ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804:2012+A2:2019/AC:2021 for

Ground silica

Version 1

Date of publication: **2024/02/29**

Validity: 5 years

Valid until: **2029/02/28**

Based on PCR 2019:14 EN15804+A2: 2019/AC:2021

Scope of the EPD®: Brazil

Registration number:
The International EDP® System:
S-P-12716

General information

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EDP® registration number	**S-P-12716**
UN CPC CODE	37990 - Non-metallic mineral products n.e.c.
Scope	The LCA is based on 2021 production data for one site Brasil
Declared issue	2024/02/29
Valid until	2029/02/28
CEN standard EN15804 served as the core PCR	
PCR identification	2019:14 v1.3.1 EN15804+A2:2019/AC:2021
PCR review conducted by	The Technical Committee of the International EPD® System Email info@environdec.com

Independent verification of the declaration and data, according to ISO 14025:2006

☐ EPD process certification (Internal) ☑ EPD verification (External)

Coverage

This EPD covers information modules A1 to C4 + module D (cradle to grave) as defined in EN 15804:2012+A2:2019/AC:2021

The EPD owner 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. For further information about comparability, see EN 15804 and ISO 14025.

EPD® registration

Product description

Product description and description of use

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 ton of Ground silica produced. The study was conducted using the annual value provided by the manufacturing site. This EPD applies for sand manufactured in one site in Brazil (Analândia-SP). Thus, no variance is considered, as this study applies for specific product from a single production site.

The production facility of Mineração JUNDU utilizes naturally occurring and abundant raw materials in the form of sand. It applies mineral extraction and refining processes to obtain various granulometric ranges. Non-metallic minerals, including sand, limestone, and dolomite, supplied by Mineração JUNDU, are essential components for numerous industrial applications and the manufacturing of everyday products. As a market leader in the supply of industrial quartz sands, Mineração JUNDU offers high-purity sands with controlled heavy mineral content. The production process involves specialized equipment that ensures stable physical and chemical characteristics, surpassing the stringent specifications required by the foundry market. The Ground silica family covers the following commercial products: SM - 200, SM - 325, SM - 400, SM - 500, 200GF, 200GC.

By employing superior quality raw materials and utilizing latest technological generation equipment's, Mineração JUNDU produces silica that meets the most demanding technical specifications. Ground silica is a form of crystalline silica obtained through the grinding and processing of silica minerals. Silica is a chemical compound consisting of silicon and oxygen atoms and is found in nature in various forms, including quartz and quartz sand. Ground silica available in various granulometries, serves as a key raw material in the application of materials and solutions in the industrial market and civil construction.

The Reference Service Life (RSL) of sand products is generally considered to be 50 years, aligning with standard building design life values as per the Saint-Gobain Environmental Product Declaration Methodological Guide for Construction Products.

Declaration of the main product components and/or materials

Description of the main components and/or materials for 1 ton of sand produced.

Parameter	Value
Quantity of raw material for 1 ton of product	1 ton
Granulometry	#200, #300, #400 and #500 mesh
Packaging for the transportation and distribution	HDPE bag: 1.33 $kg.ton^{-1}$ Kraft paper bag: 4.12 $kg.ton^{-1}$ Wood pallet: 11.3 $kg.ton^{-1}$
Product used for the installation	None

All the date of issue of this declaration, there is no “Substance Very High Concern (SVCH)” in concentration above 0.1% by weight, and neither do their packaging, following the European REACH regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product.

