

Introduction to ecoinvent v3.11

ecoinvent

December, 2024

David FitzGerald



Agenda



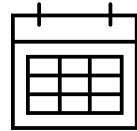
- 01 ecoinvent & Database
- 02 Contents and Features of Version 3.11
- 02.1 Sectorial Updates
- 02.2 Other Updates and Features

ecoinvent & Database

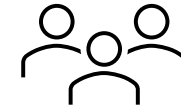
Our Association



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.

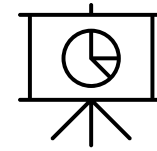
Our Mission



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)



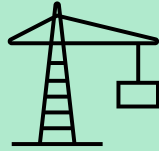
The Database Content: Sectors



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



agricultural
processes



construction
materials



electricity
supply



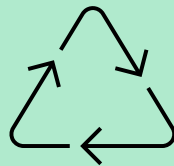
transport



wood
products



chemical
production



end-of-life
processes



resources
extraction



machinery

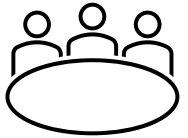


metal
products

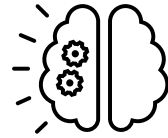
Our Initiatives



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

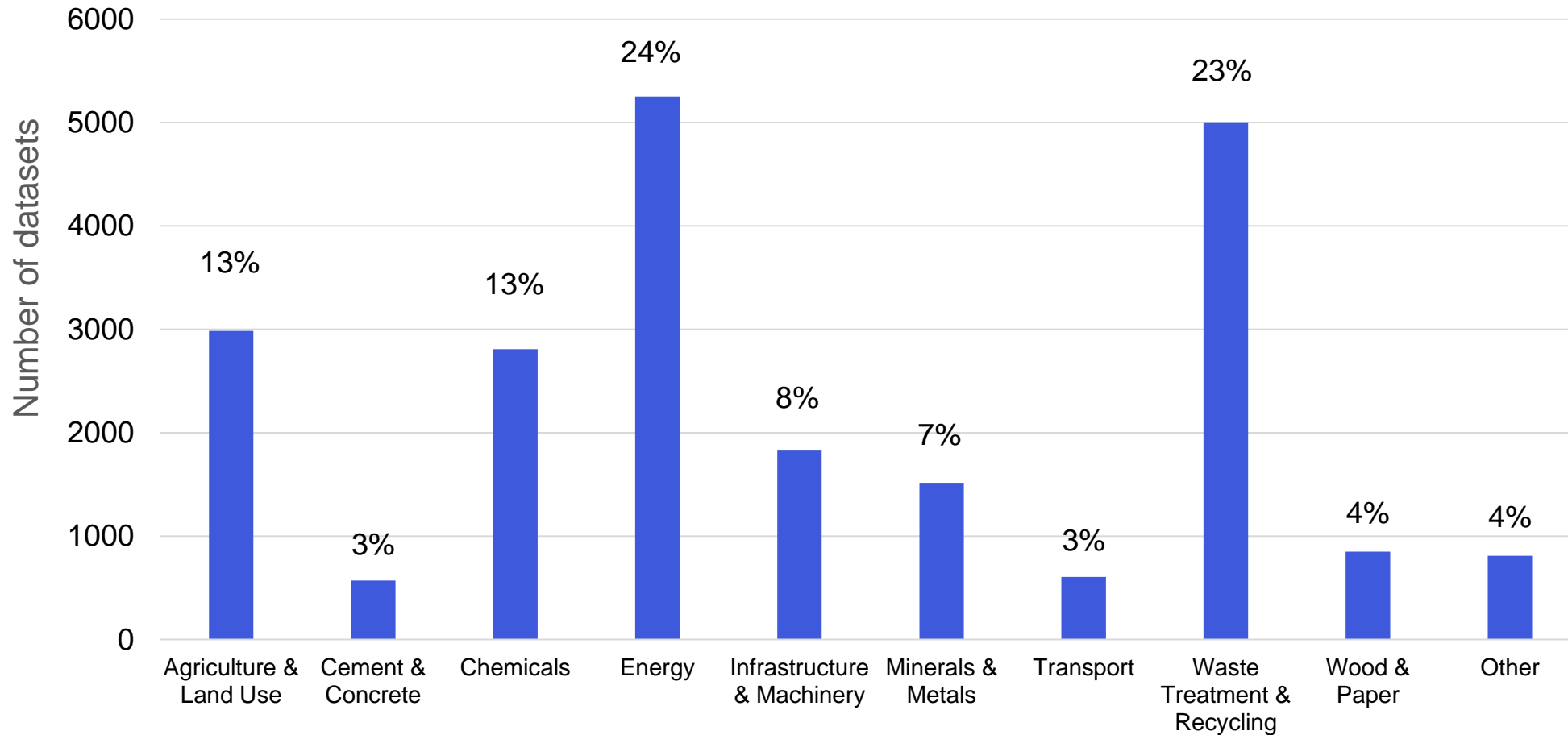
Other updates

- Biogenic carbon balancing
- LCIA methods update

Sectorial Updates



Number of Datasets per Sector



Numbers for v3.11 Allocation, cut-off

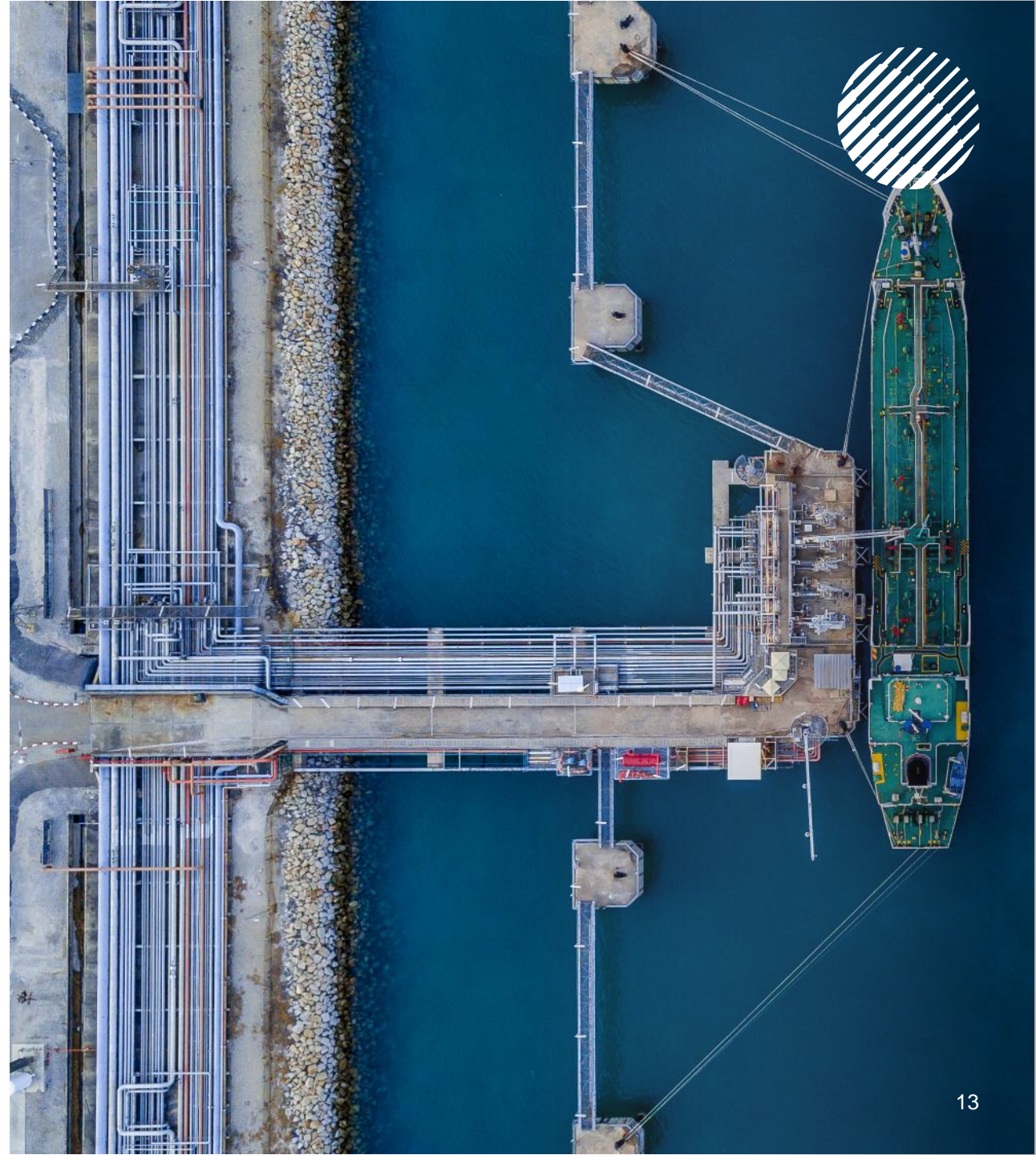
Fuels (1/3)

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.

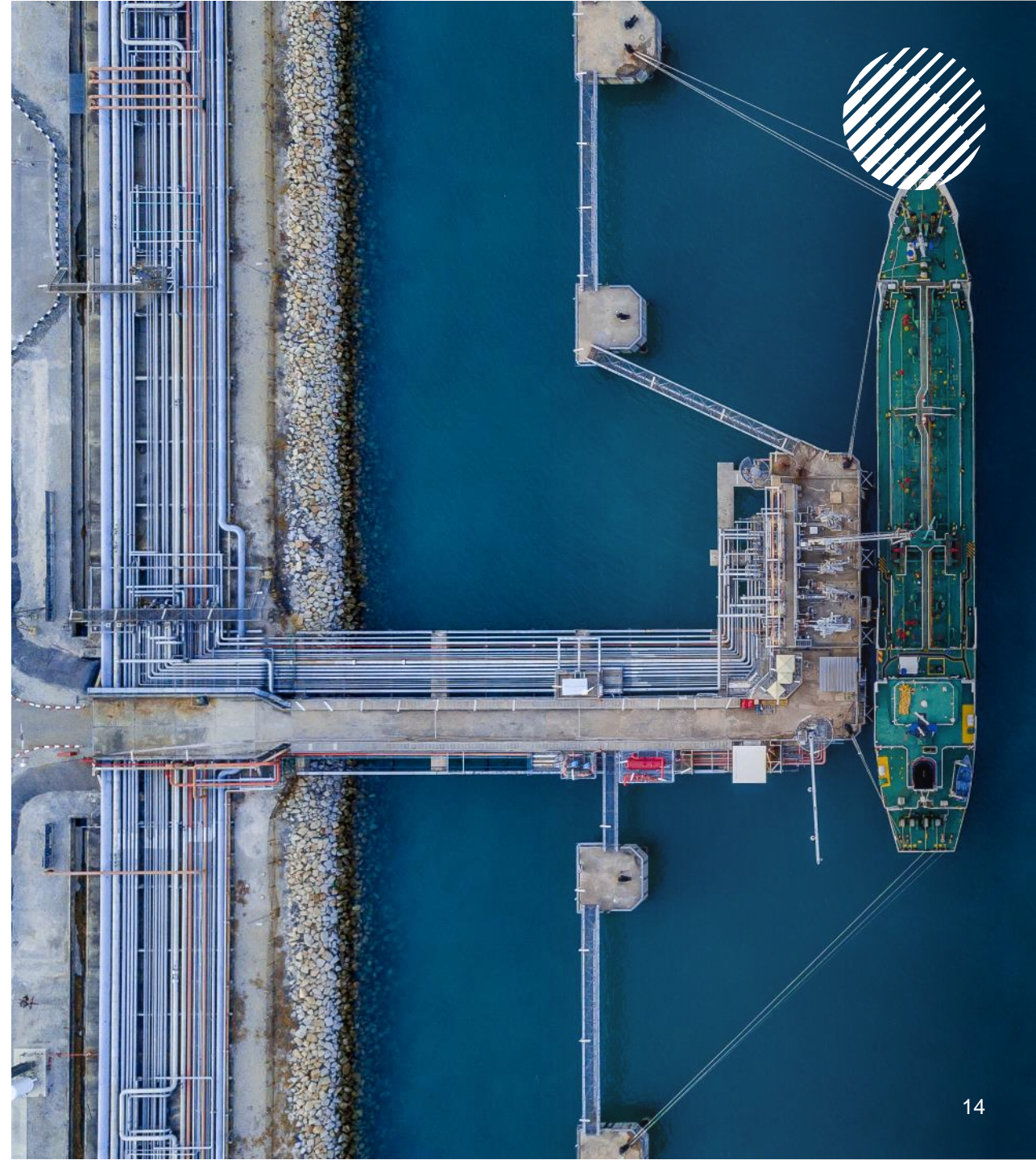


Fuels (2/3)

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.



