industry, construction materials (insulation, sealants, windows), paints & coatings, and furniture manufacturing (bedding, seating)







Chemicals (5/5)

Updated and new data was regionalized, if possible, focusing on:

- **North America:** 19 additional products covered compared to v3.10
- **Asia:** 21 additional products covered compared to v3.10

New data for **18 products** not previously covered in ecoinvent

- 1 synthetic rubber (polychloroprene)
- 11 organic & 6 inorganic chemicals

Routine maintenance of data across multiple products

- Fixed identified issues to improve the overall data quality, representation, and robustness
- Replaced outdated and aggregated LCIs with disaggregated and transparent unit process data
  - methyl chloride, now covered in Europe, Japan, and the Rest-of-World
  - methyl methacrylate, now covered in Europe, North America, and Asia
  - polymethyl methacrylate, now covered in Europe, North America, and Asia

Batteries

- **New datasets for Lithium batteries** from the literature
  - New datasets for **NMC622** and **NMC532** battery packs, including new datasets for sub-components.
- **Graphite (battery anode material)** from the literature
  - New dataset for **natural graphite** production in China (CN).
  - Updated **synthetic graphite** production in CN.
- **New datasets for battery materials** from the literature
  - New dataset for Lithium Titanate Oxide (RER, U.S., E-Asia, Rest-of-World) anode material for Li-ion batteries.
  - New dataset of electrolyte for Na-ion batteries (CN).

➡ With these updates, ecoinvent enhanced the technological resolution for Li-ion batteries, filled critical data gaps in the battery supply chain and raw materials, and provided users with the flexibility to model new or alternative battery designs.

Waste

Waste plastic recycling

- **Mechanical recycling** of waste plastic in **Europe**
  - Update on recycling of PET and HDPE
  - New recycling datasets for PE, PE/PP, LDPE, PS, PVC, PP, ABS, ABS/PS, and mixed plastic
  - Data Provider PLASTICS RECYCLERS EUROPE
- **Chemical recycling** of mixed waste plastic via **hydrothermal treatment** in the **United Kingdom**
  - New recycling technology added
  - Data Provider MURA TECHNOLOGY
- **Chemical recycling** in **China**
  - New recycling dataset of industrial waste polyester from textile
  - Data provider: Alibaba Cloud – Energy Expert

Useful for users who need to assess the end-of-life of waste plastic and compare alternative recycling technologies.