Description of the main product components and/or materials

Product components	Weight, t	Post-consumer recycled material, weight-%	Biogenic material, weight-% and t C/t
Sand	1.00	0	0 resp. 0
Sum	1.00	0	0 resp. 0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/t**
High-density polyethylene bag	1.33	0.1 - 1	0
Kraft paper bag	4.12	0.1 - 1	1.81
Wood pallet	11.33	1 - 2	4.70
Sum	16.78	1 - 2	6.52

LCA calculation information

EDP type	**Cradle to grave and module D**
Functional unity	1 ton finished wet sand and installed with an estimated useful life of 50 years
System boundaries	Cradle to grave and module D
Reference service life (RSL)	50 years
Cut-off rules	Considering all input and outflows in a unit process i.e., considering the value of all flows in the unit process and the corresponding LCI whenever available The use of cut-off criterion on mass inputs and primary energy at the unity process level (1%) and at the information module level (5%) No simplification on the LCI by additional exclusions of material flows Polluter pays principle and modularity principle All inputs and outputs to the manufacturing plants have been included and made clearly. All assumptions regarding the materials and water balances have also been included All hazardous and toxic materials and substances are included in the inventory and the cut-off rules do not apply Care has been taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil. The long-term emissions haven't been considered The flows related to human activities such as employee transport and administration activity and related to production od machines and building haven't been included
Allocations	Allocations criteria are based on mass
Geographical coverage and time period	Brazil production and transport: 2021

- EPDs of construction products may be not comparable if they do not comply with EN 15804 or ISO 21930.
- Environmental Product Declarations within the same product category from different programs may not be comparable.

LCA scope

As specified in EN 15804:2012+A2:2019/AC:2021 and the Product-Category Rules, the environmental impacts are declared and reported.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (production and transport data according 2021).

	Product stage			Construction stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
	Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction Demolition	Transport	Waste processing	Disposal	Reuse-recovery
Modules	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Variation products	One product																
Variation sites	Four plants																

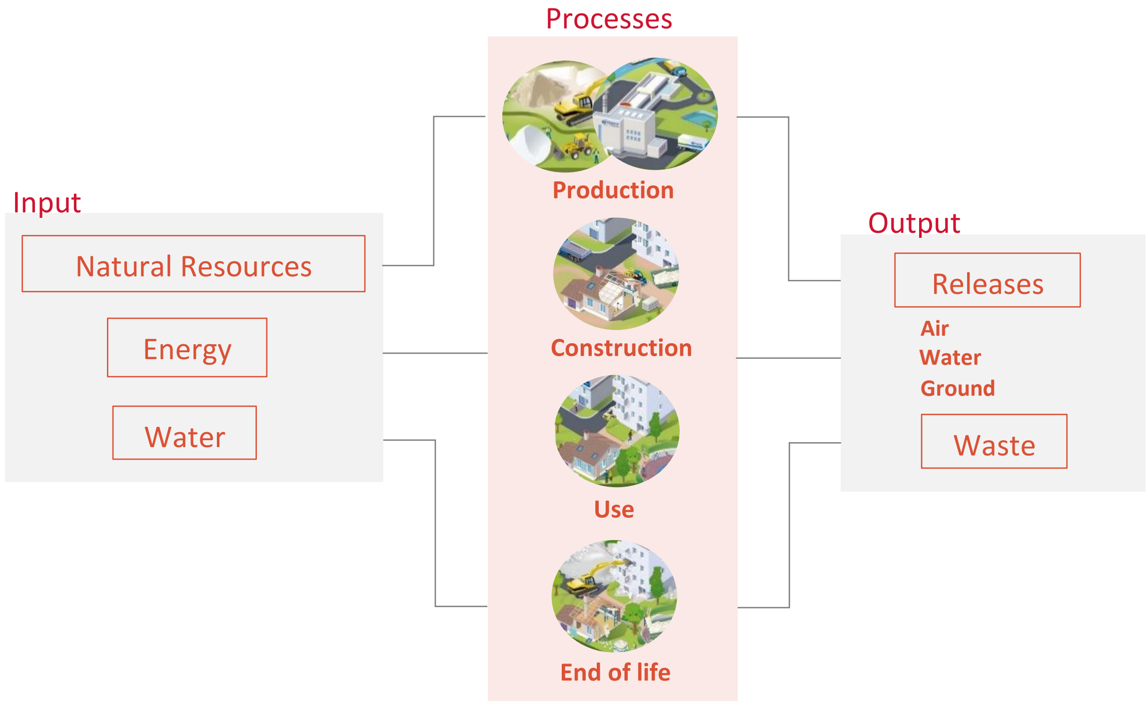
System boundaries (X=included, MND=module not declared)

