

# Introduction to ecoinvent v3.10

ecoinvent

January, 2024

David FitzGerald



# Agenda

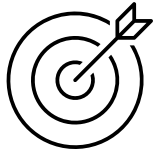


- 01 ecoinvent Association
- 02 Database
- 03 Contents and features of version 3.10
  - 03.1 Sectorial updates
  - 03.2 Other updates and features

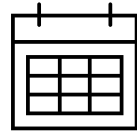
# ecoinvent Association



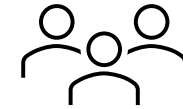
# Our Association



**Mission-driven, not-for-profit association**



**Founded 20 years ago by leading Swiss research institutions**



**Team of 60+ 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.

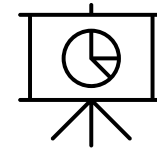
# Our Mission



**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.

# Database



# Our Database



Over 20,000 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 licenses representing ten of thousands users from more than 80 countries
- is available in many softwares and tools
- is compliant with the ISO 14 series (amongst others ISO 14040, 14044, and 14048)



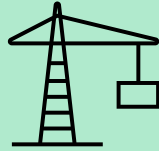
# The database content: sectors



Over 20'000 processes in 2023. Covering a variety of sectors in many regions of the world.



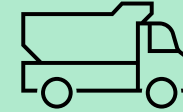
agricultural  
processes



construction  
materials



electricity  
supply



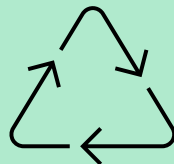
transport



wood  
products



chemical  
production



end-of-life  
processes



resources  
extraction



machinery



metal  
products



# Contents and features of v3.10



# Contents and features of version 3.10



## Sectorial updates

- Oil and natural gas
- Coke
- Chemicals
- Electricity
- Wastes
- Agricultural products
- Construction materials
- Pulp and paper
- Metals

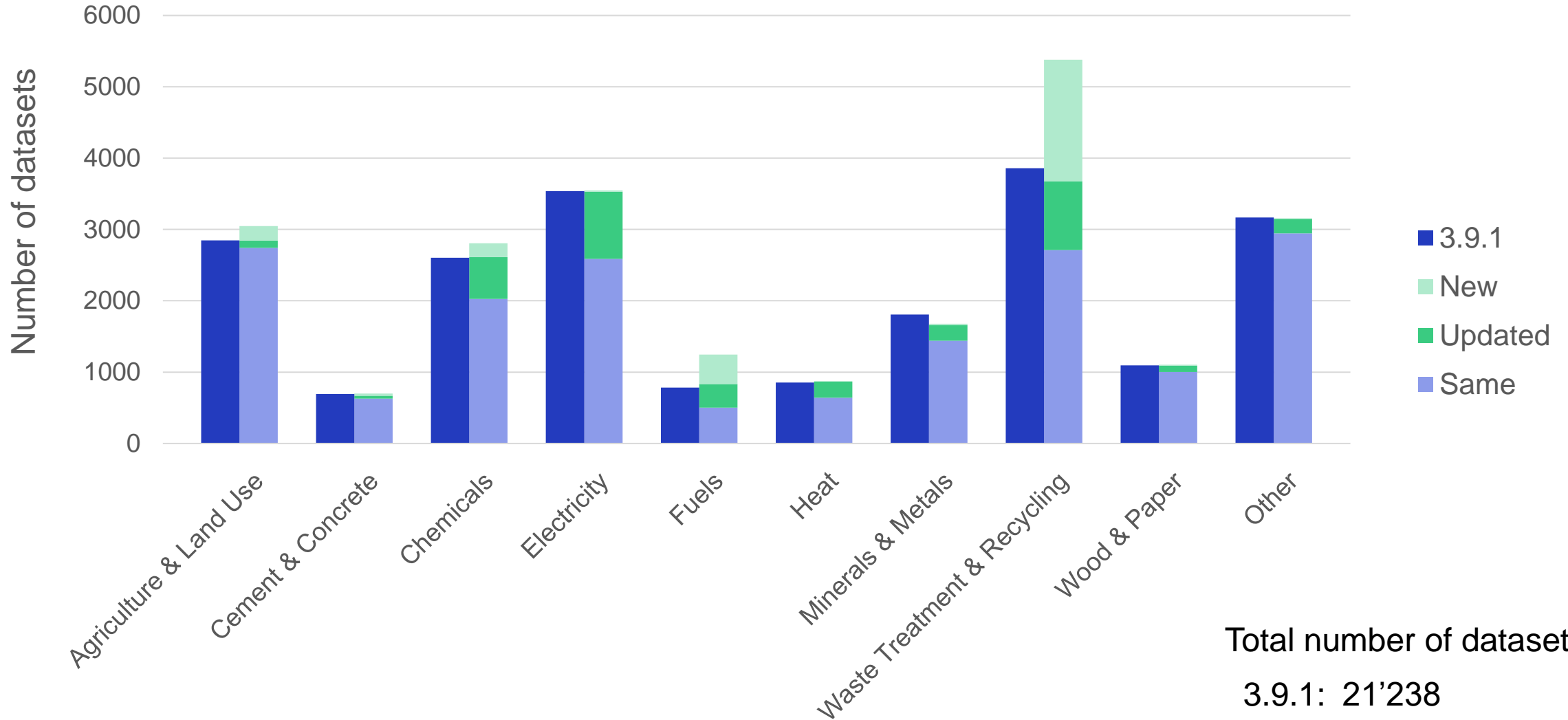
## Other updates

- New classification system for intermediate exchanges
- LCIA methods update
- New version of ecoQuery

# Sectorial updates



# Number of datasets in 3.9.1 and 3.10



Numbers are for the system model  
“Allocation, cut-off by classification”

Total number of datasets:

3.9.1: 21'238

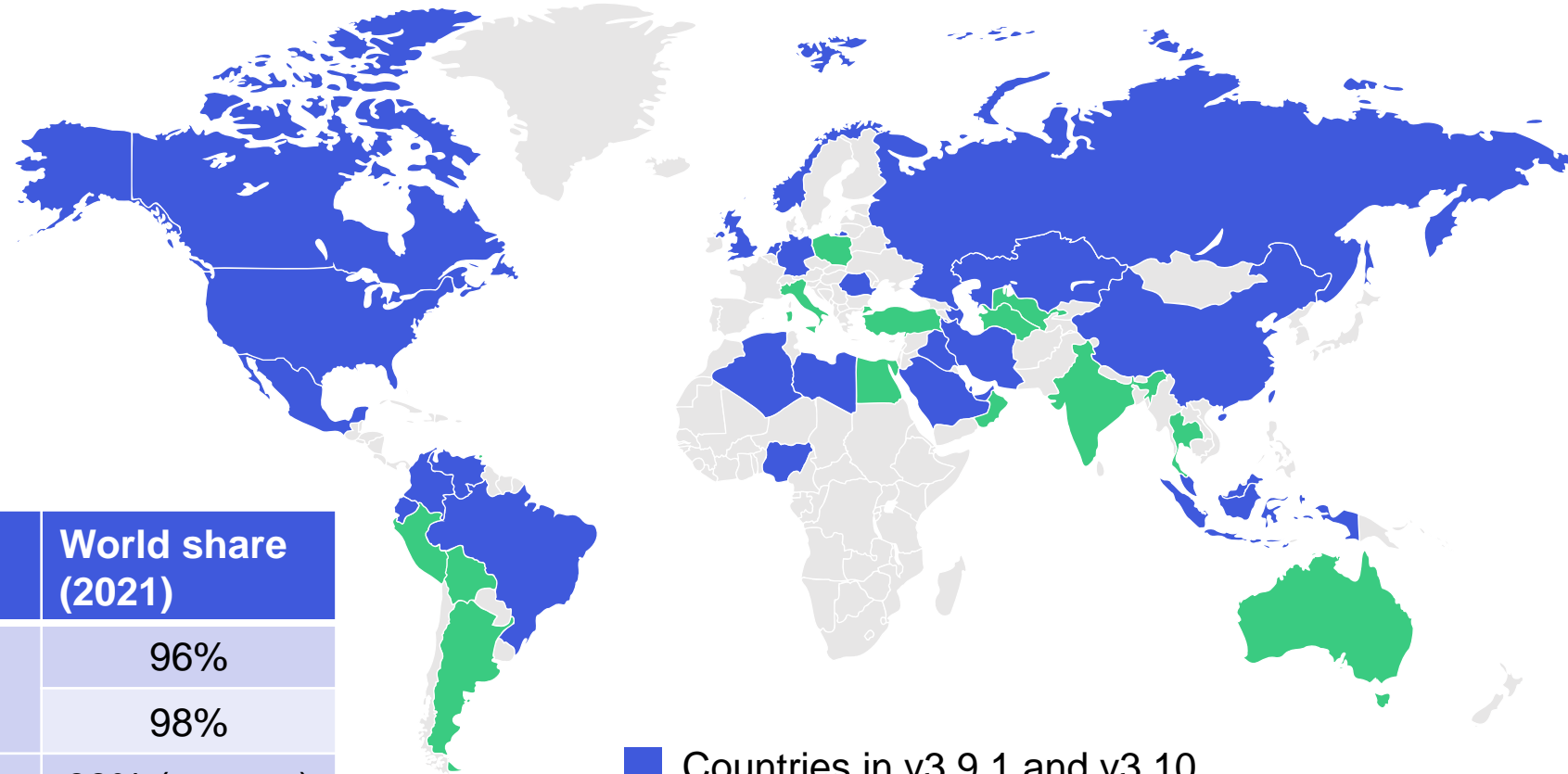
3.10: 23'523

# Crude petroleum oil and natural gas



## Geographical coverage of petroleum and natural gas production in version 3.10

- **Reference year: 2021**  
(before the large-scale invasion of Ukraine in 2022)
- For each country, distinction between offshore and onshore operations



- Countries in v3.9.1 and v3.10
- New countries introduced in v3.10

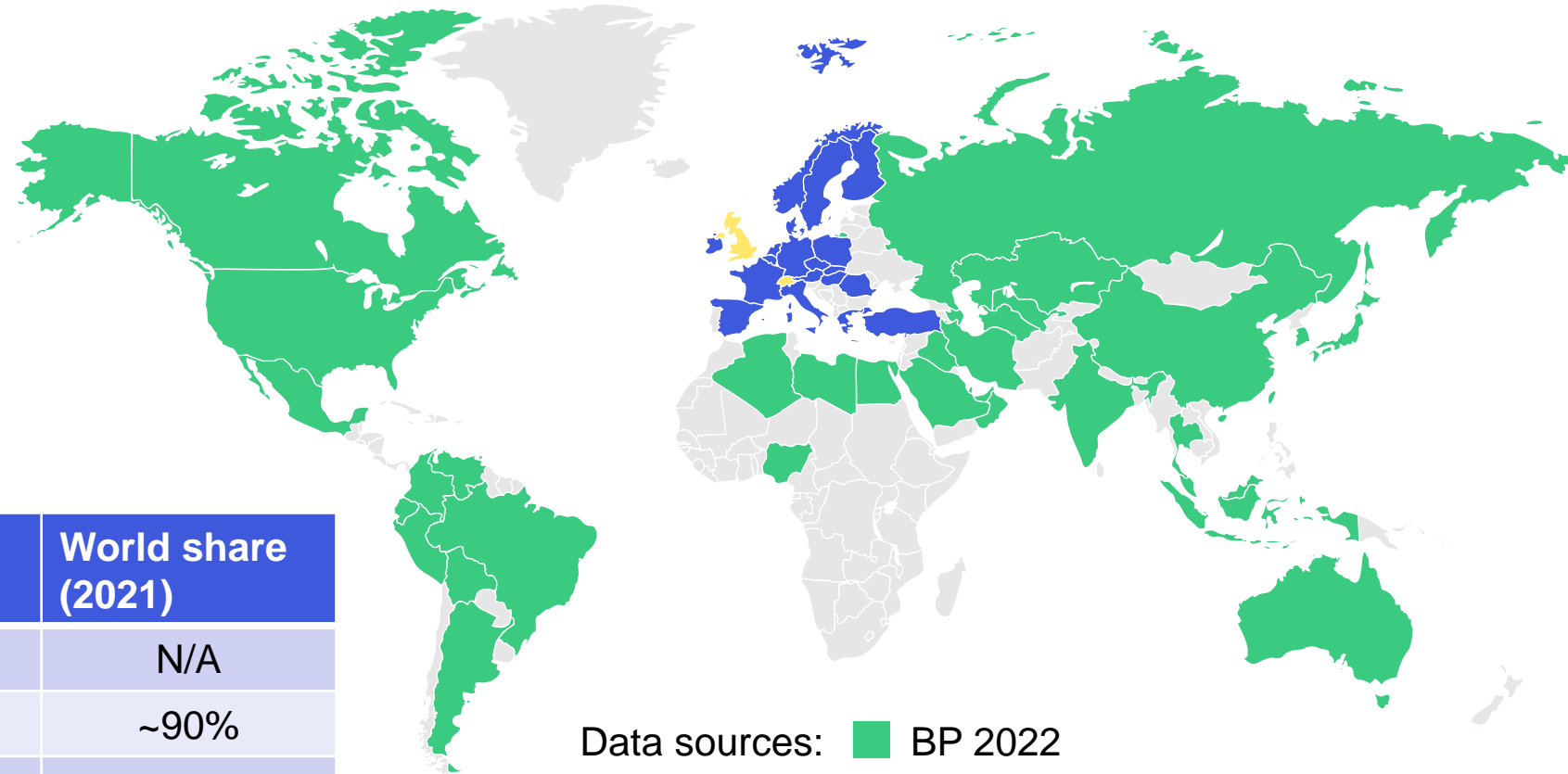
Product	Countries	World share (2021)
petroleum	41	96%
natural gas, high pressure		98%
natural gas, liquefied	14	93% (exports)