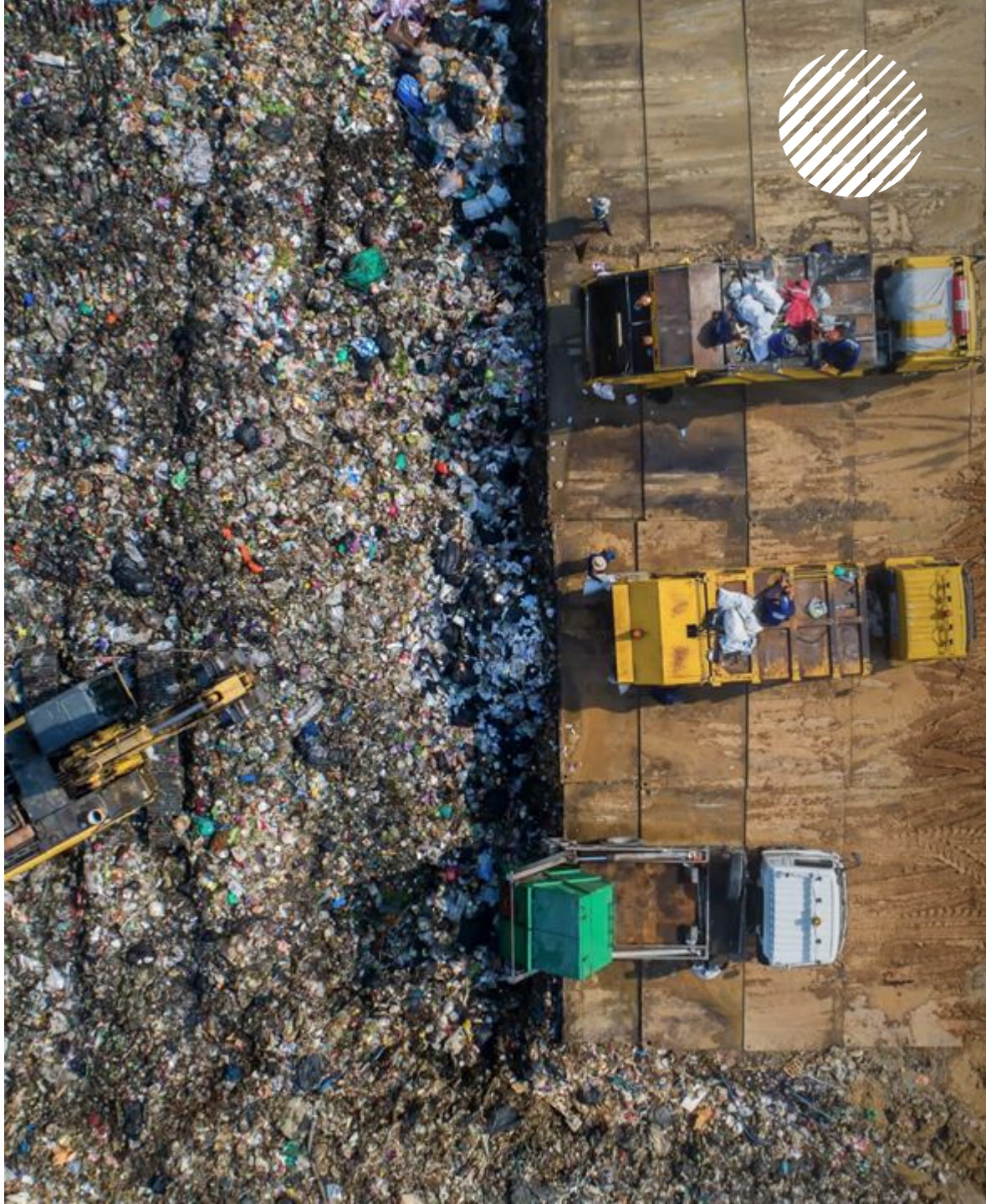
Waste

Regionalization of Municipal Solid Waste (MSW)

- New regionalized data covers the countries of **EU-27**, **CH**, **GB**, **NO**, and **IS**
- Update of the current datasets with **regionalized waste composition**, **treatment mix**, and **transport distance**
- Enables a more detailed assessment of the impacts of MSW treatment in specific European countries

Waste metal nomenclature update

- The terms "waste" and "scrap" were used interchangeably and inconsistently
- Waste metals **treated** with formal or informal technologies, like landfill, incineration, open dump, etc., are now named **"waste metal"**, like “waste copper” and “waste aluminium”
- Waste metals that are **recycled** to be reused are now named **"scrap metal"**, like “scrap copper” and “scrap aluminium”
- Enhanced clarity and consistency in naming metal waste



Agriculture

New datasets for agricultural products in Switzerland

- 130+ datasets covering conventional and organic farming production which includes:
  - Fruit-bearing trees like apple and pear
  - Grapes
  - Cereal grains such as barley, maize, and wheat
  - Root and cruciferous vegetables including carrots and cauliflower
  - Protein-rich legume crops like peas and fava beans
- Production for plain, hill, and mountain sub-regions
  - Increase products availability in the database
  - Increase regionalization
  - Provide better representation of Swiss farming activities
- Data provider: Agroscope

Construction

New datasets for Canada and Ontario

- Limestone extraction, crushing, and clinker production

Includes new products not covered in previous versions of the database:

- General Use (GU) cement;
- General Use Limestone (GUL) cement;
- Integrated cement plant construction (CA)

Other updates:

Revisions involving over 90 construction datasets including a **substantial update of the limestone supply chain**. Among the changes:

- Revised PV for several production activities: clinker, quicklime, hydrated lime, hydraulic lime, bricks, lightweight concrete blocks, and others;
- Revised exchanges for concrete 50MPa, limestone quarry operation, gravel and sand quarry activities, concrete block production, lime and cement mortars, glazing, and others.

Data provider: National Research Council Canada

Pulp and Paper

Updated data for kraft paper and paper sack manufacturing in Europe in 2021

- Data provided by CEPI Eurokraft and Eurosac
- Data on kraft paper production highlights key industry trends compared to the previous dataset based on the year 2018, including:
  - reduced energy consumption
  - decline in the share of fossil fuels, with an increase in the share of biofuels
- Up-to-date data for users of kraft paper and paper sacks across industries, such as retail and construction

Three new datasets for single-use paper-based tableware used in fast food restaurants, representing European production in 2022

- Data provided by the European Paper Packaging Alliance (EPPA)
- The data models paper-based tableware commonly used in fast food restaurants in Europe in response to EU regulations on single-use plastics
- Covers a wide range of products such as beverage cups, burger wraps, and fry boxes
- Is relevant for food chains, event organizers, and regulators in assessing the impacts of food packaging