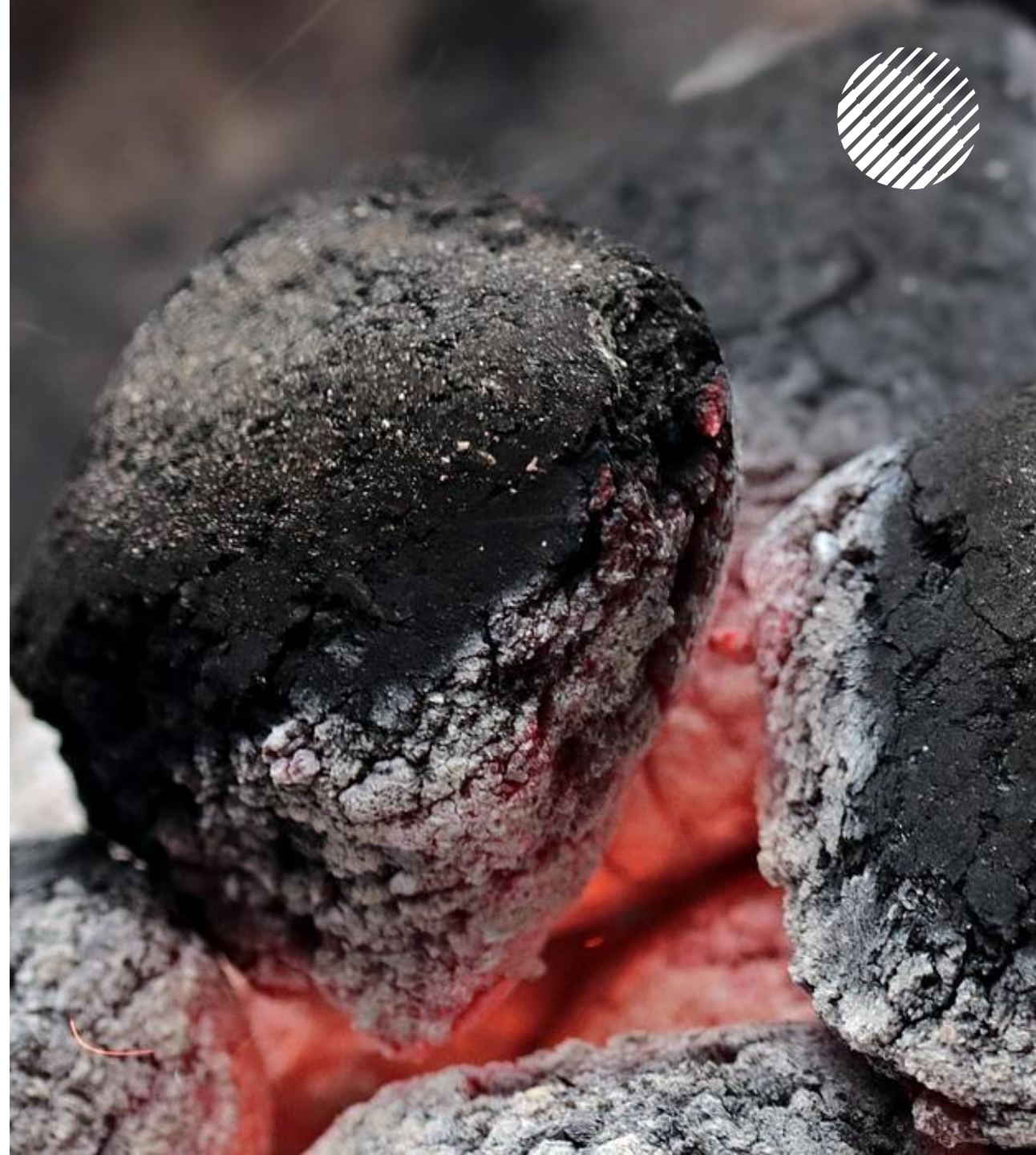
Fuels (3/3)

