Environmental Product Declaration

(CERTIFICATION)

In accordance with ISO 14025 for:

Inert material from quarry

from

Gola della Rossa Mineraria S.p.A.

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Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

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Company information

Owner of the EPD:

Gola della Rossa Mineraria S.p.A.
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Description of the organisation:
The quarrying activities in the Gola della Rossa started in 1868. The company history has always been linked to the territory, traditions, balance and respect for environment and people. It became one of the most important realities of the sector at the national level.
The company Gola della Rossa Mineraria S.p.A. (hereafter GDR Mineraria), located in Serra San Quirico in the province of Ancona, carries out its activities of extraction and processes massive limestone with high calcium carbonate content (purity higher than 98% of $CaCO_3$). The material is recognized as a strategic value for the Marche Region.
The quality of this material and the experience of workers constitute the success of this company, both in the civil and industrial construction sector, and in the agro-food and chemical-pharmaceutical sector. A work accompanied and supported by a solid experience has allowed to pursue quality and reliability. Thanks to a continuous technological innovation, materials are addressed to more traditional sectors such as the production of cement and bituminous conglomerates, mortars and plasters for the building industry, but also to chemical-pharmaceutical and agri-food industries with the micronized limestone. The quality certificate UNI EN ISO 9001 confirms the knowledge of innovative production and the efficiency in the company management.
The certification GMP+ B2 guarantees the compliance of GDR Mineraria to the production of raw materials and additives for animal feed.

Name and location of production site: Gola della Rossa Mineraria plant of Serra San Quirico site (AN)

Product information

Product name: Inert material aggregates from quarry

Product identification and description: The inert material aggregates obtained by rock grinding, from quarry activities. It is characterized by a selected granulometry to 0/4 mm until 0/80 mm.(25/40, 0/200, 0/12, 0/15, 0/40, 40/70, 80/100, 0/4, 0/6, 4/8, 6/12, 12/20, 100/150). It can be used in building sectors, depending on the characteristics and chemical composition of the stone of origin. It is mainly used as calcium carbonate additive in agriculture (e.g. fertilizer or chemical for organic management).
In this document, limestone, calcium carbonate and $CaCO_3$ will be used as synonymous.

Fig. 1 Inert material

UN CPC code: 15200 - Gypsum; anhydrite; limestone flux; limestone and other calcareous stone, of a kind used for the manufacture of lime or cement and 15320 - Pebbles, gravel, broken or crushed stone, macadam; granules, chippings and powder of stone

Geographical scope: Global

Content declaration

The Inert material produced by GDR Mineraria is a product of the highest quality both for its chemical characteristics guaranteed by the nature of the deposit and for its physical characteristics, which are the result of continuous investments in the production plant. These aspects allowed to produce a product highly appreciated by all users in the sector.

The inert material is subjected to careful and constant controls to ensure a quality standard complying with the applicable reference standards.

The product that is obtained from the processing of the various production processes is subjected to accurate and constant control to ensure a quality standard in accordance with the reference standards in force: UNI EN 933-1 _ UNI EN 933-2 _ UNI EN 933-8 _ UNI EN 933-9 _ UNI EN 933-3 _ UNI EN 933-4 _ UNI EN 1097-6 _ UNI EN 1097-7 _ UNI EN 1097-4 _ UNI EN 1097-8 _ UNI EN 1097-1 _ UNI EN 1097-2 _ UNI EN 1744-1 _ UNI EN 1744-4 _ UNI EN 1744-4 _ UNI EN 196-6 _ UNI EN 1367-1 _ UNI EN 1367-5 _ UNI EN 12697-11 _ UNI EN 8520-22.

Below is the table whose value can be attributed to Rapporto di Prova n. 018.011 issue by laboratory Igienstudio (14-3-2022).

