The ecoinvent Database

A Life Cycle Inventory for transparency in environmental assessments.
Content

Life Cycle Inventory Data 4  Fuels 22
  ecoinvent Use 5  ● Coal
  ecoinvent Quality 6  ● Natural Gas
  ecoinvent Methodology 7  ● Petroleum

Sectors
  Accommodation Services 10  Infrastructure 24
  Agriculture & Animal Husbandry 12  Metals 26
  Building & Construction 14  Pulp & Paper 28
  Chemicals & Plastics 16  Transport 30
  Energy 18  Textiles 32
    ● Electricity
    ● Heat
  Forestry & Wood 20  Waste Management & Recycling 34
    ecoinvent Benefits & Access
      Benefits 40
      Access 41
  Water Supply 36
The ecoinvent database is a Life Cycle Inventory (LCI) database that supports various types of sustainability assessments. It is a global library of human activities, which includes thousands of processes that supply goods and services across all industrial sectors.

The ecoinvent Database is used to support a wide range of studies; from internal organisational studies to respond to product development or production, to in-depth, ISO compliant studies. Specifically, the ecoinvent data are used as background, comprehensive data to support assessments on the environmental impacts of activities and products, reaching far beyond CO2 footprints. Water consumption, biodiversity loss, human toxicity or resource depletion are some of the aspects that can be considered with the support of the ecoinvent Database.

This brochure provides an overview of the data included in the ecoinvent Database, covering different industrial sectors, ranging from resource extraction to waste treatment, while introducing you to the key features and benefits of working with ecoinvent.

More than 3’000 organisations worldwide, ranging from multinational corporations to leading research institutes already trust in ecoinvent. They use the database for a variety of purposes. For example:

- Life Cycle Assessment (LCA)
- Life Cycle Sustainability Assessment (LCSA)
- Corporate Sustainability Reporting
- Scope 2 & 3 Greenhouse Gas (GHG) Emission Reporting
- Sustainable Product Design
- Product Supply Chain Management
- Environmental Product Declarations (EPDs)
- Environmental Footprinting & Offsetting
- Green (Public) Procurement

ecoinvent Data can be used to support environmental assessments and reports that aim to comply to the following standards:

- ISO14000 Family for Environmental Management
- EN15804 for Environmental Product Declarations (EPDs)
- ISO21930 for Environmental Product Declarations (EPDs)
- ISCC Certifications
- GHG protocol- Corporate Value Chain (Scope 3) Standard
- ILCD Handbook
ecoinvent Quality

**Trusted Partners**
The ecoinvent datasets are based on trusted industrial and research data, compiled by internationally renowned research institutes and universities, industrial associations and LCA consultants.

**Detailed Review Process**
A detail-orientated approach to quality control ensures that all datasets included in the database undergo thorough internal reviews, as well as external review by independent experts.

**Consistent Linking**
Consistent linking between processes ensures that new data additions, or updates in one dataset, immediately translate into updates in all other (potentially) connected datasets.

**Yearly Releases**
The ecoinvent Database is updated on an annual basis with new and up-to-date data as well as general additions to the database.

**Longevity**
The ecoinvent Database has supported LCA and other sustainability assessments for more than 20 years. The ecoinvent team continues its commitment to maintaining the database with a focus to its technical stability and endurance, as well as its content’s relevance and transparency.

ecoinvent Methodology

**Transparency from Unit Process to Impact Results**

**Unit Process**
The basic building blocks of the database are individual processes of human activities and their exchanges with the environment (elementary exchanges) and with the technosphere (intermediate exchanges).

**Cumulative Life Cycle Inventories**
Individual unit processes are linked into supply chains. Where natural resource consumption or emissions of the same type occur at different stages of a supply chain, their amounts are aggregated resulting in an aggregated list of elementary exchanges associated with the life cycle of a product. This is called the cumulative Life Cycle Inventory (LCI).

**Impact Assessment Results**
Matching these inventories with characterisation factors reveals the impact assessment results over a product’s entire life cycle (LCIA results), e.g. the carbon and water footprint.
Accommodation Services

The Accommodation Services sector in the ecoinvent Database comprises 50 datasets, covering the construction and operation of various comfort categories of tourist accommodation facilities, as well as the necessary consumer goods, including furniture and appliances. The geographies covered are Brazil (BR) and Peru (PE).