# Crude petroleum oil and natural gas



## Geographical coverage of natural gas (high pressure) markets in version 3.10, by data source

— Reference year: 2021  
(before the large-scale  
invasion of Ukraine in  
2022)



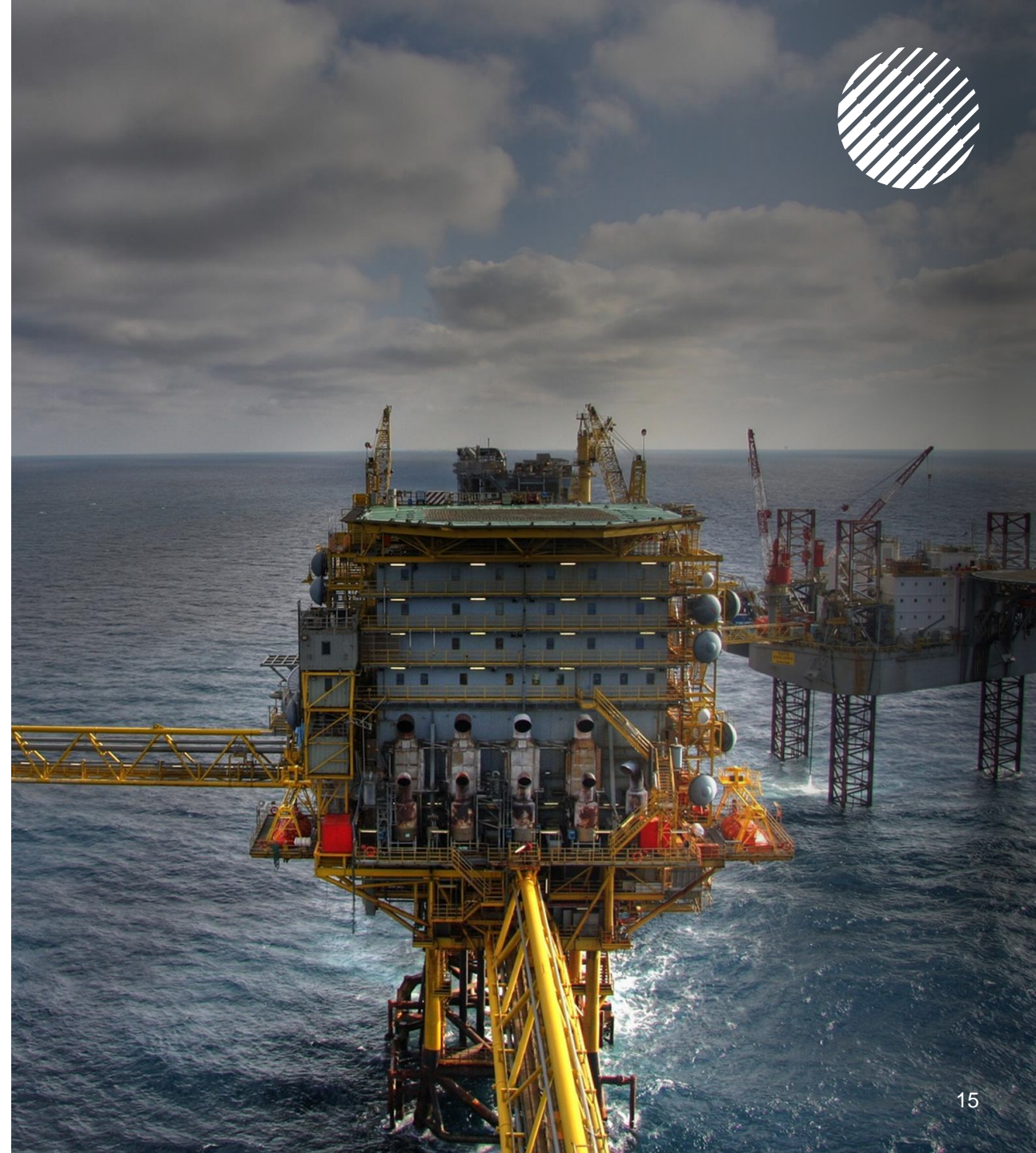
Product	Countries	World share (2021)
petroleum	8	N/A
natural gas, high pressure	57	~90%
natural gas, low pressure	15	N/A

Data sources: ■ BP 2022  
■ EuroStat  
■ Other (national statistics)

# Crude petroleum oil and natural gas

## Data origin:

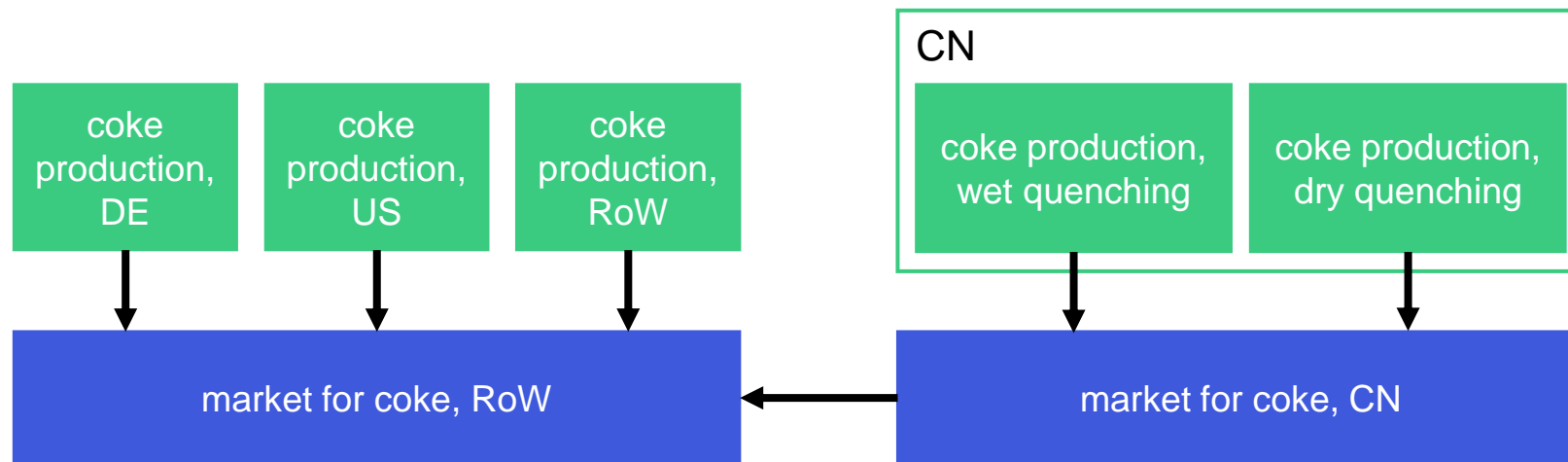
- **Data provider:** ESU-Services Ltd.
  - <https://esu-services.ch/data/public-lci-reports>
- **Main data sources**
  - Production and trade statistics from **bp** *Statistical Review of World Energy 2022* and **EuroStat**
  - Methane emissions from the **IEA** *Global Methane Tracker 2022*
  - The **World Bank's** *Global Gas Flaring Tracker Report 2022*
  - Industry environmental performance indicators (**IOGP** 2022)