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

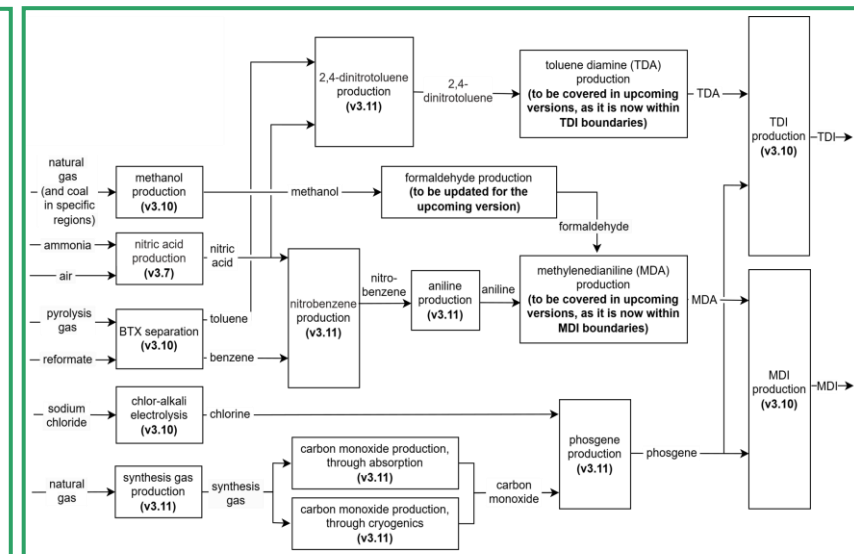
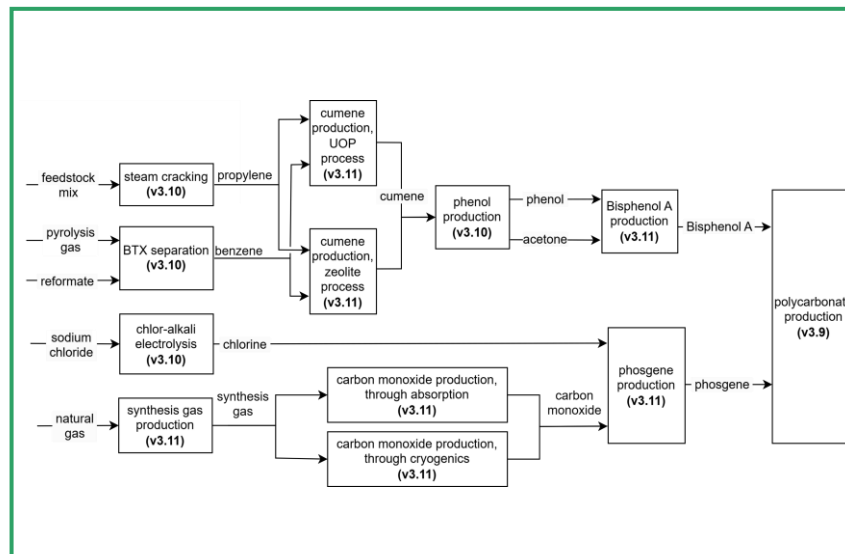
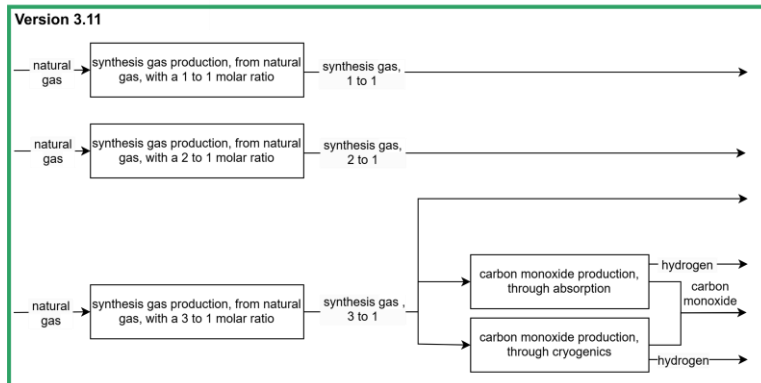
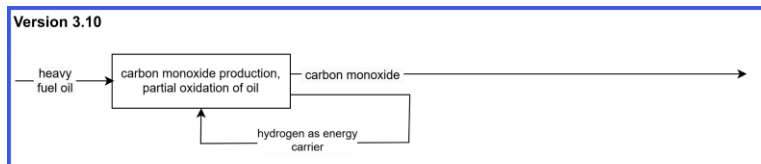


Chemicals (4/5)



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



— **Chemical recycling** of mixed waste plastic via **hydrothermal treatment** in the **United Kingdom**

- New recycling technology added
- Data Provider



— **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.