Sector Highlights

- Accommodation construction
- Accommodation operation
- Consumer goods
Agriculture & Animal Husbandry

The Agriculture & Animal Husbandry sector in the ecoinvent Database comprises of more than 2'400 datasets, covering the growing of perennial and non-perennial crops, production of seedlings, transportation, animal husbandry, fishery, supporting activities and the end of life of the various by-products. The geographies covered include more than 40 countries and various regions within countries. Major producer countries and/or regions include Brazil (BR), India (IN), Switzerland, (CH), South Africa (ZA), Canada, Europe (RER), China (CN), Peru (PE), Ecuador (EC) and many more.

The ecoinvent Database includes datasets on the various activities within the Agriculture and Animal Husbandry sector. These include, growing of perennial crops (e.g. apples, mandarins); growing of non-perennial crops (e.g. hay, grass); production of oils from crops (e.g. soybean oil); supporting agricultural activities (e.g. tillage, irrigation, sprayer); recycling of agricultural by-products (e.g. nutrient supplies); animal production (e.g. cattle, swine); crop processing activities (e.g. sugar production); crop supporting activities (e.g. drying, sorting); production of animal feeds.

There are plenty of datasets that are used almost exclusively for agriculture but are not considered part of the sector. Datasets on fertiliser production are included in the Chemicals sector. Furthermore, crop production for crops meant to be used for textiles is covered in the Textiles sector. All datasets related to irrigation are included in the Water Supply sector.

Sector Highlights

- Crop production
- Animal husbandry
- Fisheries
- Fertilisers & nutrient supplies
- Agricultural & processing service & infrastructure
- Land Use Change (LUC)
Building & Construction

The Building and Construction sector in the ecoinvent Database comprises of 1’500 datasets, covering the extraction, processing and transportation of construction minerals and the manufacturing and end-of-life treatment of most major construction materials.

Specifically, the database includes datasets on the production of construction minerals (e.g. sand, gravel, lime, gypsum, natural stone), operation of the quarry or mine for extraction of the minerals, clinker production, cement and concrete production, production of alternative materials that can substitute clinker in concrete (e.g. ground granulated blast furnace slag, calcined clay), glass production, production of insulation materials (e.g. polystyrene, expanded vermiculite, stone wool), brick and tile production and plaster and mortar production.

The geographies covered include Brazil (BR), Colombia (CO), Peru (PE), India (IN), South Africa (ZA), Switzerland (CH), Europe (RER), the region of Québec – Canada (CA-QC), North America (RNA) and the United States (US).

Datasets on wood manufacturing and processing are included in the Forestry sector of the ecoinvent Database. Datasets related to the production of metals and metal tools used in building and construction are included in the Metals sector of the database.

Sector Highlights

- Resource extraction
- Material production/processing
- Product manufacturing
- Infrastructure
The Chemicals and Plastics sector in the ecoinvent Database comprises of over 1'900 datasets, covering a broad spectrum of substances that address different needs in various industrial sectors. The database accommodates data ranging from commodities to highly specialised products. Many of the feedstocks in the Chemicals and Plastics sector are sourced in refineries, and this topic is discussed in the Fuels section.

To allow holistic modelling, the ecoinvent Database includes several infrastructure datasets, ranging from generic chemical factories to specialised plants such as a methanol factory. Additionally, data about several services such as injection moulding and extrusion are available.

Substances in the database are modelled as pure substances. An exception refers to chemicals which are produced in different grades, e.g. silicon (electronics, metallurgical and solar grade). If an assessment demands for data of substances in a diluted state, the required amount of water or solvent should be added to the assessment where necessary. To facilitate this for ecoinvent data users, the activity names in the ecoinvent Database include the industrially most applied solution state for selected chemicals.

The geographies covered are Global (GLO), Europe (RER) and selected European countries, United States (US), Canada (CA), Chile (CL), Morocco (MA), India (IN), China (CN) and Australia (AU).