Life cycle stages

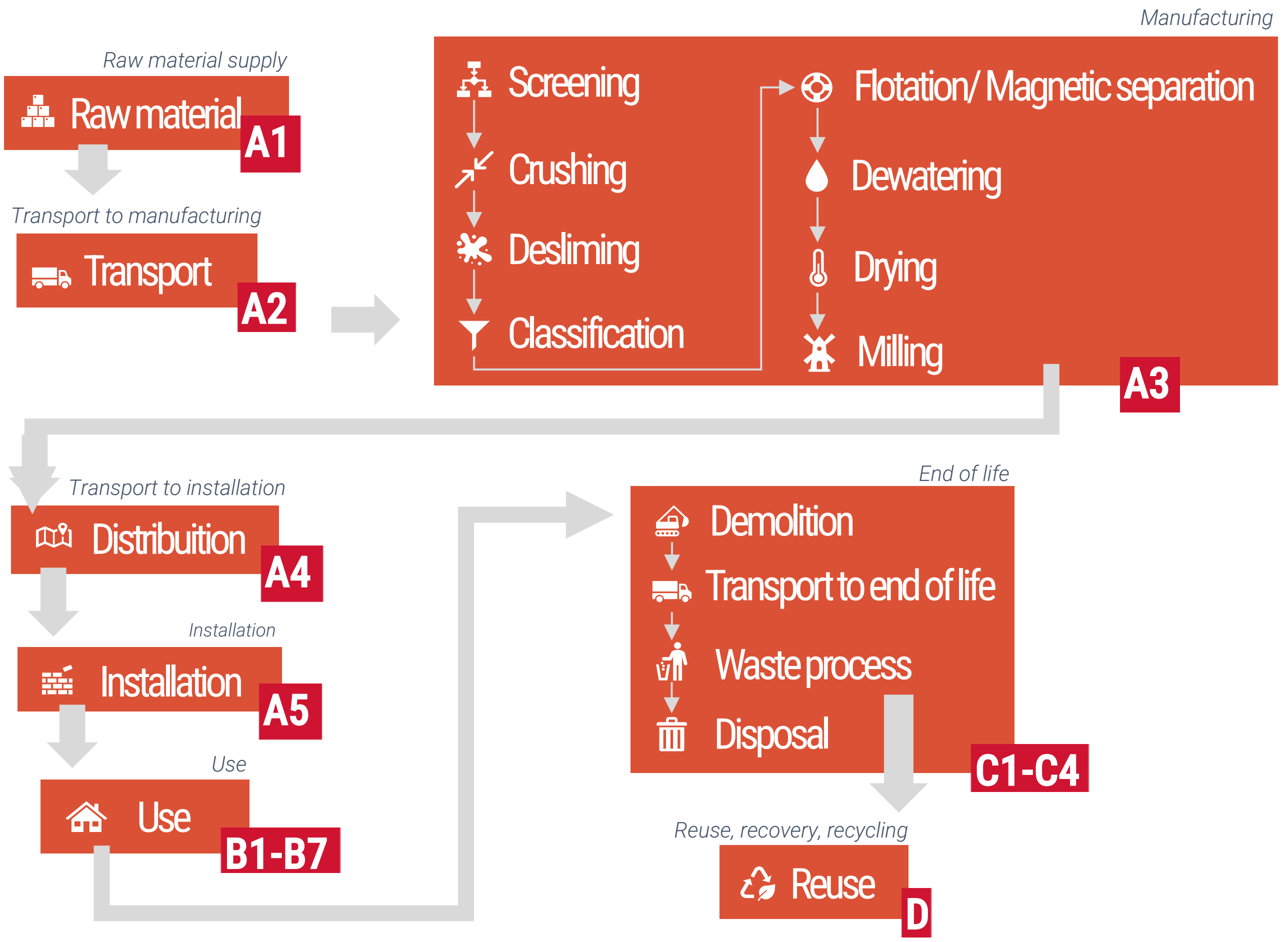
Flow diagram of the life cycle

To be consistent with EN 15804:2012+A2:2019/AC:2021, the manufacturing stage includes the following processes:

- Extraction of raw materials;
- Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- Transportation up to the factory gate and internal transport;
- Production of ancillary materials or pre-products;
- Manufacturing of products and co-products;
- Processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product.