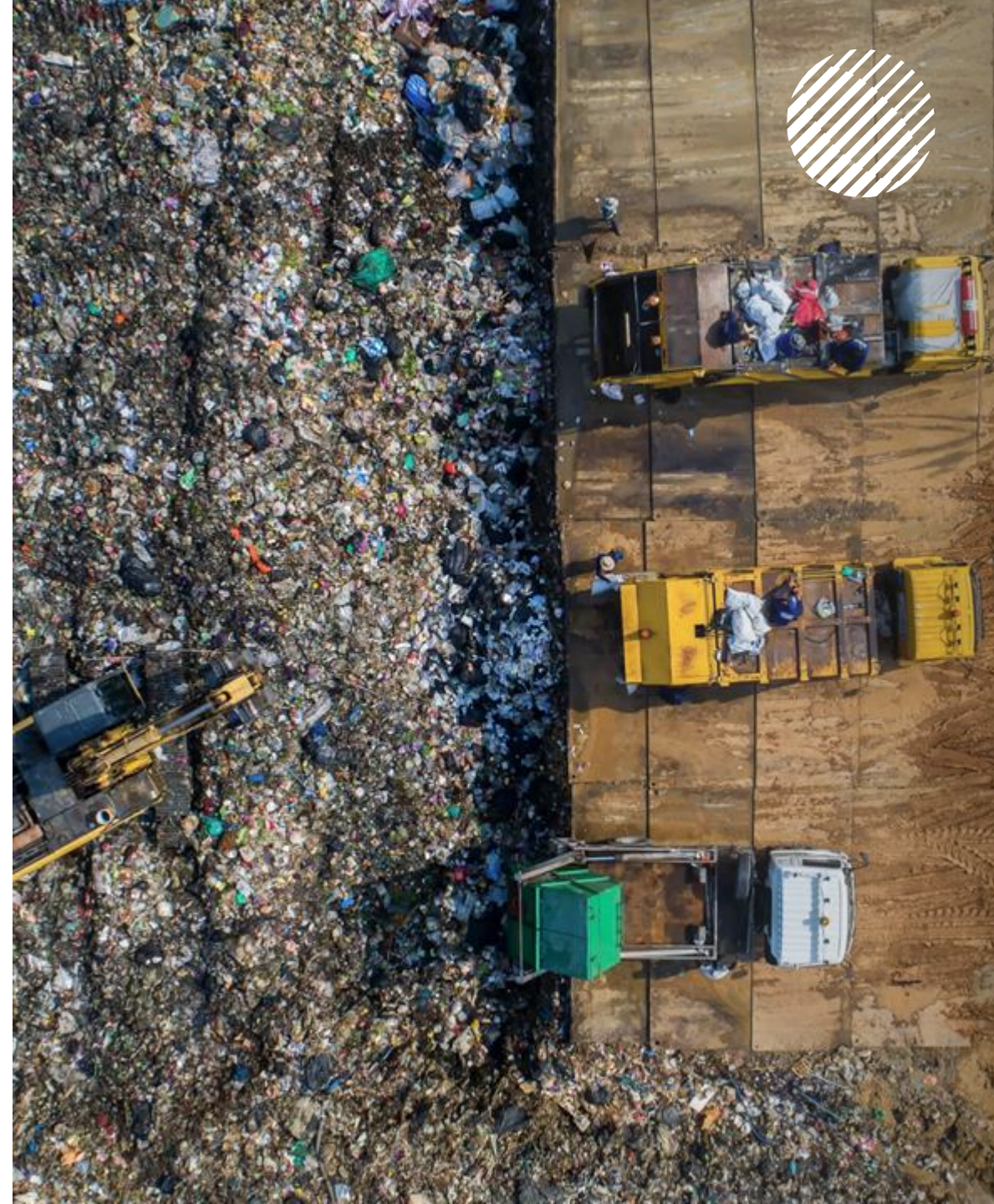
Waste

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

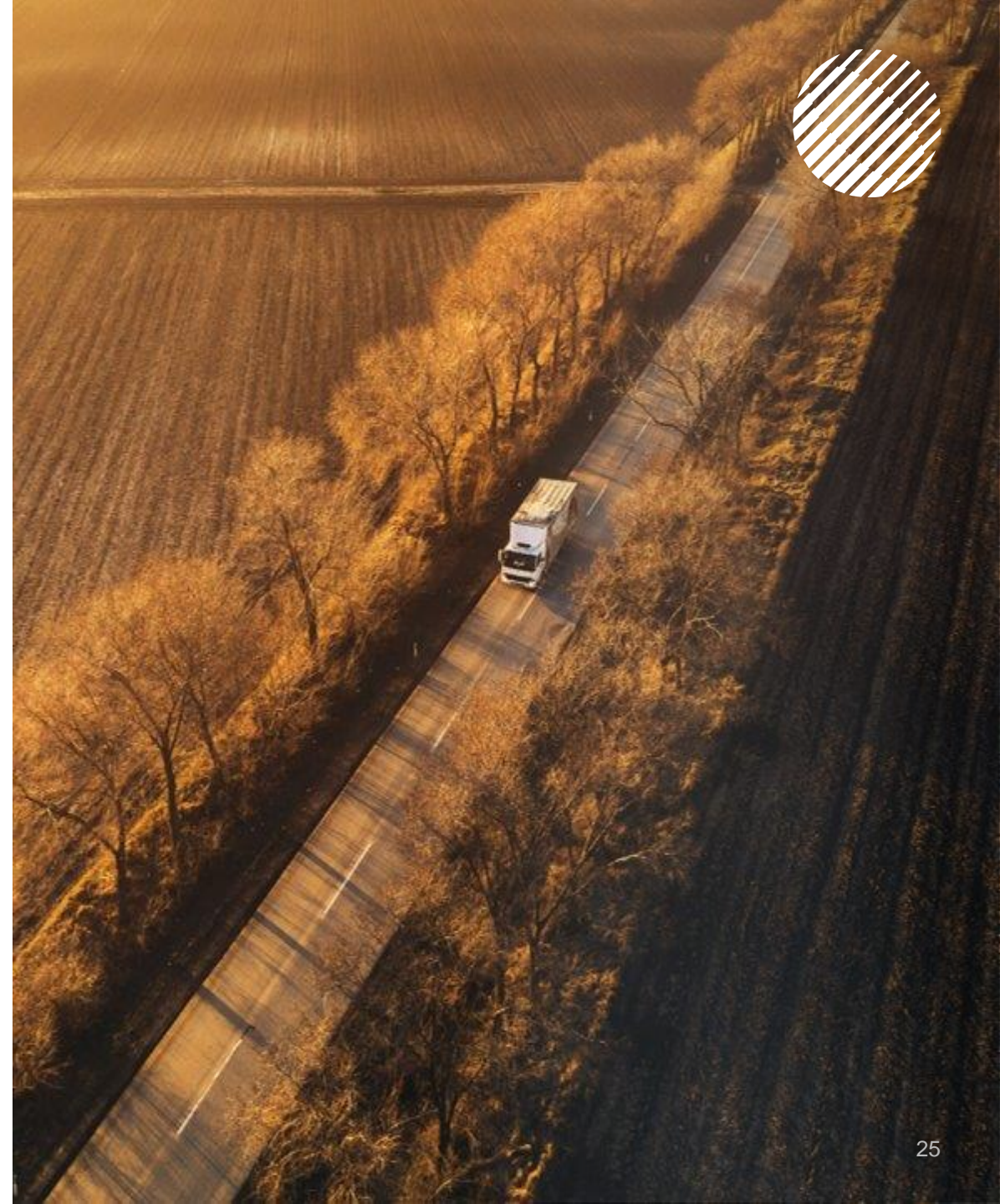
- The terms "waste" and "scrap" were used interchangeably and inconsistently
- Waste metals **treated** with formal or informal technologies, like landfill, incineration, open dump, etc., are now named "**waste metal**", like "waste copper" and "waste aluminium"
- Waste metals that are **recycled** to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



