ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Mirage ReSource Porcelain Stoneware (8 mm thick)

Mirage Granito Ceramico S.p.A.

EPD HUB, HUB-4225

Published on 24.10.2025, last updated on 24.10.2030

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Mirage Granito Ceramico S.p.A.
Address	Via Giardini Nord 225, Pavullo nel Frignano, Modena (MO), Italy
Contact details	sustainability@mirage.it
Website	https://www.mirage.it/gb/en/mirage-world/resource

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025 EN 17160 Product category rules for ceramic tiles
Sector	Construction product
Category of EPD	Sister EPD
Parent EPD number	EPD HUB-2134
Scope of the EPD	Cradle to gate with options, A4-B7, and modules C1-C4, D
EPD author	Arianna Crasti
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Mirage ReSource Porcelain Stoneware (8 mm thick)
Additional labels	-
Product reference	-
Place(s) of raw material origin	Europe and Asia
Place of production	Pavullo nel Frignano, Italy
Place(s) of installation and use	Worldwide scenario
Period for data	01.01.2024 - 31.12.2024
Averaging in EPD	No grouping
Variation in GWP-fossil for A1-A3 (%)	-
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	90,7

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m^2 of ceramic tile for covering walls and floors
Declared unit mass	18,47 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	7,85E+00
GWP-total, A1-A3 ($kgCO_2e$)	7,03E+00
Pre-consumer recycled content (%)	60,00
Secondary material, inputs (%)	3,03
Secondary material, outputs (%)	53,7
Total energy use, A1-A3 (kWh)	36
Net freshwater use, A1-A3 (m^3)	0,04

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Mirage designs and manufactures porcelain stoneware tiles for commercial, public and residential use.
The type of tiles produced are in porcelain stoneware, shaped by dry pressing natural materials such as clay, feldspar, sand and kaolin, with a very compact structure and able to guarantee excellent performance.
With a perfect blend of production capacity, experimentation and sustainability, Mirage has garnered global recognition, establishing a 100% Italian identity in which creativity and technological research define the value of each product, making it unique and exclusive.
Every day, through a network that spans over 160 countries, we engage with diverse markets, offering our expertise.
The ability to innovate and to reinvent the essence rooted in our traditions, together with the constantly improving quality of our products, serves as a testament to the Made in Italy model we export.

PRODUCT DESCRIPTION

Mirage ReSource is a porcelain stoneware collection made with ≥ 60 % recycled materials, produced by dry-pressing and high-temperature sintering. The 8 mm vitrified tiles feature very low water absorption (< 0.5 %), high mechanical and chemical resistance, and frost resistance, ensuring long-term durability for indoor and outdoor applications. Suitable for floors, walls, and façades, ReSource combines technical performance with sustainability. Tiles are manufactured and classified according to EN 14411 and tested for physical and mechanical properties according to EN ISO 10545 series. Various finishes provide slip resistance and aesthetic versatility across residential, commercial, and exterior spaces. Identified and adopted for this study is 1 m^2 of ceramic tile for covering walls and floors, 8 mm thick (18.47 kg/m^2).

Further information can be found at:
https://www.mirage.it/gb/en/mirage-world/resource

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	-	-
Minerals	100	EU & Asia
Fossil materials	-	-
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate:

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0,215

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 m^2 of ceramic tile for covering walls and floors
Mass per declared unit	18,47 kg
Functional unit	1 m^2 of ceramic tile for covering walls and floors for a period of 50 years
Reference service life	1 year

The service life of tiles is typically more than 50 years (BNB 2011). The reported results consider the use of tiles for 1 year; therefore, by multiplying the B2 values by 50, it is possible to obtain B2 values for 50 years.

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1% (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission. A market-based approach is used in modelling the electricity mix utilized in the factory.

The product is made of a mixture of minerals like clay, feldspar, kaolin and sand. The materials are transported to the manufacturer's production facility, where the manufacturing includes material preparation, shaping, drying, followed by decoration, firing, and finally, post-firing processing.