# Coke production

## New coke production datasets in China

- New Chinese coke production datasets via wet quenching and dry quenching
- Data based on literature (Liu & Yuan, 2016)
- New and updated markets
- 50% increase in GWP score for RoW market





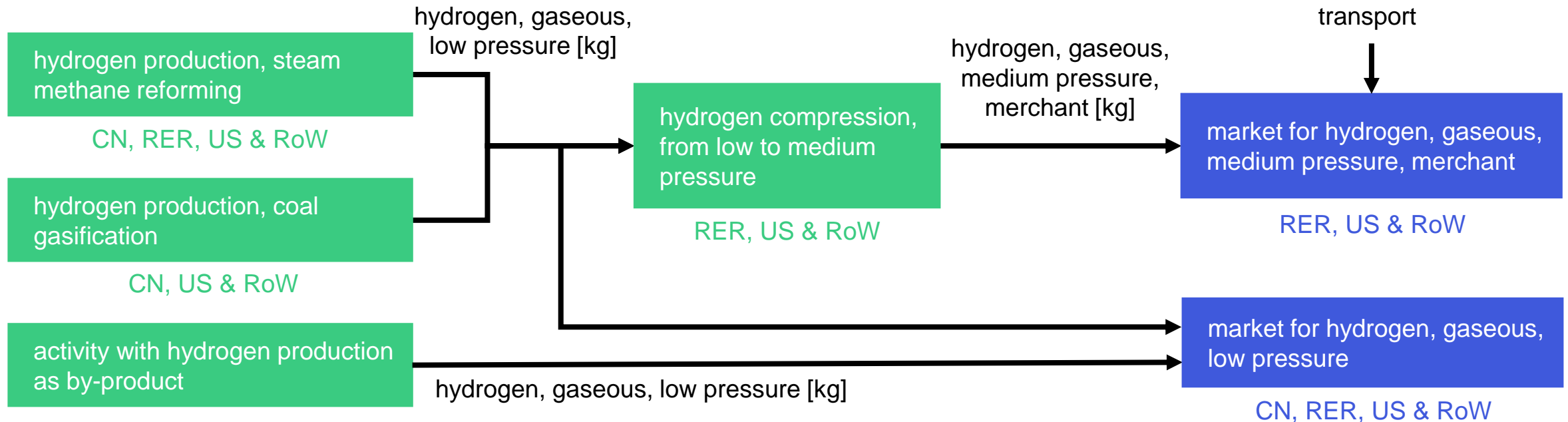
# Chemical sector



## Hydrogen supply chain update

- New and updated activities that model the main production routes of hydrogen
  - coal gasification & steam methane reforming (hydrogen is the reference product)
  - steam cracker & chlor-alkali electrolysis (hydrogen is a by-product)

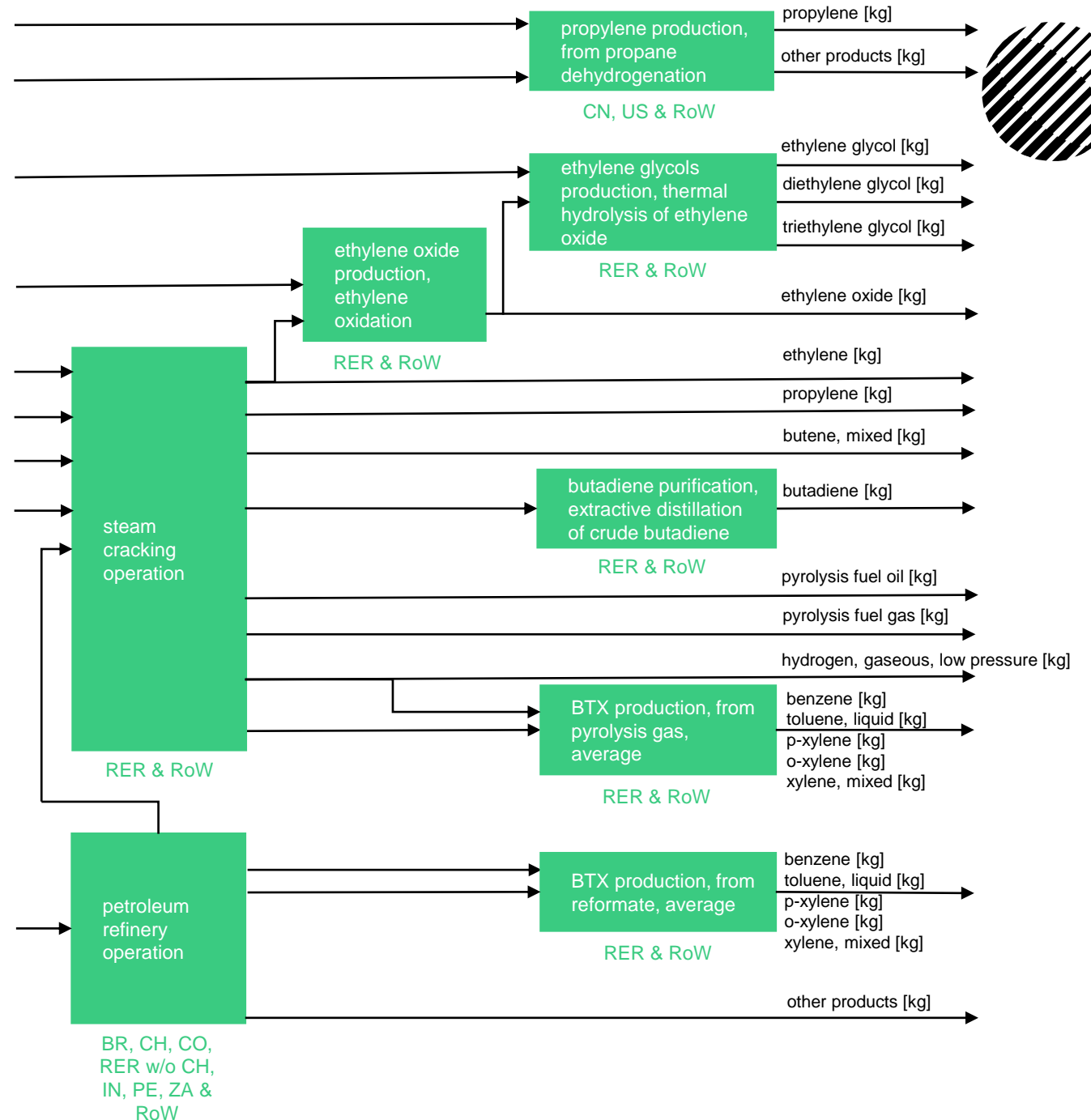
- Remodeling of hydrogen products
- Data origin
  - steam methane reforming (PSI)
  - coal gasification (literature)
- Significant increase in impact scores of the markets for hydrogen