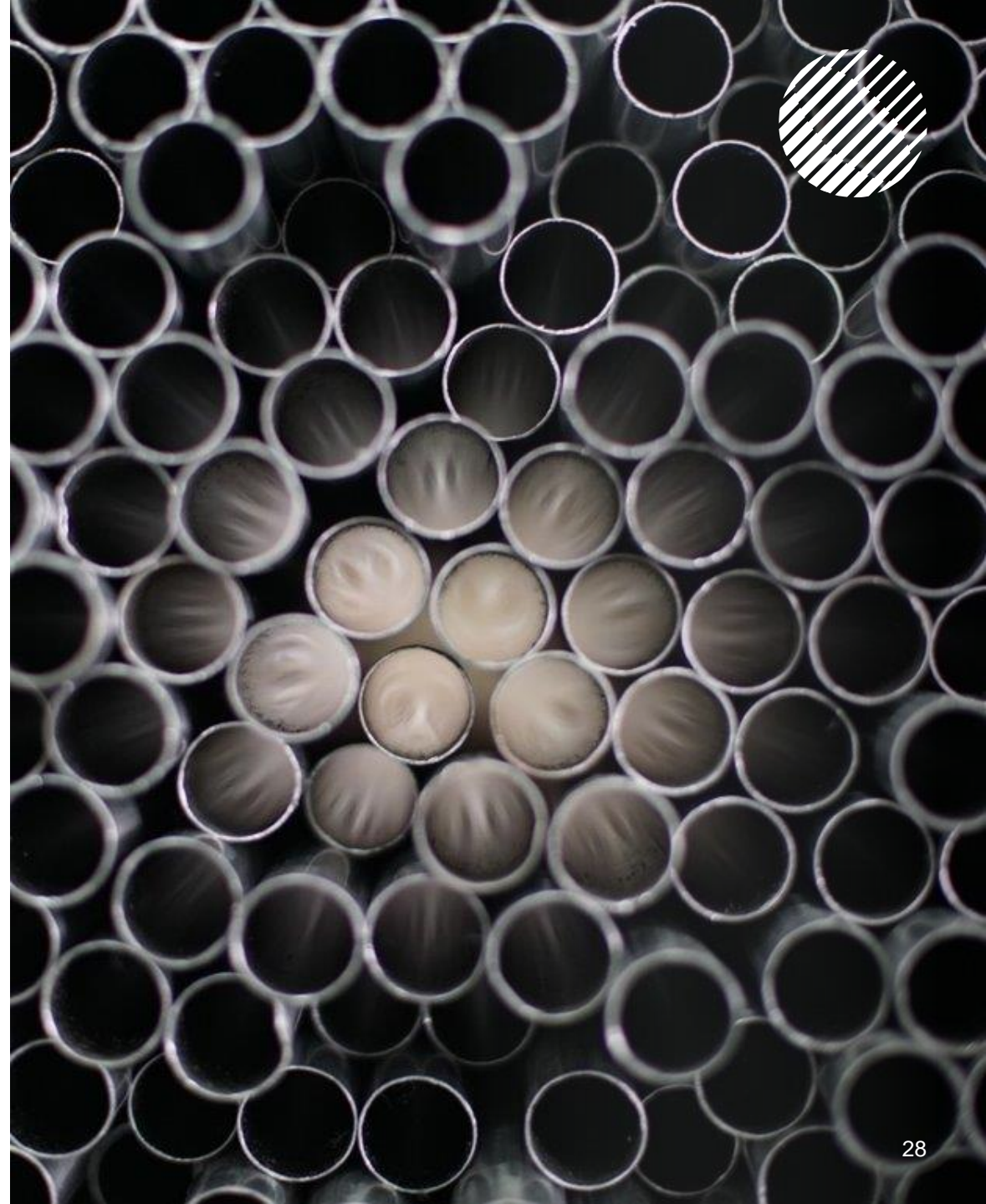
Metals

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

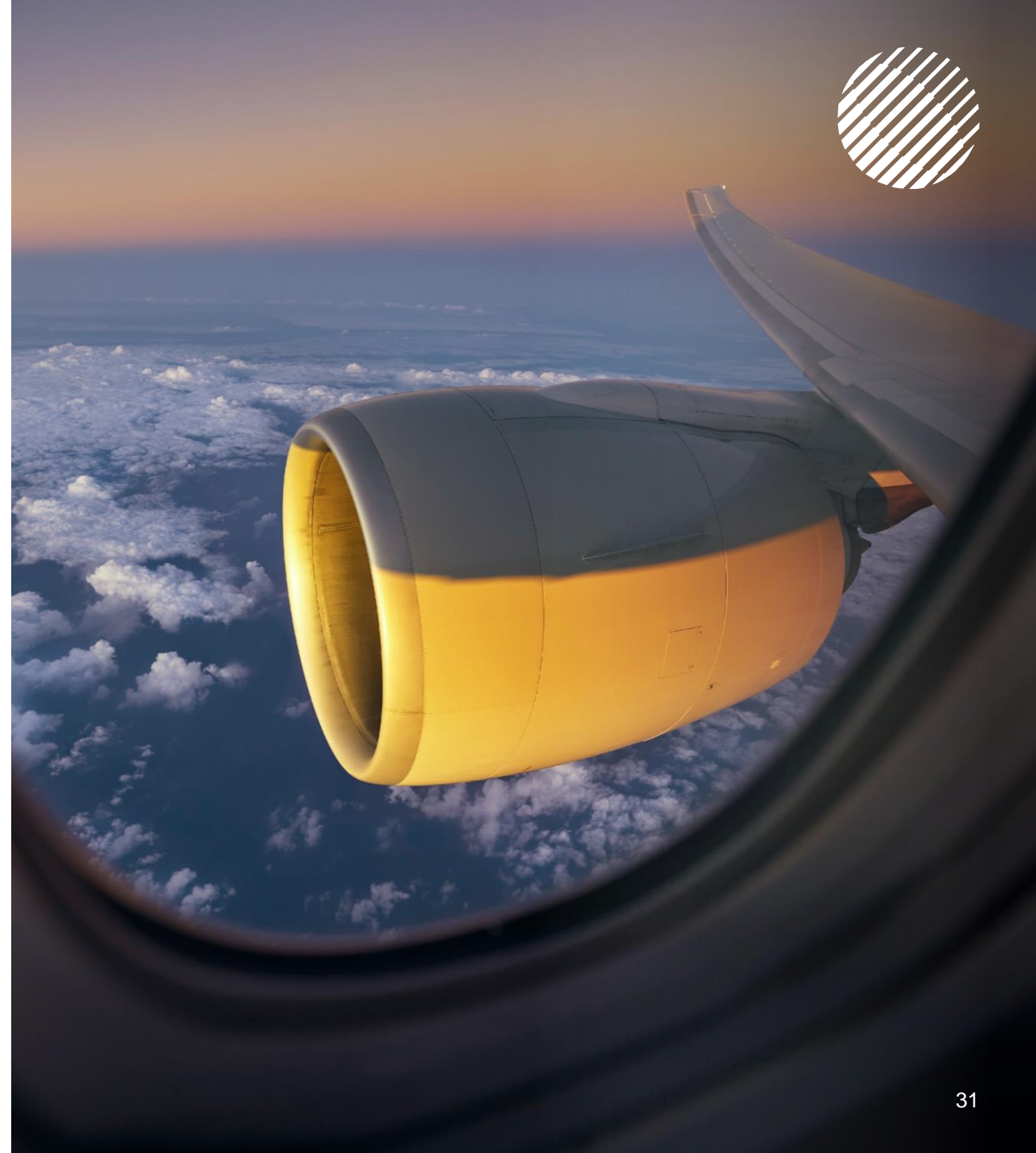


Other Updates and Features



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 CO₂ is included or not (“climate change” is now “climate change: total (excl. biogenic CO₂)”)
- Additionally, we provide carbon contents of products