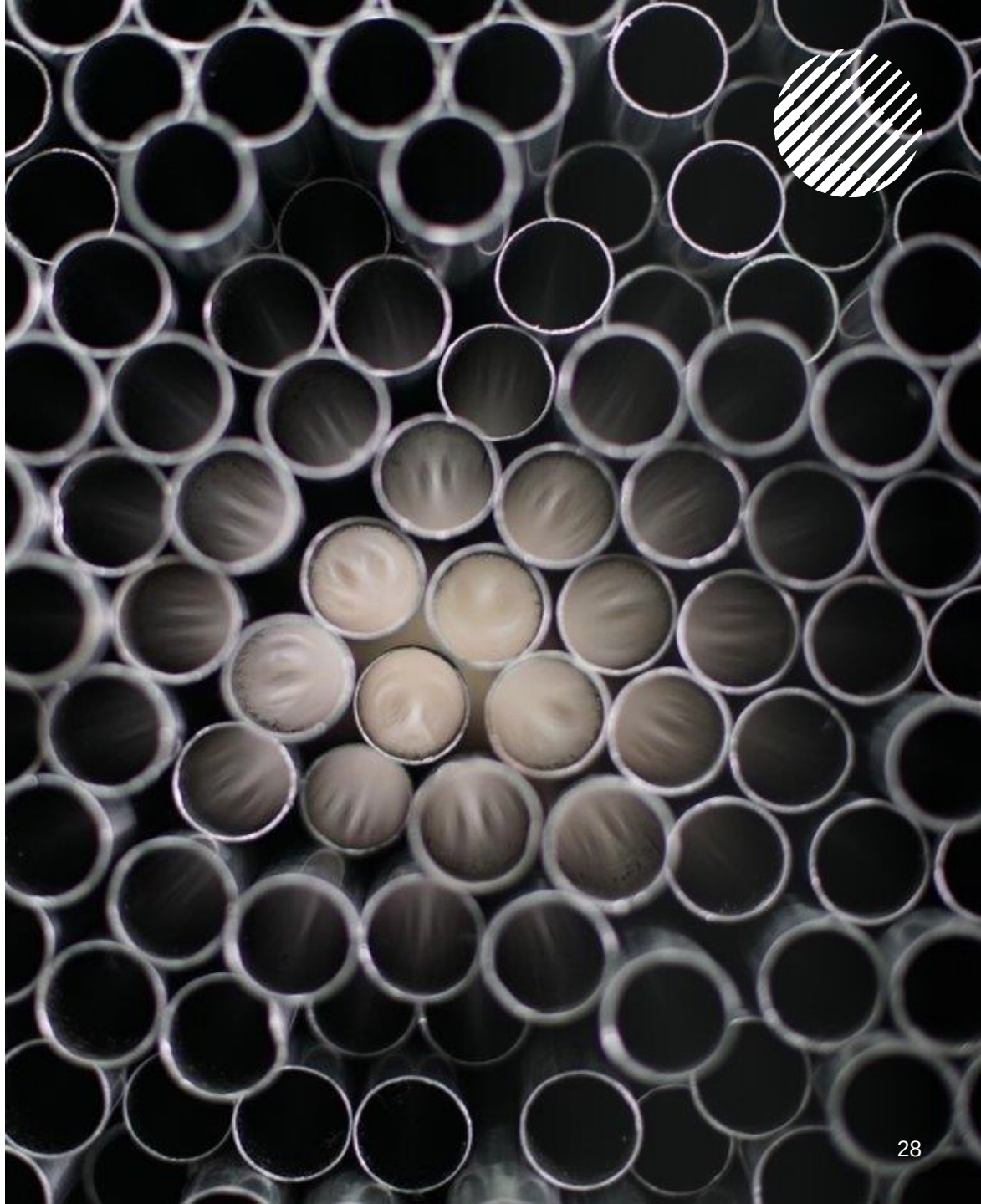
Metals

New datasets

- **Grain-oriented electrical steel in Europe.**
  - Used in transformers and other electromagnetic devices
  - Produced from 3.2% silicon steel, modeled in a separate step
- **Gallium production in China**
  - Single dataset replaced by two-step production (low-grade and high-grade gallium)
  - Now linked to the aluminium supply chain

Update of prices of metal products

- New long-term average prices for ~60 metal products
- Price data based on the ISE database (Institut für seltene Erden)
- Economic allocation of burdens based on more robust price data.