100% of raw waste is directly reintroduced into the production cycle, therefore no production losses are considered. The assumptions for the end-of-life of manufacturing waste reflect the complete recovery of these materials, with the exception of certain hazardous waste generated from the use of ancillary materials as additives in the kilns. This hazardous waste is sent to landfill, and the transport distance to the treatment plant is 50 km, consistent with the distance reported for C2 waste in Confindustria Ceramica EPD (EPD-COI-20220297-ICG1-EN).

The manufacturing process requires electricity and fuels for the different equipment as well as heating. Waste hot air that occurs during the production of electrical energy in the cogeneration plants is used in spray dryers. In addition, waste heat is recycled from various parts of the furnaces to ensure that the heat inside the furnace remains efficient. Certain ancillary materials needed to prevent air pollution are also included.

The product is finally packaged in cardboard and sent to the installation site on a wooden pallet, covered by a plastic film with a content of at least 80% of recycled plastic. The cardboard and the plastic packaging are considered negligible for the declared unit.

The use of green energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc.), and its use is ensured throughout the validity period of this EPD.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts from final product delivery to the construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions. Module A4 includes the transport from the production site to the customer or to the point of installation of the tiles (IT: 17.8 % - EU: 54.7 % - WW: 27.5 %, as per Confindustria Ceramica average EPD, EPD-COI-20220297-ICG1-EN). Vehicle capacity utilization volume factor is assumed to be 100%, meaning full load.

In reality, it may vary, but as the role of transportation emissions in total results is small, the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that return trips are used by the transportation company to serve the needs of other clients. Transportation does not cause losses as the product is packaged properly.
During installation (A5), a small amount of waste is generated due to ceramic material losses and packaging. The ceramic material loss considered is 6.5%, in line with the Confindustria Ceramica average EPD. Cementitious adhesive and tap water are used for tile installation, based on average data from Confindustria Ceramica, which collected information from different European ceramic tile manufacturers. No additional energy consumption occurs during installation.
End-of-life assumptions for A5 waste consider the ceramic material loss (6.5 %) as inert waste, transported to treatment plants 30 km away, according to Ecoinvent datasets and NF EN 15804+A2/CN scenarios. Packaging waste (pallets) is treated following a European average scenario based on Eurostat (2019), including recycling, energy recovery, and landfill, with transport to treatment plants modeled over 50 km.
Overall, the A4-A5 modules reflect real-world installation conditions and waste management practices, ensuring a conservative and representative assessment of the environmental impacts of product delivery and installation.

PRODUCT USE AND MAINTENANCE (B1-B7)

Module B1 considers the use of the tiles. During the use of ceramic tiles there is no generation of dangerous emissions indoors. Module B2 concerns the cleaning of the tiles. As per in Confindustria Ceramica EPD (EPD-COI-20220297-ICG1-EN), the consumption of water and disinfectant has been considered. The values declared in this stage refer to a time period of 1 year. Scenario for maintaining ceramic floor and wall tiles: Residential use: 0.2 ml of detergent and 0.1 l of water are used to wash 1 m2 of ceramic tiles once a week for floor tiles and once every three months for wall tiles. This stage scenario is based on average data from different manufacturers of ceramic tiles in Europe.
As per in Confindustria Ceramica EPD (EPD-COI-20220297-ICG1-EN), the consumption of water and disinfectant has been considered. The values declared in this stage refer to a time period of 1 year.
Scenario for maintaining ceramic floor and wall tiles:
Residential use: 0.2 ml of detergent and 0.1 l of water are used to wash 1 m2 of ceramic tiles once a week for floor tiles and once every three months for wall tiles.
This stage scenario is based on average data from different manufacturers of ceramic tiles in Europe.
Modules B3-B4-B5 refer to the repair, replacement and renovation of the tiles. If the tiles are installed correctly, no repair, replacement or renovation is required.
Modules B6-B7 consider the use of energy for the operation of the technical systems integrated into the building (B6) and the use of operating water for technical installations related to the building. The use of operating energy or water is not considered. Cleaning water is declared in module B2.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

Module C1 concerns the process of demolition and deconstruction of the tiles from the building. In line with the Confindustria Ceramica average EPD (EPD-COI-20220297-ICG1-EN), C1 assumes the use of machinery, with a diesel consumption of 1.69E-5 kg per kg of tile, to dismantle the product and enable its subsequent transport. This scenario reflects common current practices for tile removal in construction and renovation works in Europe.
Module C2 considers the transport of discarded tiles from the building site to recycling or disposal facilities. The ceramic tile demolition waste is transported by truck, with an average distance of 20 km from the building site to a container or treatment plant. The return trip is included in the system and can be considered an average distance of 30 km from the

container or treatment plant to the final destination. These distances are representative of typical logistics observed in current European practices.