	method/standard/ guideline	IPCC 2021	IPCC 2021 (incl. biogenic CO ₂)	ISO 14067
Impact category	handling of biogenic CO ₂	0/0 for biogenic CO ₂	-1/+1 for biogenic CO ₂	-1/+1 for biogenic CO ₂
climate change: total (excl. biogenic CO ₂)		x		(x)
climate change: total (incl. biogenic CO ₂)			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. CO ₂)		x		
climate change: biogenic (incl. CO ₂)			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>

The screenshot displays the ecoinvent support Knowledge Base interface. The header includes the ecoinvent support logo, 'Knowledge Base', and links for 'Database Login' and 'Contact us'. A search bar is present with the placeholder text 'Search for answers'. The left sidebar contains a navigation menu with the following items: 'Getting Started', 'FAQ', 'Database', 'Fundamentals', 'Sectors', 'Releases' (highlighted), 'Use Cases', 'Resources', 'Data Submission', 'Glossary', and 'Projects'. The main content area is titled 'Relevant Documents and Files' and contains three sections: 'Report of Changes', 'Correspondence File', and 'Database Overview File'. Each section includes a brief description and a link to the relevant document, represented by a document icon and the text 'See [document name]'.

ecoinvent support Knowledge Base Database Login Contact us

Search for answers

Getting Started

FAQ >

Database >

Fundamentals

Sectors

Releases

Use Cases

Resources >

Data Submission >

Glossary

Projects

Relevant Documents and Files

Report of Changes

This report covers all changes made in the ecoinvent database between version 3.10 (2023) and 3.11 (2024). It reflects both database-wide changes, as well as sector-specific changes.

See [Report of Changes](#)

Correspondence File

The correspondence file is a spreadsheet that lists all datasets in versions 3.10 and 3.11 and matches corresponding datasets between versions.

See [Correspondence File \(3.10 to 3.11\)](#)

See [Correspondence File \(3.10.1 to 3.11\)](#)

Database Overview File

The database overview file describes the contents of the database. The following information is contained in the file:



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



Database Search

Follow [our step-by-step guide](#) for more information on how to use ecoQuery, search for datasets and access all available documentation, files, etc.

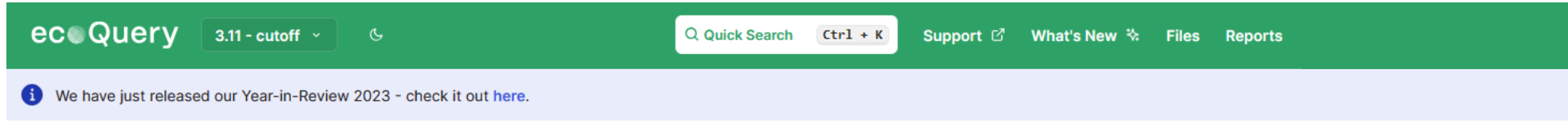
To leverage the ecoinvent database to the fullest we recommend our users to go through the Fundamentals of the ecoinvent Database [e-learning course](#) as well as consult the [ecoinvent knowledge base](#), including the explanation of system models. Our [Glossary](#) and [FAQs](#) clarify the terms we use, as well as answering common questions for users.

<input type="text" value="Search for an activity, product, or by CAS number..."/>						Filters
						Sector
						Geography
						Activity type
						ISIC Section
						ISIC Class
ACTIVITY NAME	REFERENCE PRODUCT	UNIT	GEOGRAPHY	SECTOR	ACTIVITY TYPE	
1,1-difluoroethane production	1,1-difluoroethane	kg	Rest-of-World (RoW)	Chemicals	Transforming activity	Details
1,1-difluoroethane production	1,1-difluoroethane	kg	United States of America (US)	Chemicals	Transforming activity	Details
1,1-dimethylcyclopentane to generic market for solvent, organic	solvent, organic	kg	Global (GLO)	Chemicals	Transforming activity	Details

Unit process datasets in ecoQuery



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



Home / NCA oxide production, for Li-ion battery

NCA oxide production, for Li-ion battery

Version	System model	Activity name	Geography	Reference product
3.11	cutoff	NCA oxide production, for Li-ion battery	CN	NCA oxide

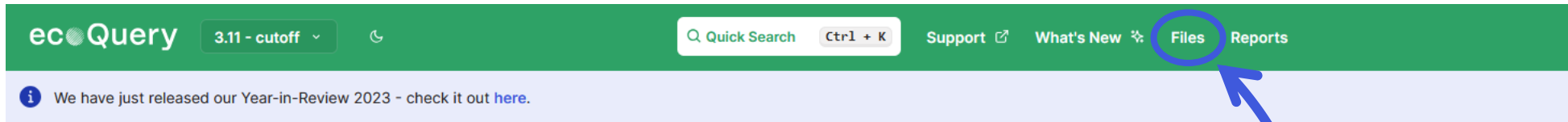
Documentation	General comment This dataset represents the production of 1 kg nickel cobalt aluminium (NCA) oxide in Chinese industry, and it is used as active material in the production NCA cathodes in Li-ion batteries.
Exchanges	
Consuming activities	Technology NCA oxide is produced through a multi-step calcination process. NCA hydroxide and lithium hydroxide are mixed and heated in the calcination kiln over two or three rounds of mixing and calcination. Oxygen is also add to the mixture. The resulting material is crushed, sieved and demagnetized to obtain NCA oxide. The production process is completely automated and almost all electricity consumption is attributed to the calcination kiln. The facility can achieve an overall material efficiency of approximately 100%.
LCI results	
Impact assessment	
Export	The general reaction is the following: $\text{NCA(OH)}_2 + \text{LiOH} + 0.25 \text{ O}_2 \rightarrow \text{Li-NCA-O}_2 + 2.5 \text{ H}_2\text{O}$ Reference: Dai, Q., Kelly, J. C., Dunn, J., & Benavides, P. (2018). Update of Bill-of-Materials and Cathode Materials Production for Lithium-Ion Batteries in the GREET Model. 2018. Argonne National Laboratory.