Transport

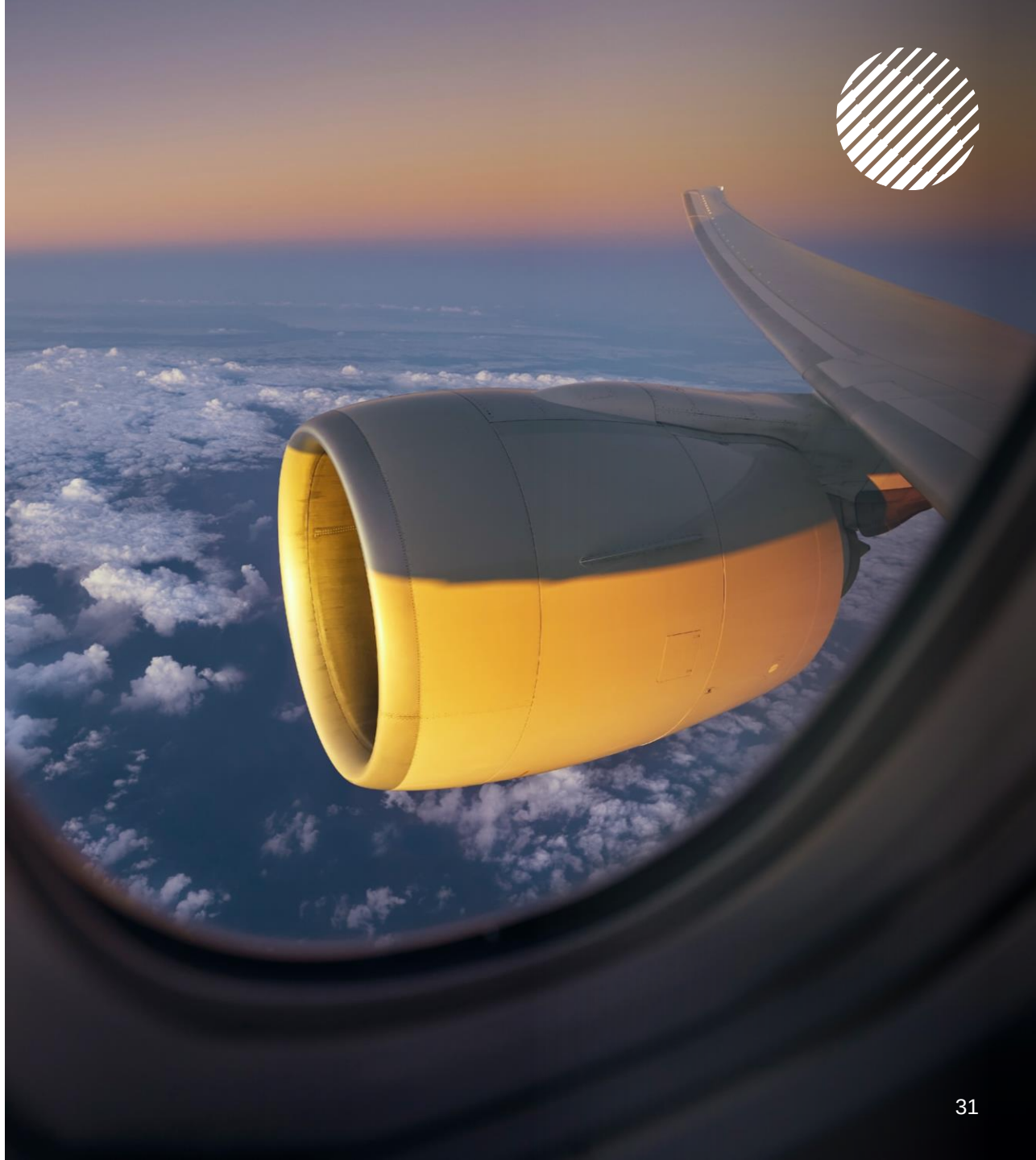
- **Updated European and Global passenger car fleets**
  Better representation of the current situation
- **Nomenclature update for transport datasets**.
  - Alignment of names throughout the sector
  - Improves naming consistency, enables easier search
- **New datasets for aircraft maintenance**
  Improved representativeness of aircraft use phase

Other Updates and Features

Impact Assessment Methods

- Non-fossil carbon flows were updated and balanced with special attention to biogenic carbon uptake
  - Allows characterizing non-fossil carbon dioxide with -1/+1 for removals/releases when assessing climate change impacts following IPCC.
  - Is demanded by some standards and guidelines such as ISO 14067.

- The EN15804 impact assessment method was restructured and renamed to be closer to nomenclature in the standard
  - Helps users find the right indicator.



Impact Assessment Methods
IPCC 2021

- Biogenic carbon dioxide is considered in a complementary method to the existing “IPCC 2021” method
- Impact categories can be mapped to standards and guidelines
- Impact categories were renamed to be explicit about biogenic CO_2 is included or not (“climate change” is now “climate change: total (excl. biogenic CO_2)”)
- Additionally, we provide carbon contents of products

	method/standard/ guideline	IPCC 2021	IPCC 2021 (incl. biogenic CO2)	ISO 14067
Impact category	**handling of biogenic CO2**	0/0 for biogenic CO2	-1/+1 for biogenic CO2	-1/+1 for biogenic CO2
climate change: total (excl. biogenic CO2)		x		(x)
climate change: total (incl. biogenic CO2)			x	x
climate change: fossil		x		x
climate change: aircraft emissions		x		x
climate change: direct land use change		x		x
climate change: biogenic (excl. CO2)		x		
climate change: biogenic (incl. CO2)			x	x

(not all impact categories are shown here)