Module C3 includes all processes necessary for tile recycling, such as collection, crushing, and preparation for reuse. This module assumes that the majority of ceramic waste is inert and suitable for recycling, in line with current treatment practices for ceramic construction waste.

Module C4 covers all landfill disposal processes, including pre-treatment and management of the disposal site. For the small portion of waste that is not recycled, C4 assumes disposal in licensed landfills following current European regulatory practices.

Module D accounts for the potential environmental benefits and loads beyond the product system boundary, associated with the recovery and recycling of materials and energy at the end of life. The module includes all processes that occur after the product has reached the end-of-waste stage, as defined in EN 15804+A2.

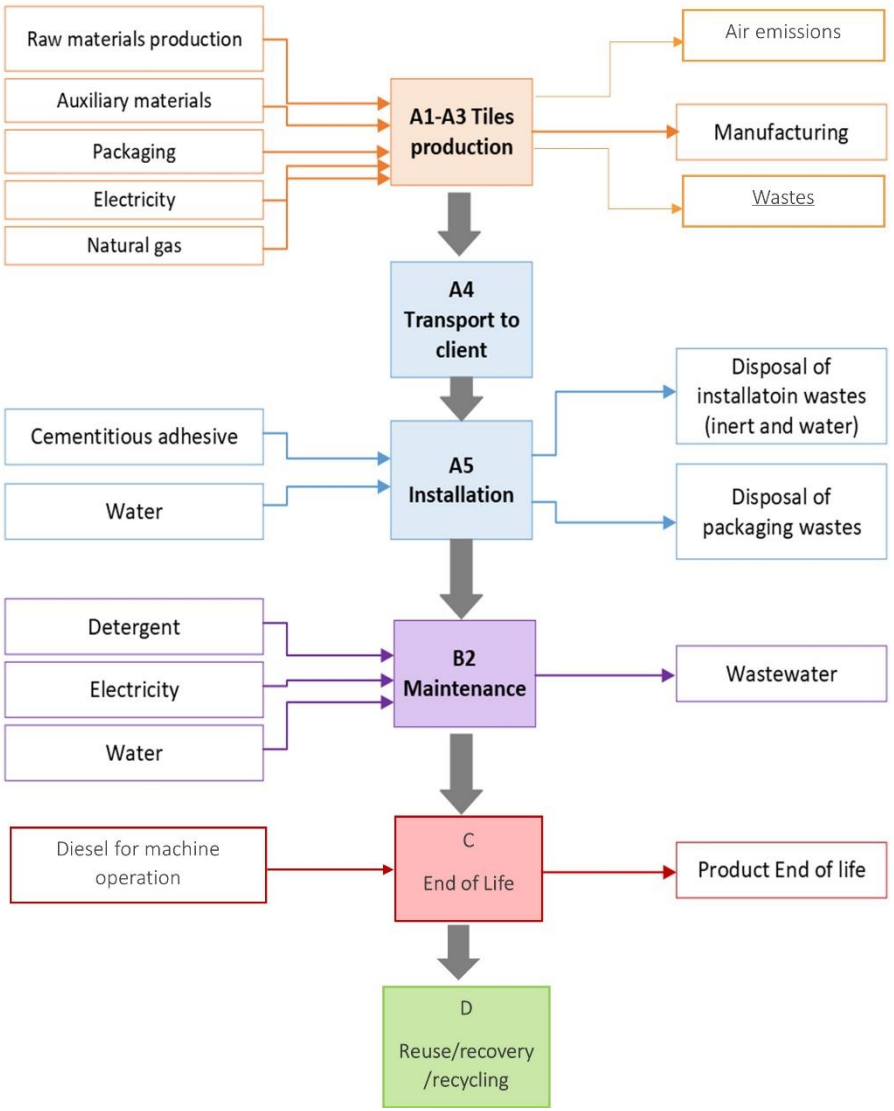
The main contributions in this module are:

1. Energy recovery: the incineration of packaging materials generates electricity and thermal energy. The substituted energy is modelled using the average European electricity and heat mix from Ecoinvent v3.9 (reference year: 2020).
2. Material recovery: recycled ceramic waste (approximately 70% of the total end-of-life waste) is assumed to replace natural aggregates in construction applications. The environmental benefits correspond to the avoided production of primary aggregates, modelled with the Ecoinvent dataset “gravel, crushed, at mine/Europe” (reference year: 2020).
3. The remaining 30% of ceramic waste is disposed of in landfill and does not contribute to any benefits.