Included activities starts

Files available in ecoQuery



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



Files

Here you can download the database in ecoSpold2 format and access several supporting files for different versions of the ecoinvent database (for more information on the files, see [our step-by-step guide](#)). The data type `.spold` can be overwritten to `.xml`, and thus all the unit process (UPR), cumulative inventory (LCI), and results of the impact assessment (LCIA) of any activity can be viewed in any XML editor.

Version 3.11

Released November 19th, 2024

Allocation cut-off by classification		
FILE NAME	SIZE	
ecoinvent 3.11_cutoff_cumulative_lcia.xlsx.7z	169Mb	Download
ecoinvent 3.11_cutoff_cumulative_lci.xlsx.7z	973Mb	Download
ecoinvent 3.11_cutoff_ecoSpold02.7z	110Mb	Download
ecoinvent 3.11_cutoff_lcia_ecoSpold02.7z	255Mb	Download
ecoinvent 3.11_cutoff_lci_ecoSpold02.7z	2Gb	Download
Electricity Analysis 3.11 - Allocation cut-off.xlsx	17Mb	Download

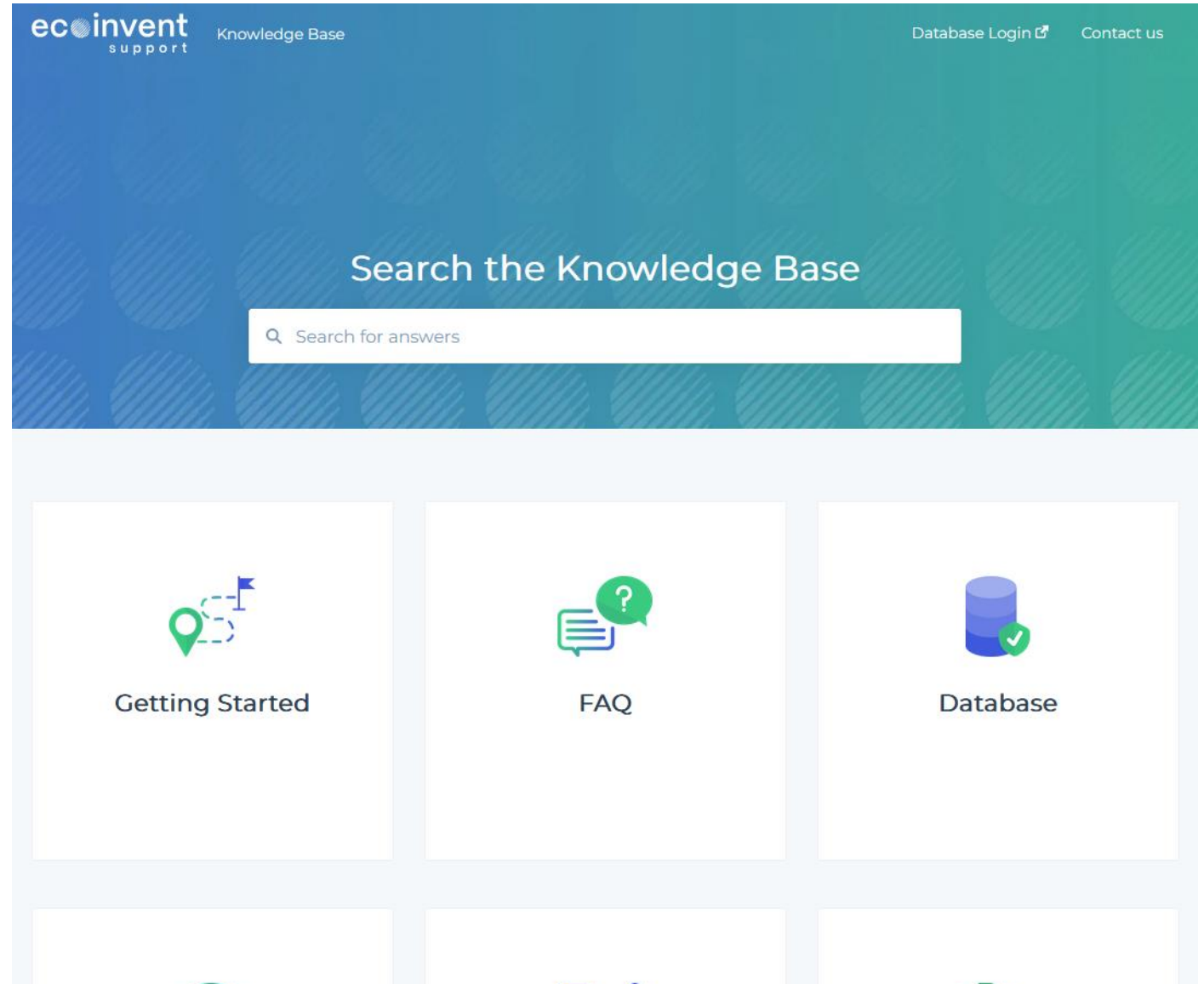
Jump to

- 3.11
- 3.10.1
- 3.10
- 3.9.1
- 3.9
- 3.8
- 3.7.1
- 3.7
- 3.6
- 3.5
- 3.4
- 3.3
- 3.2
- 3.1
- 3.0.1

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!

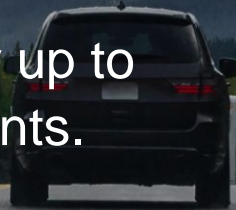
For any questions, comments, or other feedback, please get in touch through

<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

ecoinvent