The activities developed for production in the ground silica refer to sandstone mining, transportation, manufacturing (screening, crushing, desliming, classification, flotation, dewatering, drying and milling), distribution, installation, use and disposal.



The mining method adopted is open pit mining through mechanical excavation of the sandstone ore. Loading is done directly by wheel loader or hydraulic excavator on articulated trucks to the storage area. The manufacturing of sandstone ore from mining occurs basically through a combination of the following processes:

Screening

Separation of the unused sand fraction, destined for the foundry and glass market.

Crushing

Stage where the sandstone sand particles are strongly rubbed together, mechanically through propellers submerged in the mineral pulp, promoting surface cleaning of the sand grains.

Desliming

Through centrifugation in hydrocyclones, it becomes possible to separate the clay contained in the sandstone ore.

Classification

Stage designed to eliminate excess fine sand contained in sandstone ore.

Flotation

Purification of quartz sand destined for the glass market.

Dewatering

Through centrifugation in hydrocyclones, the sandy pulp is densified by removing water, making it possible to stack the quartz sand in storage.

Drying

The drying is supplied with the wet sand product resulting from the sandstone manufacturing process. The dryer consumes Compressed Natural Gas (CNG) to generate hot air, necessary for drying the product.

Milling

In the grinding, dry quartz sand is fragmented by ball mills, which reduce the grains to a diameter of less than 0.05 mm.

A1-A3, Product stage

The model includes the impact associated with all raw materials (including waste), their transport to the site, and the production of the product.

A1, Raw material supply

- Extracting and processing of raw materials;
- Processing of secondary materials used as input for manufacturing the product, but not including those processes that are part of the waste processing in the previous product system;
- Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- Energy recovery and other recovery processes from secondary fuels, but not including those processes that are part of waste processing in the previous system.

A2, Transport to the manufacturer

- Transportation up to the factory gate and internal transport.

A3, Manufacturing

- Production of ancillary materials or pre-products;
- Manufacturing of products and co-products;

A1-A3 processing up to the end-of-waste state or disposal of final residues including for any packaging not leaving the factory gate with the product.

The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15804 standard. This rule was applied in the present EPD.

Description of the scenarios and other additional technical information:

A1, Raw material supply

This module considers the extraction and processing of all materials and energy which occur upstream to the studied manufacturing process.

Especially raw material sourcing for product recipe and packaging.

A2, Transport to the manufacturer

The raw materials are transported to the manufacturing site. In the present EPD, road transportation (average values) of each raw material was modeled.

A3, Manufacturing

This module includes the manufacturing of the products. In this stage are included energy, water and wastes data from plant.

Sand’s product manufacturing is a production system with a variety of input materials and product outputs. Mass-based physical allocation was applied to split the environmental burden among the sand’s production life cycle.

During manufacture one part of waste is landfilled, other goes to external recycling and the other feeds a composting area in manufacturing plant.

A4-A5, Construction process

The construction process is divides into two modules: transport to the customer site (A4) and installation (A5).

A4, Transport to the customer site

This module includes transport from the production gate to the customer site.

The transport is calculated based on a scenario with the parameters described in the following table.

Parameter	Value/description
Fuel type and consumption of vehicle or vehicle type used for transportation e.g., long distance truck, boat, etc.	Average truck trailer (30 t payload) and diesel consumption of 33 liters for 100 km
Distance	68 km
Capacity utilization (including empty returns)	100 % of the capacity in volume

A5, Installation

There is no installation for sand use. This module includes processing of packaging wastes.