All calculations follow the approach described in Table 4 of the PCR Guidance-Texts for Building-Related Products and Services and are consistent with Table 17 of EN 17160, which defines the default 70–30% recycling-to-landfill ratio for ceramic tiles.

These assumptions represent one of the most likely and up-to-date end-of-life scenarios for ceramic tiles in the European construction sector.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

As stated in this article (https://oneclicklca.zendesk.com/hc/en-us/articles/360015036640-Biogenic-Carbon) the calculation rule for the estimation is following EN16449:2014 Wood and wood-based products. We used the results page to take the GWP associated with the EUR-flat pallet and convert it to kg C (0.83*12/44 = 0.226).

We used the generic 1% cut-off criteria. This criterion has been applied to some raw materials, used in the decoration phase of the product (frits, natural pigments, fluidifying agents), and to some packaging materials (e.g. cardboard boxes, plastic shrink). After checking the amount of these substances and materials per m2 (specific data), we discovered that they fall under 1%. In both cases, there were many different but irrelevant substances, each of which constituted a fraction well below 1%. Including all this data would have been complicated due to the large number of data points and the challenging identification of the correct datapoints.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

This EPD is product and factory specific.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

The following links are part of the bibliography:

- https://oneclicklca.zendesk.com/hc/en-us/articles/360015036640-Biogenic-Carbon
- https://confindustriaceramica.it/documents/20119/44747/EPD_Italian+Ceramic+Tiles.pdf/917a79e4-e33e-c3b4-cfbb-1f9fed27946c?t=1717597587112
- EUROSTAT https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519174/default/table?lang=en
- "Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023" https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity production, hydro, pumped storage (Reference product: electricity, high voltage)
Electricity CO2e / MJ	0.54 kg CO2e / kWh
District heating data source and quality	Heat production, natural gas, at industrial furnace >100kW (Reference product: heat, district or industrial, natural gas)
District heating CO2e / MJ	0.0773 kg CO2e / MJ

Transport scenario documentation A4

Scenario parameter	Value
Fuel and vehicle type. Eg, electric truck, diesel powered truck	Freight, sea, bulk carrier for dry goods; Freight, lorry >32 metric ton, EURO6
Average transport distance, km	2607
Capacity utilization (including empty return) %	100%
Bulk density of transported products	800 – 1200 kg/m³
Volume capacity utilization factor	1

Installation scenario documentation A5

Scenario information	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate	Adhesive for ceramic tiles, 6 kg
Water use / l	1,5
Waste materials on the building site before waste processing, generated by the product's installation (specified by type) / kg	1,20 + 0,393 kg. The ceramic material loss considered is 6,5%, Confindustria Ceramica average EPD (EPD-COI-20220297-ICG1-EN)
Output materials (specified by type) as result of waste processing at the building site e.g. collection for recycling, for energy recovery, disposal (specified by route) / kg	1,593 kg. Packaging waste transport to treatment plants is modelled with Ecoinvent dataset and following NF EN 15804+A2/CN scenarios: 50 km for non-hazardous waste; 30 km for inert waste (ceramic material loss).