# Chemical sector

## Petrochemicals: olefins, aromatics, and derivatives

- Replacement of aggregated datasets modelling the production of:
  - Light olefins: ethylene, propylene, butene, butadiene
  - Monocyclic aromatics: benzene, toluene, and xylene(s) (BTX)
  - Ethylene derivatives: ethylene oxide & ethylene glycols
- **Several value chains affected – score increases**
- Data provided by Plastics Europe, ifeu



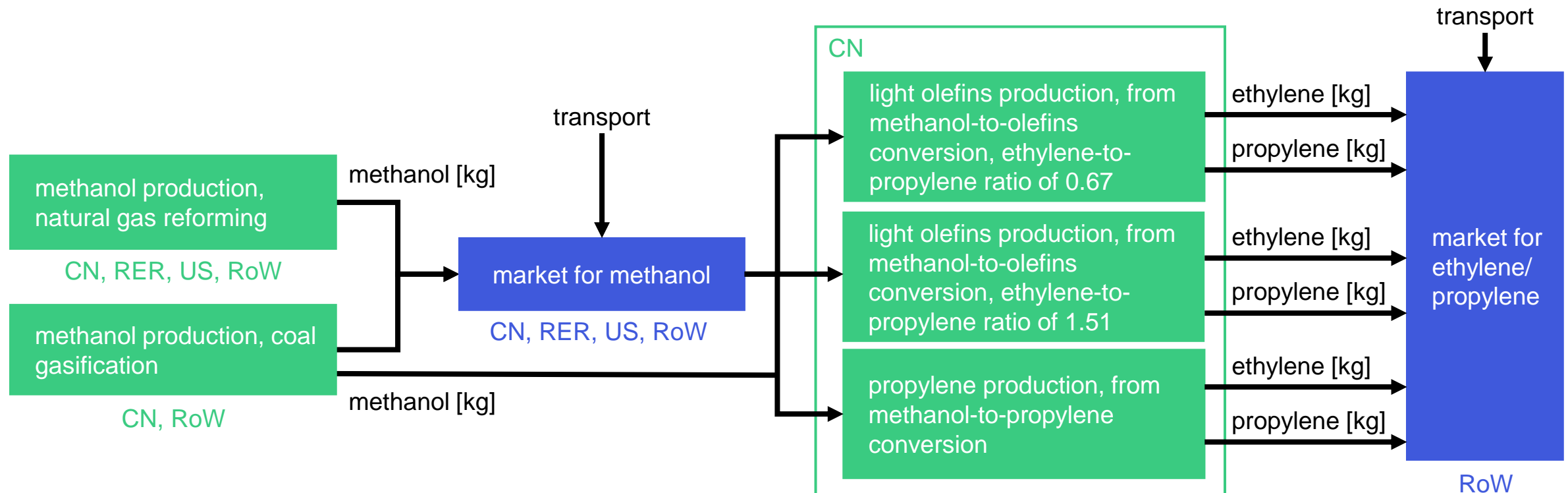
# Chemical sector



## Production of methanol & derivatives

- New and updated data:
  - Update: from natural gas
  - New: from coal gasification
  - New: light olefins production from methanol

- Geographical coverage
  - Methanol from natural gas: CN, US, RER, & RoW
  - Methanol from coal: CN & RoW
  - Light olefins from methanol: CN



# Chemical sector


## Update of chlor-alkali electrolysis in Europe (RER)

- New and updated chlor-alkali electrolysis activities in RER:
  - average production
  - membrane cellReplaces the datasets for sodium hypochlorite production
- Deleted activities in RER:
  - mercury cell (phased out)
  - diaphragm cell (included in average production)
- Data provided by ifeu, Euro Chlor



# Chemical sector

## Diisocyanates (MDI & TDI) and polyols production

- Building blocks of polyurethane
- Generic polyol replaced by short chain and long chain polyols
- Update of methylene diphenyl diisocyanate (MDI) and toluene diisocyanate (TDI)
- Data provided by ISOPA 
- Aggregated Eco-profiles were also provided. Different background data. Activity and product names contain "ISOPA"



# Chemical sector

## Other updates

- New GLO activities for cooling at:  
-15, -25, -45, -55, -100, and -160 °C
- Update of datasets for around 20 chemicals
  - Revised mass and energy balances based on stoichiometry and new references
- Harmonization of proxy exchanges in 400+ chemical datasets



# Electricity sector

## Update of market mixes

- All electricity markets mixes have been updated, covering 100% global electricity supply reported in statistics:
  - China, India, Brazil, Switzerland based on data from national statistics for 2021
  - US and Canada based on IEA data for 2021
  - All other countries are based on 2020 data from the IEA and eGrid
- GWP scores of markets mostly changed within  $\pm 10\%$

## Update of metadata of electricity datasets

- For all electricity markets, transformation and import activities: updated time periods and every mention of reference year



# Electricity sector

## Other updates

- Update of residual mixes for EU-28 and Norway, Iceland, and Serbia for the year 2022 (Switzerland and Ireland removed)
- Introduction of 3 datasets for the construction of small-scale wind turbines in Germany (provided by the University of Pforzheim)