Impact Assessment Methods EN 15804

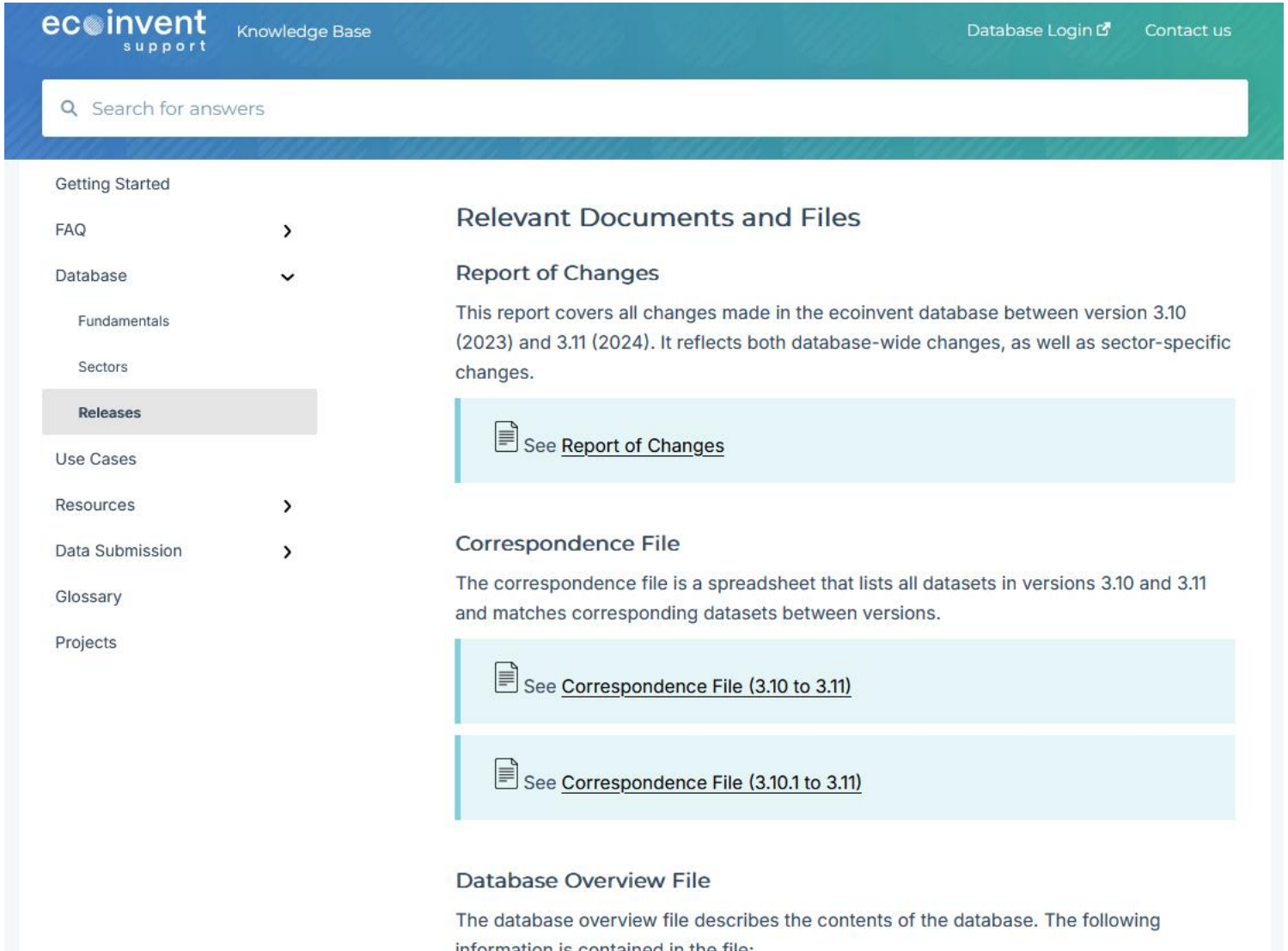
The method was split into several methods aligned with the standard

- EN15804+A2 - Core impact categories and indicators
- EN15804+A2 - Additional impact categories and indicators
- EN15804+A2 - Indicators describing resource use
- EN15804+A2 - Indicators describing waste categories
- EN15804+A2 - Indicators describing output flows
- EN15804+A2 - Indicators describing biogenic carbon content at factory gate