Use stages scenario documentation - B2 Maintenance

Scenario information	Value
Maintenance process / Description or source where description can be found	Cleaning of tiles, Confindustria Ceramica average EPD (EPD-COI-20220297-ICG1-EN)
Maintenance cycle / Number per RSL or year *(Not applicable if only B2 is declared)*	52/1 year
Ancillary materials for maintenance, e.g. cleaning agent, specify materials / kg / cycle	Detergent, 0,002
Net fresh water consumption during maintenance / m³	0,00521

End of life scenario documentation

Scenario information	Value
Collection process – kg collected separately	17,18 kg (70% of mass as per Table 17 EN 17160)
Collection process – kg collected with mixed construction waste	7,36 kg (30% of mass as per Table 17 EN 17160)
Recovery process – kg for recycling	17,18 kg (70% of mass as per Table 17 EN 17160)
Disposal (total) – kg for final deposition	7,36 kg (30% of mass as per Table 17 EN 17160)
Scenario assumptions e.g. transportation	Use of machinery (diesel consumption of 1.69E-5 per kg) to dismantle the product to enable its subsequent transport. The waste is transported from the building site to a container or treatment plant by truck and an average distance of 20 km is considered. The return trip is included in the system, with an average distance of 30 km from the container or treatment plant to the final destination.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	5,67E-01	4,44E-01	6,02E+00	7,03E+00	1,89E+00	3,90E+00	0,00E+00	1,19E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,60E-02	1,32E-01	7,52E-02	7,36E-02	-4,58E+00
GWP – fossil	kg CO_2e	5,66E-01	4,44E-01	6,84E+00	7,85E+00	1,89E+00	3,24E+00	0,00E+00	1,21E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,60E-02	1,32E-01	7,52E-02	7,37E-02	-5,50E-02
GWP – biogenic	kg CO_2e	2,54E-04	9,43E-05	-8,25E-01	-8,24E-01	4,16E-04	6,59E-01	0,00E+00	-3,04E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,66E-06	2,99E-05	-7,67E-06	-1,22E-04	-4,52E+00
GWP – LULUC	kg CO_2e	2,81E-04	2,29E-04	1,16E-03	1,67E-03	8,92E-04	1,90E-03	0,00E+00	8,64E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,67E-06	5,91E-05	7,70E-06	2,03E-05	-8,20E-05
Ozone depletion pot.	kg CFC_{-11}e	1,81E-08	6,48E-09	2,69E-07	2,93E-07	2,84E-08	1,63E-07	0,00E+00	2,36E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,99E-10	1,95E-09	1,15E-09	2,31E-09	-6,79E-10
Acidification potential	mol H^+e	2,06E-03	4,71E-03	5,90E-03	1,27E-02	1,18E-02	9,08E-03	0,00E+00	8,05E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,35E-04	4,50E-04	6,79E-04	8,13E-04	-3,52E-04
EP-freshwater[2)]	kg Pe	9,29E-05	2,88E-05	1,77E-04	2,98E-04	1,36E-04	4,10E-04	0,00E+00	1,02E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,52E-07	1,03E-05	2,17E-06	1,24E-04	-3,25E-05
EP-marine	kg Ne	6,52E-04	1,18E-03	2,04E-03	3,87E-03	3,24E-03	2,38E-03	0,00E+00	1,06E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,09E-04	1,48E-04	3,15E-04	2,03E-04	-5,74E-05
EP-terrestrial	mol Ne	7,44E-03	1,30E-02	2,17E-02	4,22E-02	3,56E-02	2,54E-02	0,00E+00	1,26E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,19E-03	1,61E-03	3,45E-03	2,18E-03	-5,95E-04
POCP ("smog")[3)]	kg NMVOCe	2,53E-03	4,12E-03	1,37E-02	2,04E-02	1,26E-02	8,10E-03	0,00E+00	8,80E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,56E-04	6,64E-04	1,03E-03	7,97E-04	-1,85E-04
ADP-minerals & metals[4)]	kg Sbe	2,89E-06	1,01E-06	3,46E-06	7,36E-06	4,89E-06	8,78E-06	0,00E+00	1,10E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,34E-09	3,68E-07	2,70E-08	1,45E-07	-1,11E-07
ADP-fossil resources	MJ	8,64E+00	6,12E+00	1,09E+02	1,23E+02	2,69E+01	3,28E+01	0,00E+00	1,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,41E-01	1,92E+00	9,83E-01	1,71E+00	-8,97E-01
Water use[5)]	m^3e depr.	1,08E-01	2,73E-02	3,47E-01	4,82E-01	1,28E-01	6,25E-01	0,00E+00	2,82E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,51E-04	9,47E-03	2,46E-03	1,04E-02	-3,06E-02