- HDPE bag: 100% collected and modelled as landfilled matter.
- Kraft paper bag: 100% collected and modelled as recycled matter.
- Wooden pallet: 100% collected and modelled as reused matter.

Parameter	Value/description
Distance	100 km to landfill by truck
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	Kraft paper bag and wooden pallet wastes are 100% collected and modeled as recovery matter. HDPE bag is 100% collected and modeled as landfilled matter.

B1-B5, Use stage

This stage includes any emissions to the environment from the used product (module B1) and technical operations on the product such as maintenance, repair, replacement, and refurbishment (module B2 to B5, respectively).

B1, Use or application of the installed product

This module represents any emissions to the environment from the installed product. In this case, there is no installation for sand use.

B2, Maintenance; B3, Repair; B4, Replacement; B5, Refurbishment

There is no action or technical operations required during the use stage until the end-of-life stage.

B6-B7, Operation stage

The use stage related to the operation of the building is divided into the operational energy use (module B6) and the operational water use (module B7).

B6, Operational energy use; B7, Operational water use

The ground silica is not related to the use of electricity nor water during operation.

C1-C4, End-of-life

This stage includes the different modules of end-of-life C1 to C4 detailed below.

C1, De-construction, demolition

There is no action or technical operations required for de-construction, demolition of the used sands.

C2, Transport to waste processing

This module includes transport from the sands used site to the waste processing.

C3, Waste processing for reuse, recovery and/or recycling

The ground silica is considered landfilled.

C4, Disposal

The ground silica is assumed to be 100% landfilled.

Parameter	Value/description
Collection process specified by type	1 ton of the product is collected alongside any mixed construction waste and sent to landfill
Disposal specified by type	1 ton of the product are landfilled
Assumptions for scenario development (e.g., transportation)	The waste going to landfill will be transported by truck with 24 t payload, using diesel as a fuel consuming 38 liters per 100 km. Distance covered is 100 km.

D, Benefits and loads beyond the system boundary

Module D declared the environmental benefits from reusable products, recyclable materials or energy recovery. It implies 0% benefit from recycling process in this module.

LCA Results

As specified in EN 15804:2012+A2:2019/AC:2021 and the PCR 2019:14 Construction Products, version 1.3.1 is not recommend the use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C. Furthermore, the estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The environmental impacts are declared and reported using the baseline characterization factors are from the ILCD. Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2021 and transport data according 2021).

All the results refer to 1 ton finished ground silica.

Environmental impacts

Environmental indicators	Product stage	Construction stage		Use stage							End of life stage				Reuse, Recovery Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Climate Change [kg CO2 eq.]	2.32E+01	2.85E+00	9.29E-02	0	0	0	0	0	0	0	0	4.57E-03	0	5.95E-02	0
Climate Change (fossil) [kg CO2 eq.]	2.29E+01	2.63E+00	6.37E-02	0	0	0	0	0	0	0	0	4.21E-03	0	1.55E-02	0
Climate Change (biogenic) [kg CO2 eq.]	-2.39E-02	0	2.39E-02	0	0	0	0	0	0	0	0	0.00E+00	0	4.36E-02	0
Climate Change (land use change) [kg CO2 eq.]	2.74E-01	2.22E-01	5.35E-03	0	0	0	0	0	0	0	0	3.55E-04	0	3.67E-04	0
Ozone depletion [kg CFC-11 eq.]	3.44E-06	5.52E-17	4.36E-12	0	0	0	0	0	0	0	0	8.82E-20	0	5.62E-17	0
Acidification terrestrial and freshwater [Mole of H+ eq.]	1.17E-01	1.52E-02	3.66E-04	0	0	0	0	0	0	0	0	2.43E-05	0	1.14E-04	0
Eutrophication freshwater [kg P eq.]	2.43E-03	1.67E-05	4.04E-07	0	0	0	0	0	0	0	0	2.66E-08	0	1.02E-07	0
Eutrophication marine [kg N eq.]	3.08E-02	7.53E-03	1.82E-04	0	0	0	0	0	0	0	0	1.20E-05	0	3.12E-05	0
Eutrophication terrestrial [Mole of N eq.]	3.16E-01	8.05E-02	1.94E-03	0	0	0	0	0	0	0	0	1.29E-04	0	3.37E-04	0
Photochemical ozone formation - human health [kg NMVOC eq.]	8.48E-02	1.37E-02	3.29E-04	0	0	0	0	0	0	0	0	2.18E-05	0	1.05E-04	0
Resource use, mineral and metals [kg Sb eq.][1]	3.74E-05	1.27E-07	3.22E-09	0	0	0	0	0	0	0	0	2.03E-10	0	1.26E-09	0
Resource use, energy carriers [MJ][1]	3.76E+02	3.56E+01	8.58E-01	0	0	0	0	0	0	0	0	5.69E-02	0	1.95E-01	0
Water deprivation potential [m^3 world equiv.][1]	1.96E+01	8.59E-03	2.22E-04	0	0	0	0	0	0	0	0	1.37E-05	0	1.56E-03	0