# Waste sector



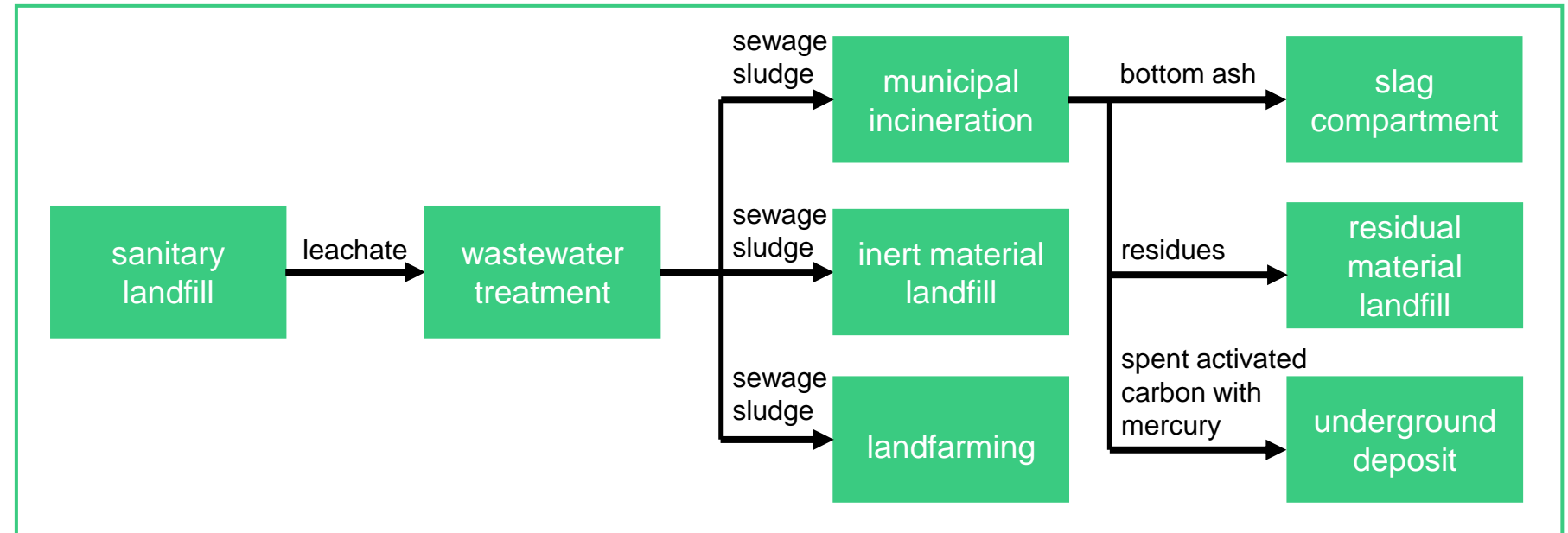
## Disaggregation of all waste treatments chains

- Same waste compositions as in v3.9.1, but new modelling approach
- More detailed modelling of treatment chains
- Collection and transportation of intermediate wastes is modelled
- Enables more customization

Previous versions



Version 3.10



# Agriculture sector

## New data for crops and field operations in Australia

- Data for 5 crops (for several states): wheat, maize, barley, oat, and rape seed
- 5 datasets modelling field operations (at the country level), e.g. planting and harvesting
- Data provided LifeCycles

## New data for crops and field operations in the United States of America

- State-level datasets for 4 crops previously available only at the country level: maize grain, sweet corn, soybean, potato
- 41 datasets for field operations (country level) covering for example planting, tillage, and harvesting
- Data provided by Earthshift Global



# Agriculture sector

## Other updates

- Data for flax fibre production in Europe, provided by the Alliance for European Flax Linen & Hemp
- New Excel file which provides FLAG emissions values related to land use



Activity Name	Geography	Reference Product	Unit	Amount	FLAG emissions (kg)		
					Carbon dioxide, from soil or biomass stock	Dinitrogen monoxide	Methane, from soil or biomass stock
almond production	CN	almond	kg	1	6.12348E-05	1.8495E-09	6.28816E-08
almond production	US	almond	kg	1	0.000149617	4.6907E-09	1.59482E-07
apple production	CL	apple	kg	1	1.05543E-05	3.2746E-10	1.11337E-08
apple production	CN	apple	kg	1	2.8114E-05	8.6741E-10	2.94921E-08

# Construction sector

## New cement and clinker datasets for Tunisia (TN)

- Covers clinker and 3 types of cement produced in TN
- Data collected in 2019 and provided by Université de Tunis El Manar

## Updated cement and clinker datasets for Switzerland (CH)

- Covers clinker and different types of cement produced in CH
- Data based on all cement producers in CH, from 2017 to 2021
- Data provided by cemsuisse (largest cement association in Switzerland)



# Construction sector

## New construction materials in Ecuador (EC)

- Basic and artisanal construction materials:
  - Clinker, cement, concrete block
  - adobe bricks, clay bricks, clay roof tiles