Information about Version 3.11

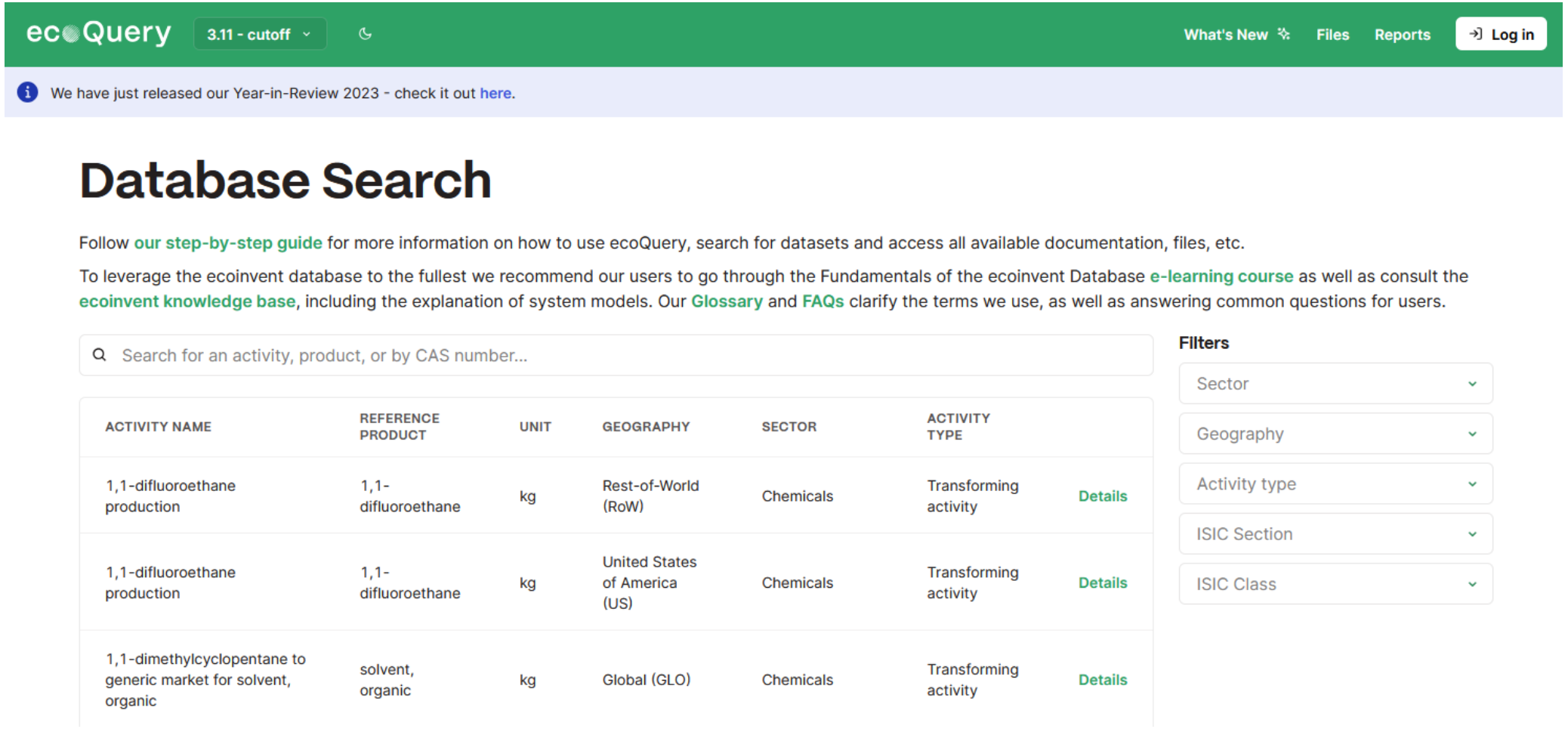
The Report of Changes, Correspondence File, and other useful files and information are available at