[1] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Information on biogenic carbon content

		Product stage
	Biogenic Carbon Content	A1 / A2 / A3
	Biogenic carbon content in product [kg]	0
	Biogenic carbon content in packaging [kg]	6.52

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2*.*

Resources use

Resources Use indicators	Product stage	Construction stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Use of renewable primary energy (PERE) [MJ]	4.41E+02	2.28E+00	5.48E-02	0	0	0	0	0	0	0	0	3.64E-03	0	2.68E-02	0
Primary energy resources used as raw materials (PERM) [MJ]	2.74E-04	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	4.41E+02	2.28E+00	5.48E-02	0	0	0	0	0	0	0	0	3.64E-03	0	2.68E-02	0
Use of non-renewable primary energy (PENRE) [MJ]	3.76E+02	3.56E+01	8.58E-01	0	0	0	0	0	0	0	0	5.69E-02	0	1.95E-01	0
Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	5.32E-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	3.76E+02	3.56E+01	8.58E-01	0	0	0	0	0	0	0	0	5.69E-02	0	1.95E-01	0
Input of secondary material (SM) [t]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels (RSF) [MJ]	4.74E-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels (NRSF) [MJ]	5.57E-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water (FW) [m3]	5.13E-01	2.18E-03	5.29E-05	0	0	0	0	0	0	0	0	3.48E-06	0	5.22E-05	0

Waste category & Output flows

	Product stage	Construction stage		Use stage							End of life stage				D Reuse, recovery, recycling
Waste Category & Output Flows	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (HWD) [t]	2.34E-07	3.07E-09	7.39E-11	0	0	0	0	0	0	0	0	4.91E-12	0	2.19E-10	0
Non-hazardous waste disposed (NHWD) [t]	1.96E-01	3.40E-03	8.18E-05	0	0	0	0	0	0	0	0	5.43E-06	0	1.00E+00	0
Radioactive waste disposed (RWD) [t]	3.26E-04	5.97E-06	1.44E-07	0	0	0	0	0	0	0	0	9.54E-09	0	1.98E-06	0
Components for re-use (CRU) [t]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for Recycling (MFR) [t]	4.54E-04	0	4.12E-03	0	0	0	0	0	0	0	0	0	0	0	0
Material for Energy Recovery (MER) [t]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported electrical energy (EEE) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported thermal energy (EET) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Additional voluntary indicators from EN 15804 (according to ISO 21930:2017)

		Product stage	Construction stage		Use stage							End of life stage				Reuse, Recovery Recycling
	Environmental indicators	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
	GWP-GHG [kg CO2 eq.][2]	2.32E+01	2.61E+00	6.30E-02	0	0	0	0	0	0	0	0	4.17E-03	0	4.24E-02	0

[2] The indicator includes all greenhouse gases included in GWP-GHG total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP-GHG indicator originally defined in EN 15804:2012+A1:2013.