## Datasets for bamboo products in Ecuador

- Bamboo culm, bamboo pole, and flattened bamboo

Data for EC was provided by EMPA, collected by the University of Cuenca



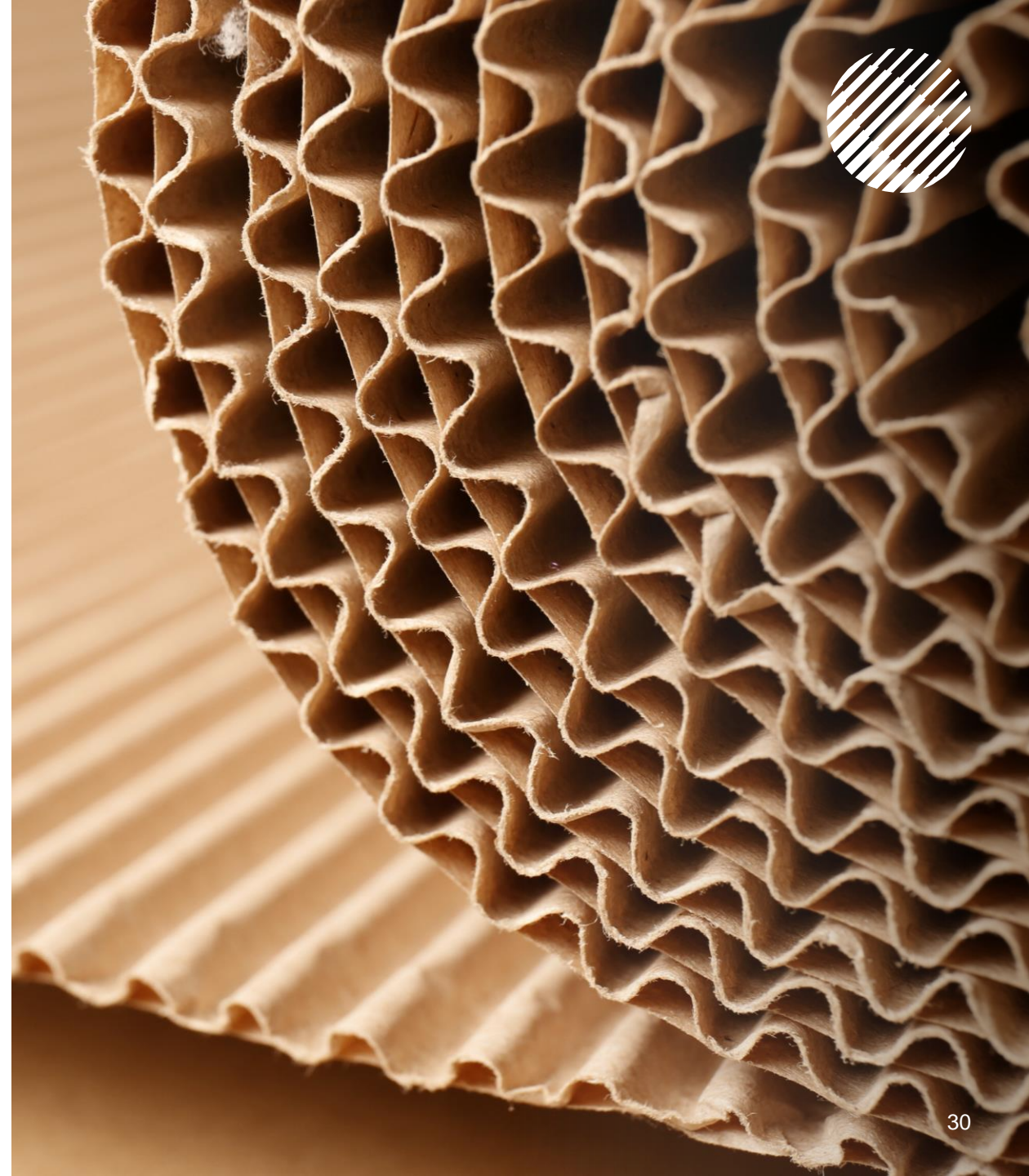
# Pulp and paper sector

## Containerboard and corrugated board box production

- New data for 2020 from European producers, covering 70 – 80% of production
- Datasets for RoW and CA-QC geographies updated as well
- Data from members of FEFCO and CCB, reviewed by ifeu (Institut für Energie- und Umweltforschung)

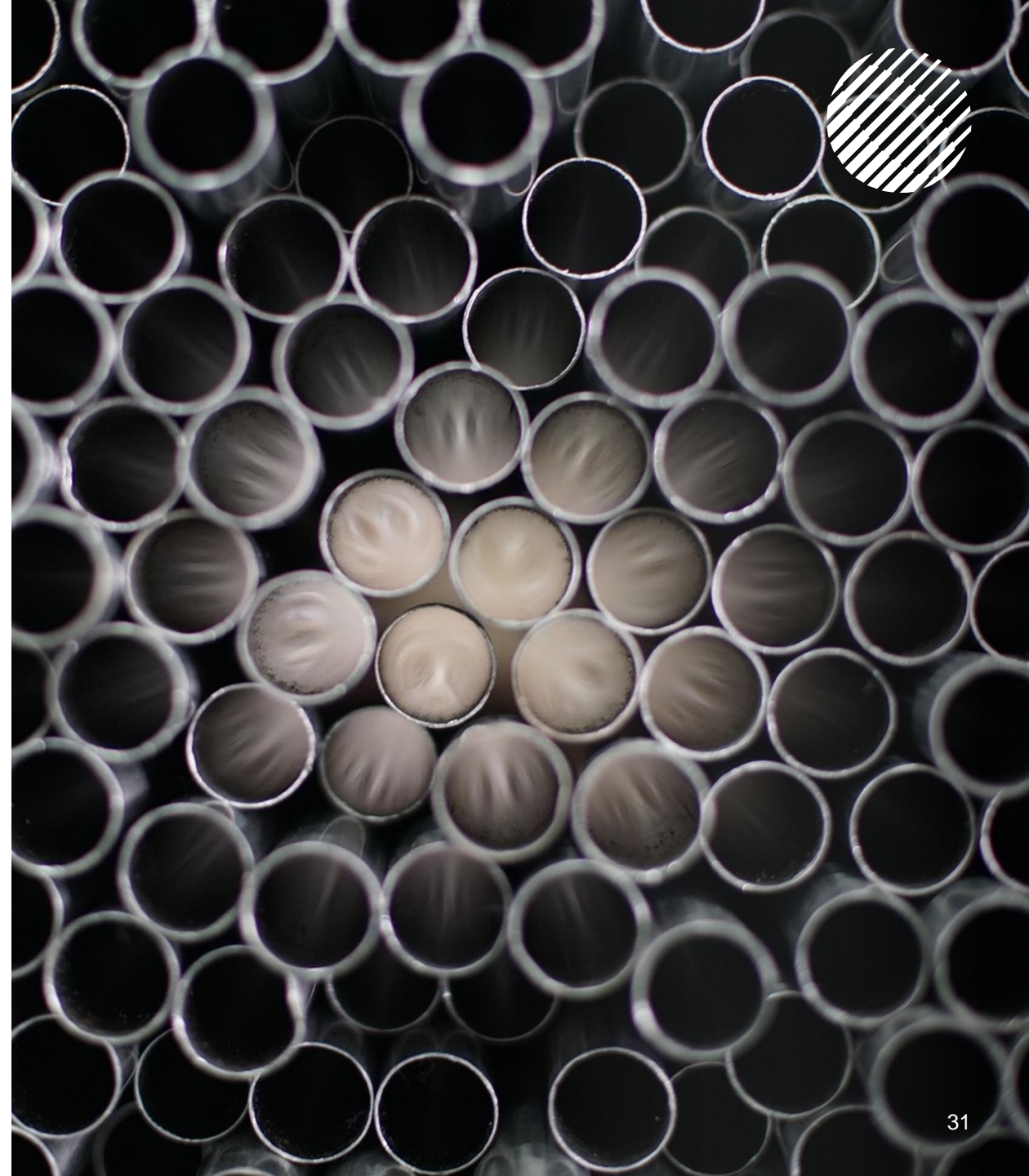
## Beverage cartons in Europe

- New data for 3 types of beverage cartons: UHT milk, fresh milk, and juice
- Replaces “liquid packaging board container production”
- Data from 2017, prepared by ifeu, provided by members of ACE



# Metal sector

- **Thermal spraying**
  - Atmospheric plasma spray, high velocity oxyfuel, and cold spray
  - Abrasive blasting
  - Data provided by the University of Barcelona
- **Update of prices of rare earth oxides (REO)**
  - More up-to-date and harmonized prices
  - Updated economic allocation factors