**Sector Highlights**

- Fertilisers & pesticides
- Ink & paints
- Plastics & rubber
- Cleaning agents
- Bulk & specialised chemicals
Electricity

The Electricity sector in the ecoinvent Database is continuously updated. Currently, more than 3'500 datasets in over 250 geographies model electricity supply and consumption, and cover electricity generation including power plants, transformation, transmission, distribution and use. Electricity-generating datasets cover a wide range of fossil as well as renewable energy sources and production technologies including secondary electricity production datasets from various industrial processes.

Sector Highlights

- Renewable electricity
- Fossil electricity
- Biogas & waste incineration
- Transmission & distribution

Heat

As an important energy provider, Heat and Steam is produced and consumed through various ways in the ecoinvent database. Classical means of heat production through the burning of fossil fuels such as oil, coal and natural gas or burning of wood pellets and hardwood are available. Many different production technologies including large scale heat and power co-generation (CHP) or combined cycle gas turbines for centralized heat distribution, but also small-scale furnaces, boilers and mini CHPs for local production are incorporated as well. In turn, the production of infrastructure required for these heat production processes is represented in separate datasets.

Sector Highlights

- Heat from fuels
- Biogas & waste burning
- Heat from solar collectors
- Heat as by-product
- Steam
- Use of heat & steam
Forestry & Wood

The Forestry & Wood sector in the ecoinvent Database comprises roughly 1'000 datasets, covering the growing of the forest, the production, processing, and transportation of wood and wood products as well as the end of life of the various wood by-products.

The sector contains datasets on various activities. These include forestry processes for various species (e.g., pine, oak, eucalyptus), extraction of various wood products (e.g. logs, energy wood, pulpwood), sawing, drying, and planing of wood, production of engineered wood products (e.g. fiberboard, glued laminated timber, plywood), production of wood preservatives, application of different preservation methods, and the production of wood pellets.

Geographies covered include Europe (RER) and some countries within Europe (Germany (DE), Portugal (PT), Sweden (SE), Switzerland (CH)), some countries in Asia (China (CN), Malaysia (MY), Thailand (TH), the Philippines (PH)), and some countries in the Americas (Brazil (BR), including some of its territories, Canada, Québec (CA-QC), Colombia (CO)).

Sector Highlights

- Forestry
- Sawmill
- Engineered wood products
- Wood preservation
- Wood incineration
- Infrastructure
Fuels

Coal

The Coal sector is comprised of data on mining and preparation of hard coal and lignite (also known as brown coal). No further quality distinctions/classifications, e.g. by heating value, or by application (steam coal vs. coking coal) are currently made. Both coal types are also processed into briquettes used for heat production, while the original/crude form is used as inputs in many datasets for electricity and heat production.

Sector Highlights

- Hard coal
- Lignite

Petroleum

The ecoinvent Database includes data on the extraction, transport, and refining of Petroleum to liquid and gaseous fuels, as well as other refined petroleum products. Both on-shore and off-shore production of petroleum (in combination with natural gas) is covered for several of the major oil producing regions by the following datasets:

- Petroleum production, onshore (GLO, RAF, RME, RU)
- Petroleum & gas production, onshore (GLO, CA-AB, NL, NG, US)
- Petroleum & gas production, offshore (GLO, GB, NO, NL)

Sector Highlights

- Petroleum quality & classification
- Transport of crude oil
- Global crude oil trade
- Petroleum refining
- Product applications

Natural gas

In the ecoinvent Database Natural gas is modelled from the extraction from the ground in on-shore and off-shore production plants to the processing of the raw gas to the burning in a multitude of applications. Infrastructure for extraction processes are represented in separate datasets. Additionally, datasets on the construction and transport of natural gas through pipelines for high- and low-pressure distribution networks are modelled. For the transport of natural gas in the form of liquefied natural gas (LNG), the ecoinvent database contains processes for the liquification and evaporation of natural gas. Natural gas products (except natural gas liquids) are measured in normal cubic meters (Nm3) which is defined as the volume the gas takes up at 273.15°K and atmospheric pressure (1.013 bar).