The variance from the means of LCIA results

From the LCIA of the Ground silica of each manufacturing plant, a weighted average was applied based on the annual production in each plant to obtain a national average of impact for each type of sand.

Data quality

Inventory data quality is judged by geographical, temporal, and technological representativeness. To cover these requirements and to ensure reliable results, first-hand industry data crossed with LCA background datasets were used. The data was collected from internal records and reporting documents from Mineração JUNDU. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects poor inventory data quality for the geographical representation, fair for technological and good for temporal representation.

Information related to sectoral EPD

This EPD is not sectoral.

Differences from previous versions

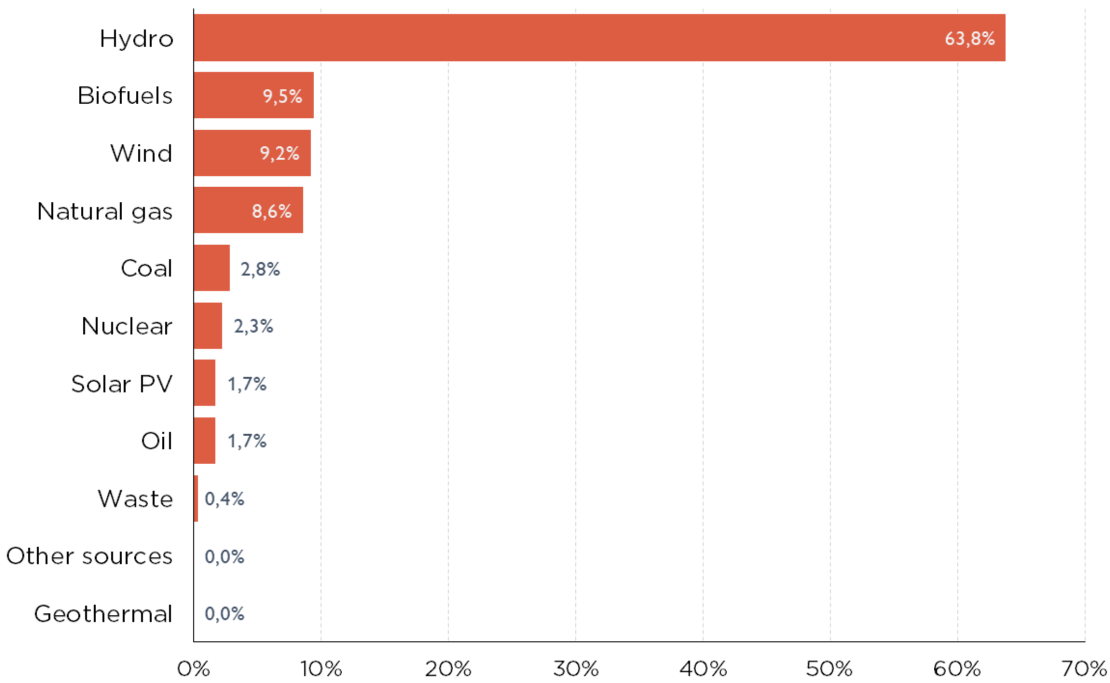
First version of EPD®.

Appendix I: Additional information

The electricity used in the model is residual mixes from:

Type of information	Description
Location	Representative of average production in Brazil (2020)
Geographical representativeness description	Split of energy sources in Brazil (Source: IEA, 2022) - Coal: 2.8% - Oil: 1.7% - Natural gas: 8.6% - Nuclear: 2.3% - Biofuels: 9.5% - Hydro: 63.8% - Wind: 9.2% - Waste: 0.4% - Solar PV: 1.7%
Reference year	2020
Type data set	Online database
Source	IEA – International Energy Agency, 2022
CO2 emission kg CO2 eq. kWh-1	0.140 kg CO2 eq. kWh-1

Electricity generation by source, Brazil - 2020



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