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3,31E-08	3,46E-08	4,36E-08	1,11E-07	1,72E-07	8,56E-08	0,00E+00	2,45E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,68E-09	1,32E-08	1,47E-07	1,24E-08	-3,38E-09
Ionizing radiation[6)]	kBq U235e	2,59E-02	4,75E-03	6,59E-02	9,66E-02	2,30E-02	1,42E-01	0,00E+00	2,00E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,51E-04	1,67E-03	4,36E-04	2,29E-03	-1,69E-02
Ecotoxicity (freshwater)	CTUe	1,02E+00	7,61E-01	3,78E+00	5,56E+00	3,59E+00	2,24E+01	0,00E+00	2,84E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,88E-02	2,71E-01	5,41E-02	1,15E+00	-1,14E-01
Human toxicity, cancer	CTUh	2,88E-10	8,17E-11	1,41E-09	1,77E-09	3,27E-10	8,96E-10	0,00E+00	7,42E-12	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,68E-12	2,18E-11	7,73E-12	3,18E-11	-1,25E-11
Human tox. non-cancer	CTUh	9,17E-09	3,30E-09	9,74E-09	2,22E-08	1,63E-08	2,57E-08	0,00E+00	6,15E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,24E-11	1,24E-09	1,22E-10	2,04E-09	-4,78E-10
SQP[7)]	-	9,70E+00	4,58E+00	6,79E+01	8,22E+01	2,44E+01	3,75E+01	0,00E+00	4,06E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,39E-02	1,93E+00	6,89E-02	4,21E+00	-4,07E-01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	3,50E-01	7,60E-02	6,09E+00	6,52E+00	3,59E-01	1,79E+01	0,00E+00	2,04E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,16E-03	2,63E-02	6,23E-03	3,61E-02	1,11E+00
Renew. PER as material	MJ	0,00E+00	0,00E+00	7,23E+00	7,23E+00	0,00E+00	-7,23E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,95E+01
Total use of renew. PER	MJ	3,50E-01	7,60E-02	1,33E+01	1,37E+01	3,59E-01	1,07E+01	0,00E+00	2,04E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,16E-03	2,63E-02	6,23E-03	3,61E-02	4,06E+01
Non-re. PER as energy	MJ	8,64E+00	6,12E+00	1,08E+02	1,23E+02	2,69E+01	1,60E+01	0,00E+00	1,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,41E-01	1,92E+00	9,83E-01	1,71E+00	-8,97E-01
Non-re. PER as material	MJ	0,00E+00	0,00E+00	4,77E-01	4,77E-01	0,00E+00	-4,77E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,61E+00
Total use of non-re. PER	MJ	8,64E+00	6,12E+00	1,08E+02	1,23E+02	2,69E+01	1,55E+01	0,00E+00	1,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,41E-01	1,92E+00	9,83E-01	1,71E+00	1,71E+00
Secondary materials	kg	5,60E-01	2,85E-03	4,03E-02	6,03E-01	1,19E-02	2,12E+00	0,00E+00	1,88E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,41E-04	8,16E-04	4,08E-04	5,70E-04	-2,27E-04
Renew. secondary fuels	MJ	3,30E-05	2,59E-05	2,44E-01	2,44E-01	1,33E-04	1,59E-02	0,00E+00	5,27E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,70E-07	1,04E-05	1,07E-06	1,03E-05	-1,60E-06
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	1,49E-02	7,84E-04	2,24E-02	3,80E-02	3,77E-03	1,38E-02	0,00E+00	5,91E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,25E-05	2,83E-04	6,50E-05	-2,07E-02	-9,71E-04

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1,98E-01	1,01E-02	5,97E-02	2,68E-01	4,48E-02	3,03E-02	MND	6,92E-04	MND	MND	MND	MND	MND	3,79E-04	3,25E-03	1,09E-03	2,89E-03	-4,01E-03
Non-hazardous waste	kg	3,85E-01	1,74E-01	1,09E+00	1,65E+00	8,10E-01	8,92E+00	MND	5,37E+00	MND	MND	MND	MND	MND	5,17E-03	6,01E-02	1,49E-02	2,63E+01	-1,67E-01
Radioactive waste	kg	6,55E-06	1,16E-06	1,66E-05	2,44E-05	5,63E-06	2,40E-06	MND	4,46E-07	MND	MND	MND	MND	MND	3,70E-08	4,09E-07	1,07E-07	5,59E-07	-4,32E-06