https://support.ecoinvent.org/ecoinvent-version-3.11



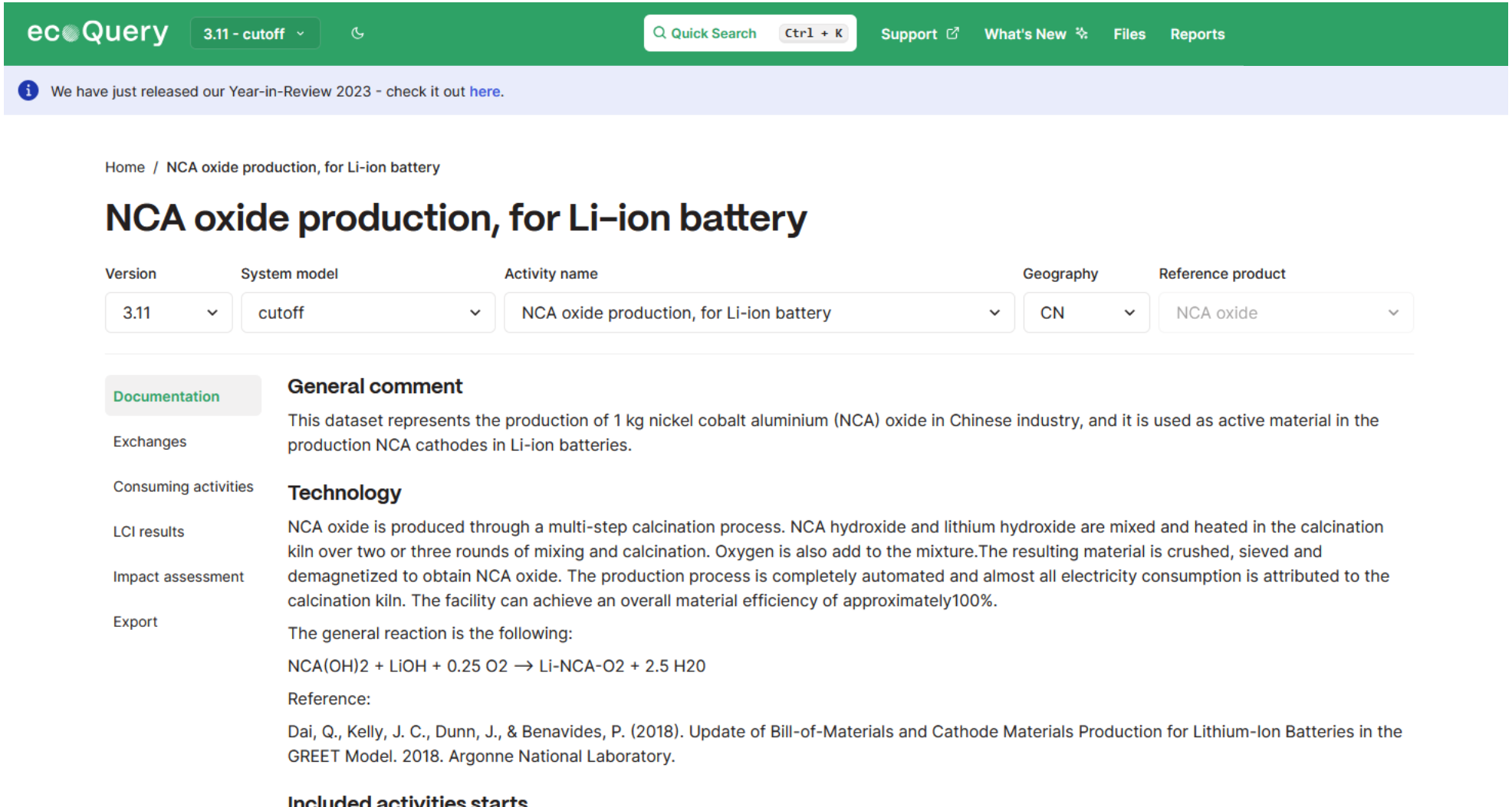
ecoQuery

ecoQuery is the online platform to access the ecoinvent database through ecoinvent's website https://ecoquery.ecoinvent.org



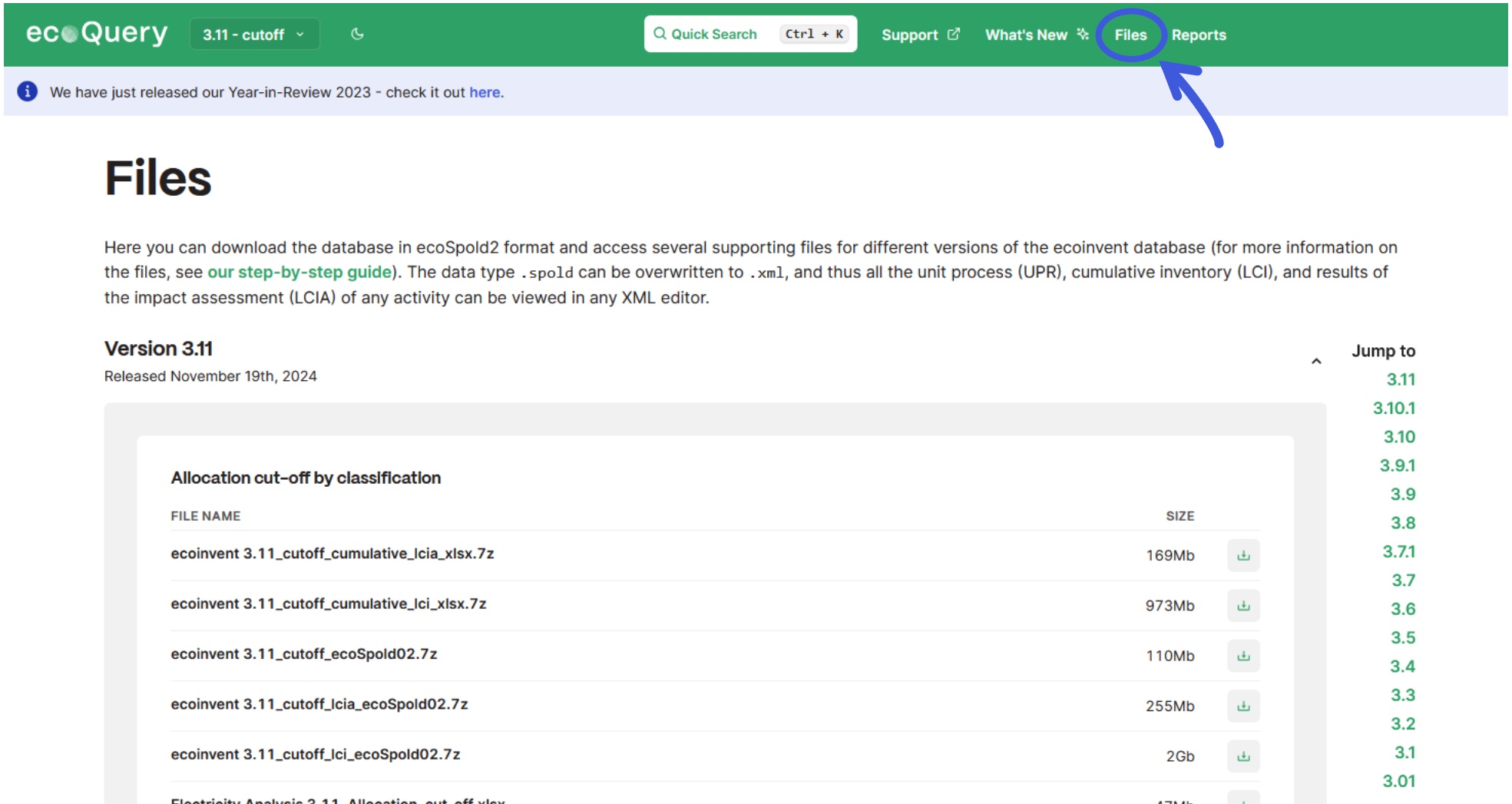
Unit process datasets in ecoQuery

The documentation of each dataset is shown, in addition to the exchanges.