Sector Highlights

- Natural gas, high & low pressure
- Liquified natural gas
- Natural gas, vehicle grade
- Burning of natural gas
Infrastructure

The Infrastructure sector includes the technical systems that provide key services like transportation, water supply and sewage, energy supply and provision of commercial or industrial space (Bergesen et al., 2017). These systems are the main channels through which natural resources are consumed and products of human activities produced and treated. Infrastructure systems are not intended for consumption (final use by the receiving activity or incorporation into a product). In product Life Cycle Assessment studies, in general, infrastructure plays a limited role in the environmental impact of the final product.

Infrastructure can be distinguished into mobile and immobile. The current section covers immobile infrastructure (hereinafter referred to as infrastructure).

In the ecoinvent Database, the Infrastructure sector is identified primarily by one or more of the following aspects:

- the term ‘construction’, rather than ‘production’, in the activity name
- transformation and occupation of land are included in the inventory
- decommissioning at the end of service life is covered within the producing activity, i.e., the used product is ‘treated’ on the site of production, e.g., through demolition

The sector comprises of 600 datasets for 33 geographies, covering infrastructure for construction, transport, agriculture, manufacturing, energy generation and transport, mining, waste treatment and the hospitality sector. Infrastructure-related information is transversally included in all the database’s sectors.

Sector Highlights

- Infrastructure construction
- Infrastructure maintenance
- Infrastructure end-of-life
In the ecoinvent Database, the Metals sector comprises activities from the mining and beneficiation of natural resources to the production of metal and mineral commodities. The production of a specific metal (or metals) is represented as a chain of linked activities. Chains start with “mine operation” activities that cover the mining and beneficiation of ores and yield one or multiple metal/mineral concentrates. Concentrates are subsequently processed through one or multiple activities to yield refined metals. The number of datasets that make up a production chain varies between metals, with some chains comprising many intermediate steps, production routes and final products, such as iron and steel production. In other cases, all production activities from mining through to refining are aggregated into one single activity, such as “cobalt production”.

For some metals, datasets are available for multiple production routes based on different technologies. For instance, two chains of datasets are available for primary copper production through either pyrometallurgy or hydrometallurgy, while there are also datasets for secondary copper production from recovered copper scrap. Users of the database can, therefore, choose copper produced from a specific production route, such as primary copper produced by pyrometallurgy. Alternatively, they may select a mix of copper obtained from different primary and secondary sources, by using the dataset “market for copper, cathode”. In total, there are more than 400 datasets related to metals production producing more than 200 different products.

**Sector Highlights**
- Mining and quarrying operations
- Metal production
- Metal working
- Recycling & secondary materials
- Treatment of tailings
Pulp & Paper

The Pulp & Paper sector in the ecoinvent Database includes roughly 200 datasets covering the whole supply chain from initial production of pulp to the manufacturing of the different paper and paperboard products, and, finally, the end-of-life treatment of wastepaper and waste paperboard.

Specifically, the activities within the sector include the production of chemical and mechanical pulp from virgin fibers as well as production of pulp from recovered paper; production of various graphical paper such as lightweight coated paper, supercalendered paper, newsprint paper, and coated and uncoated paper; production of packaging paper such as kraft paper and paper sack; production of carton board such as folding boxboard carton, white lined chipboard carton, solid bleached and unbleached board carton; and corrugated board box production.

Geographies covered in the database are Canada, Québec (CA-QC), Europe (RER), Latin America, the Caribbean (RLA), and Switzerland (CH).

Sector Highlights

- Paper
- Pulp
- Paperboards
- Infrastructure
Transport

The Transport sector in the ecoinvent Database comprises of over 600 datasets, covering the production, maintenance, and operation of transportation vehicles, the necessary infrastructure, and the end-of-life treatment. Datasets included cover road, rail, water, air and pipeline transport.

Each transport mode is split into different technologies based on relevant criteria such as vehicle size, fuel, type of transport goods, etc. Data on vehicles equipped for refrigerated transport are also available.

The geographies covered are Global (GLO), Europe (RER) and selected European countries, United States (US), China (CN), South Africa (ZA) and India (IN).

Sector Highlights

- Freight transport
- Passenger transport
- Infrastructure mobile & immobile
Textiles

In the ecoinvent Database, the Textiles sector comprises of 150 datasets, covering the cultivation of raw natural materials, their processing and transportation and the end of life of the various by-products arising from the relevant processes.