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,30E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,72E+01	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,20E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,60E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,60E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	5,63E-01	4,42E-01	6,80E+00	7,80E+00	1,88E+00	7,68E+00	0,00E+00	1,24E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,59E-02	1,31E-01	7,48E-02	7,31E-02	-5,49E-02
Ozone depletion Pot.	kg CFC_{-11}e	1,48E-08	5,16E-09	2,19E-07	2,39E-07	2,26E-08	1,48E-07	0,00E+00	1,94E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,16E-10	1,56E-09	9,12E-10	1,84E-09	-5,64E-10
Acidification	kg SO_2e	1,55E-03	3,76E-03	4,47E-03	9,78E-03	9,32E-03	6,61E-02	0,00E+00	7,31E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,65E-04	3,44E-04	4,77E-04	6,52E-04	-2,95E-04
Eutrophication	kg PO_4^3e	3,43E-04	4,93E-04	7,09E-03	7,92E-03	1,54E-03	8,89E-02	0,00E+00	9,18E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,86E-05	8,38E-05	1,11E-04	1,73E-04	-3,47E-05
POCP (“smog”)	kg C_2H_4e	1,29E-04	2,17E-04	7,63E-04	1,11E-03	6,30E-04	4,95E-03	0,00E+00	3,05E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,24E-05	3,07E-05	3,58E-05	4,23E-05	-1,70E-05
ADP-elements	kg Sbe	2,67E-06	9,90E-07	2,92E-06	6,58E-06	4,77E-06	6,32E-05	0,00E+00	1,08E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,07E-09	3,59E-07	2,62E-08	1,40E-07	-1,10E-07
ADP-fossil	MJ	8,19E+00	6,04E+00	1,08E+02	1,22E+02	2,66E+01	1,13E+02	0,00E+00	1,43E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,38E-01	1,89E+00	9,76E-01	1,68E+00	-6,00E-01

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	5,67E-01	4,44E-01	6,84E+00	7,85E+00	1,89E+00	3,24E+00	MND	1,22E-02	MND	MND	MND	MND	MND	2,60E-02	1,32E-01	7,52E-02	7,37E-02	-5,51E-02

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH4 fossil, CH4 biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO2 is set to zero.

ENVIRONMENTAL IMPACTS – TRACI 2.1.

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	5,58E-01	4,38E-01	6,72E+00	7,72E+00	1,86E+00	7,00E-01	0,00E+00	1,23E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,57E-02	1,30E-01	7,42E-02	7,19E-02	-5,46E-02
Ozone Depletion	kg $CFC_{-11}e$	1,89E-08	6,83E-09	2,81E-07	3,07E-07	3,00E-08	2,33E-08	0,00E+00	2,49E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,20E-10	2,06E-09	1,21E-09	2,43E-09	-7,18E-10
Acidification	kg SO_2e	1,80E-03	4,01E-03	5,20E-03	1,10E-02	1,02E-02	1,73E-03	0,00E+00	6,24E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,17E-04	4,00E-04	6,27E-04	6,93E-04	-2,93E-04
Eutrophication	kg Ne	1,86E-04	2,09E-04	2,88E-03	3,27E-03	7,12E-04	3,56E-04	0,00E+00	2,02E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,47E-05	4,22E-05	4,26E-05	8,52E-05	-3,59E-05
POCP (“smog”)	kg O_3e	4,31E-02	7,77E-02	1,53E-01	2,74E-01	2,17E-01	4,00E-02	0,00E+00	6,64E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,18E-03	1,02E-02	2,07E-02	1,34E-02	-3,28E-03
ADP-fossil	MJ	8,64E+00	6,13E+00	1,08E+02	1,23E+02	2,70E+01	1,09E+01	0,00E+00	1,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,41E-01	1,92E+00	9,84E-01	1,71E+00	-8,97E-01

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15802+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez
Tool verification validity: 27 March 2025 - 26 March 2028

Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub Limited 24.10.2025

EPD Hub
VERIFIED ISO 14025