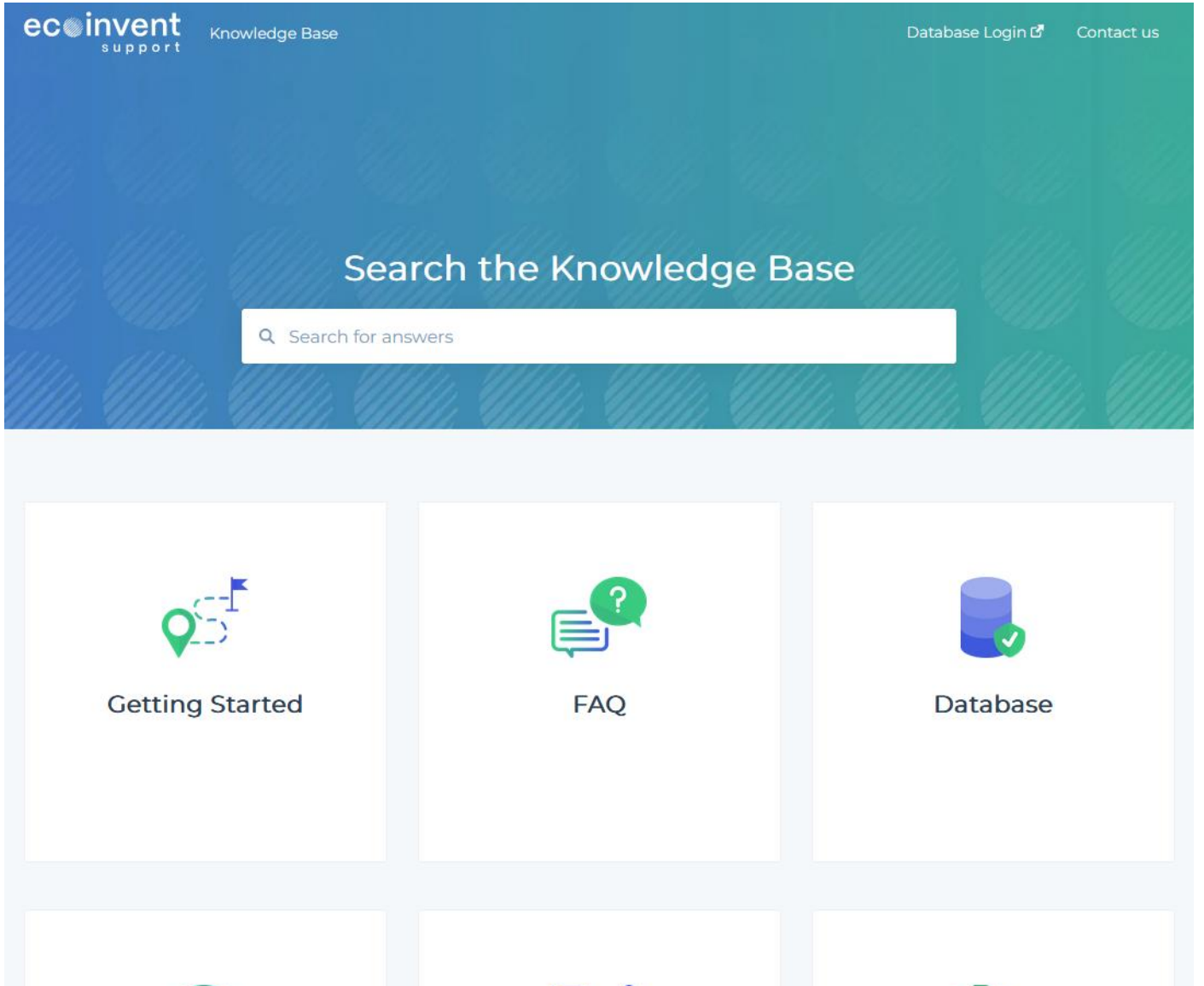
Files available in ecoQuery

The Files section contains useful files specific to each system model.



ecoinvent's Knowledge Base

- The Knowledge Base contains general information about the database: https://support.ecoinvent.org/
- It contains descriptions of how supply chains are modeled as well as other information helpful for understanding and using the database



Thank you!

For any questions, comments, or other feedback, please get in touch through

https://ecoinvent.org/contact-us

Also if you would like to provide data!

Follow us on LinkedIn to stay up to date on the latest developments.

December, 2024