Specifically, the datasets cover cultivation of crops used for fibre production plants used for clothing (e.g., cotton, organic cotton, jute, kenaf, flax), production of other fibres (e.g., silk), manufacturing of man-made products (e.g., polyester, viscose), processing of the plants into fibres, processing of fibres into yarns, textile production with various processes (e.g. knitting, needle punching), as well as auxiliary activities of the processing of yarns and textiles (e.g. dyeing, sanforising, bleaching).

There are plenty of datasets that are used as inputs in textile production datasets but are not considered part of the sector. Such are datasets on fertiliser production (used in the fibre production), which are included in the Chemicals sector. Further, all datasets related to irrigation are included in the Water Supply sector.

Geographies covered include India (IN) and Bangladesh (BD) that are major producers on a global scale. The database also features global averages.

Sector Highlights

- Fibre production plants
- Manufacturing of fibres, yarns and textiles
- Auxiliary activities
- Global cotton production
Waste Management & Recycling

In the ecoinvent Database, the Waste Management & Recycling sector comprises of more than 1,600 datasets, covering the management of wastes and wastewaters from a wide variety of sectors producing them. The sector can be subdivided into solid waste management (SWM) and wastewater treatment (WWT). SWM covers treatment, recycling, and disposal (landfiling) activities, while WWT covers the treatment of wastewater. The geographies covered for both SWM and WWT include more than 50 countries across the globe.

The sector frequently overlaps with other sectors. For instance, where waste materials are recovered for recycling, they are reintroduced into industrial systems for reprocessing (e.g., recycling of steel scrap takes place in an electric arc furnace, which is a metallurgical activity). Similarly, where electrical and thermal energy is generated from waste management activities (e.g., incineration), it feeds into the electricity and heat sectors. Similarly, sludge from WWT is introduced to anaerobic digestion.

However, it is worth mentioning here, that the term “treatment activity”, as considered in the ecoinvent Database, refers to any activity that has a reference product with a negative sign. This effectively means that the activity supplies the service of treating, recycling, or disposing the reference product. So, in the ecoinvent Database all treatment-, recycling-, and disposal activities are “treatment activities”.

In the database, by-products and wastes are classified within attributional system models, exclusively by their need for treatment. As such, they are classified as ordinary by-products, wastes, recyclables (cut-off), and materials for treatment (mft) and non-materials for treatment (non-mft) (APOS). By-products and wastes, apart from ordinary by-products and non-mfts, can potentially enter a “treatment activity”, so within this text we refer to them as “wastes”.

Sector Highlights

- Solid waste management
- Wastewater treatment
- Waste tools
**Water Supply**

The Water Supply sector comprises over 150 datasets which model the extraction, treatment, and distribution of water. Data for three main types of water are available in the ecoinvent database, i.e. tap water, process water, and irrigation water.

The geographies of the water production datasets cover 20 regions and countries located on the continents of Europe, Asia, Africa and North and South America.

**Sector Highlights**

- Tap water
- Process water
- Irrigation
The ecoinvent Database
Benefits & Access
Benefits

Transparency
The ecoinvent Database provides individual unit process data for all datasets, as well as detailed documentation for all its aspects. In this way, database users can understand and reproduce results independently. Annual reports that document changes to the database are also available.

Documentation
Each dataset includes meta-data that support users in following and comprehending how the data was generated and how it is implemented. This comprises descriptions of the processes, products and materials as well as their modelling in the database. It is further supported by explanations and references to literature or statistical sources.

Product Information
Each product and material includes an associated price as well as relevant properties associated to it (carbon content, water content, metal content etc.).

Reliability
The ecoinvent Database includes high-quality data. Their high quality is ensured by the carefully chosen partnerships and the detailed quality control of the database through internal and external review processes.

Access

Free Guest Access
New users can benefit from a free guest user account to access all the datasets available in their raw, gate-to-gate form.

Buy A Licence
The ecoinvent Association offers yearly and perpetual licences for individuals, researchers, tool providers and enterprises.

Explore our products and prices on our website, or contact sales@ecoinvent.org for further information.

For accessing the database via LCA software, contact our trusted partners.
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