# Other updates and features





# Additional info for exchanges, Database Overview File



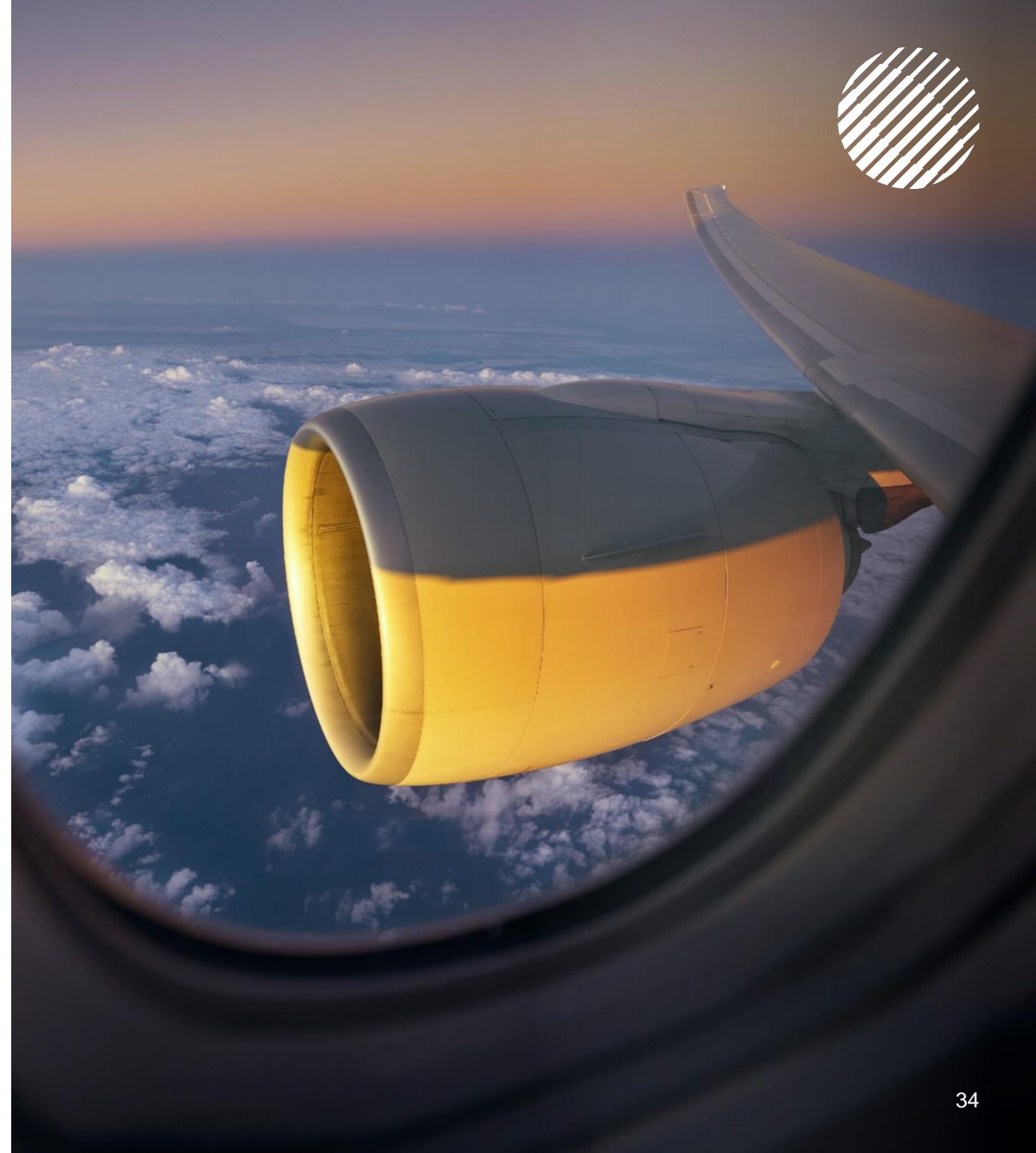
- Updated CAS numbers and formulas
- Introduction of the HS 2017 (Harmonized System) classification for intermediate exchanges

→ Accessible in the Database Overview Excel file

Reference Product Name	CPC Classification	HS2017 Classification	Unit	Product Information	CAS Number
alkyd resin, long oil, without solvent,	35110: Paints and varnishes	320890: Paints and varnishes;	kg	The product "alkyd resin, long	
petrol, unleaded	33311: Motor gasoline	2710: Petroleum oils and oils	kg	'petrol, unleaded' is a fossil	086290-81-5
natural gas, high pressure	12020: Natural gas, liquefied	271121: Petroleum gases and	m3	'natural gas, high pressure' is	8006-14-2
electricity, medium voltage	17100: Electrical energy	271600: Electrical energy	kWh	This product represents	
alfalfa-grass silage	01912: Alfalfa for forage and	0604: Foliage, branches and	kg	The product 'alfalfa-grass	
photovoltaic slanted-roof installation,	87360: Installation services		unit	This is an infrastructure,	
paper, woodfree, uncoated	32113: Mechanical wood	480255: Uncoated paper and	kg	The product 'paper, woodfree,	
uranium mill	53269: Other constructions		unit	This is an immobile	
kerosene	3334: Kerosenes	270900: Oils; petroleum oils and	kg	kerosene' is a fossil fuel with a	008008-20-6

# Impact assessment methods

- New methods:
  - IMPACT World+ v2.0.1, footprint version
  - USEtox v2.13 midpoint
  - USEtox v2.13 endpoint
  - Inventory results and indicators (successor of “Selected LCI results”)
  - EN15804 EPD PCR extension for GWP (introduced as impact category in EF v3.X EN15804 methods)



# New version of ecoQuery



- ecoQuery is the online platform to access the ecoinvent database directly <https://ecoquery.ecoinvent.org>
- A new version was launched in August 2023



## Database Search

The [How to use ecoinvent online step-by-step](#) document provides guidance on how to use ecoQuery, search for datasets and access all the available information, 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 [our website](#), including the explanation of system models. Our [Terminology](#) and [FAQs](#) clarify the terms we use, as well as answering common questions for users.

ACTIVITY NAME	REFERENCE PRODUCT	UNIT	GEOGRAPHY	SECTOR	ACTIVITY TYPE	
blast furnace production	blast furnace	unit	RER Europe	Infrastructure & machinery, metals	Transforming activity	<a href="#">Details</a>

**Filters**

- Sector
- Geography
- Activity type
- ISIC Section

# More detailed information about version 3.10



The Report of changes and other useful files and information are available at

<https://support.ecoinvent.org/ecoinvent-version-3.10>

The screenshot shows the Ecoinvent Knowledge Base interface. At the top, there is a navigation bar with the Ecoinvent logo, 'Knowledge Base', 'Database Login', and 'Contact us'. Below this is a search bar with the placeholder text 'Search for answers'. On the left side, there is a vertical navigation menu with the following items: 'Getting Started', 'FAQ', 'Database', 'Fundamentals', 'Sectors', 'Releases' (highlighted), 'Use Cases', 'Resources', 'Data Submission', and 'Glossary'. The main content area is divided into two columns. The right column is titled 'Relevant Documents and Files' and contains three sections: 'Report of Changes' (with a description of changes between versions 3.9.1 and 3.10), 'Correspondence File' (with a description of a spreadsheet listing datasets), and 'Database Overview File' (with a description of the database contents). Each section includes a document icon and a link to the respective file.

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Search for answers

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Fundamentals

Sectors

**Releases**

Use Cases

Resources >

Data Submission >

Glossary

### Relevant Documents and Files

#### Report of Changes

This report covers all changes made in the ecoinvent database between version 3.9.1 (2022). It reflects both the database-wide changes, as well as the sector-specific changes.

See [Report of Changes](#)

#### Correspondence File

The correspondence file is a spreadsheet that lists all datasets in versions 3.9.1. and 3.10 and matches corresponding datasets between versions.

See [Correspondence File](#)

#### Database Overview File

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

# 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.

January, 2024

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