Materials / chemical substances	Quantity	Unit
$CaCO_3$ purity	98,27	%
Calcium (Ca)	39,35	%
Insoluble ash	0,31	%
Substances insoluble in acid solution	<0,1	%
Magnesium (Mg)	0,24	%
Arsenic (As)	0,2	mg/kg
Aluminium (Al)	186	mg/kg
Barium (Ba)	36	mg/kg
Cadmium (Cd)	0,12	mg/kg
Iron (Fe)	87,1	mg/kg
Cromum (Cr)	1,6	mg/kg
Mercury (Hg)	<0,1	mg/kg
Nickel (Ni)	0,50	mg/kg
Lead (Pb)	0,40	mg/kg
Copper (Cu)	0,70	mg/kg
Zinc (Zn)	3,3	mg/kg
Fluorine (as F-)	12	mg/kg
Silica (as SiO_2 soluble)	34	mg/kg
Silicon(Si)	95	mg/kg

With regard to periodic checks on hazardous substances, the table below certifies that the values found are within the limits set by the Directive 2002/32/CE and further modification.

Parameter	Value	References standard
Arsenic (As)	0,2	15 mg/kg
Mercury (Hg)	<0,1	0,3 mg/kg
Fluorine (as F-)	12	350 mg/kg
Lead (Pb)	0,40	20 mg/kg
Cadmium (Cd)	0,12	2 mg/kg

Packaging

Distribution/consumer packaging: the product is distributed unpacked

LCA information

Time representativeness:	data refer to the year 2021
Database used:	EcoInvent Database v.3.4.
LCA software used:	SimaPro 9.3.0.2

The scope of the present Environmental Product Declaration is to assess potential environmental impact values for the inert material production based on the Life Cycle Assessment methodology and make them explicit. A description follows with details on functional/declared unit, system boundaries, key assumptions and a flow chart describing the lifecycle stages of the product.

A comprehensive quantitative evaluation of environmental performances in the **inert material** production chain has been provided based on Life Cycle Assessment (LCA). The considered lifecycle includes all the main processes from the withdrawing of raw materials, to the limestone extraction, grinding, sifting and micronization processes, until its transport to retailer.

Functional Unit

The Functional Unit (FU) is 1 t of calcium carbonate produced by GDR Mineraria S.p.A. in Serra San Quirico site (AN - IT).

Description of system boundaries

Based on a “from cradle to gate” approach, the **inert material** lifecycle system boundaries concern:

Upstream Process: it consists in the “from cradle to gate” set of processes that includes:

- production and transport of raw materials used (e.g. chemical products and components of explosives, detonators and fuses);
- production and transport of materials for packaging (e.g. PVC, cardboard boxes)
- production of machineries components that are substituted for ordinary maintenance (annual or more frequent)

Core process: it consists in processes within the production plant (from gate to gate) that include the following sub-sections:

0 – Transport of materials to the company gate: transport of e.g. explosives, detonators, fuses to the gate of the production site (Serra San Quirico)

1 - Limestone extraction: activities of tracking, perforation, explosive loading, explosion, disaggregation, material loading and transport to the processing plant. From this phase boulders and tout-venant are obtained. The tout-venant continues towards the next phase.

2 – Grinding: activities of crashing and sifting using a series of hopper, crushers, sifters, conveyors. From this phase, the fraction identified with the codes 0/40, 0/12, 0/15, 25/40, 40/70, 80/100, 100/150, 0/200 are obtained. The 25/40 fraction is used for the next phase. The remaining part and the other fractions can either be sent to the warehouse and sold as it is, or processed to obtain other products.

Waste from the production process, mainly explosive, detonator and fuses packaging (e.g. non contaminated materials) were considered sent 100% to recycling for cardboard, 100% landfill for machinery tyres, while plastic materials was addressed to recycling (7.5%), incineration (23.9%) and landfill (68.5%) coherently to the current state of waste treatment (ARRR, 2008). Transport of waste to the waste plant was considered as 50km average distance. The wastewater treatment was also included. No rejected raw material (i.e. not compliant to the suitable characteristics for sale) were produced during the processing (i.e. 100% of mined limestone is used in the production chain).

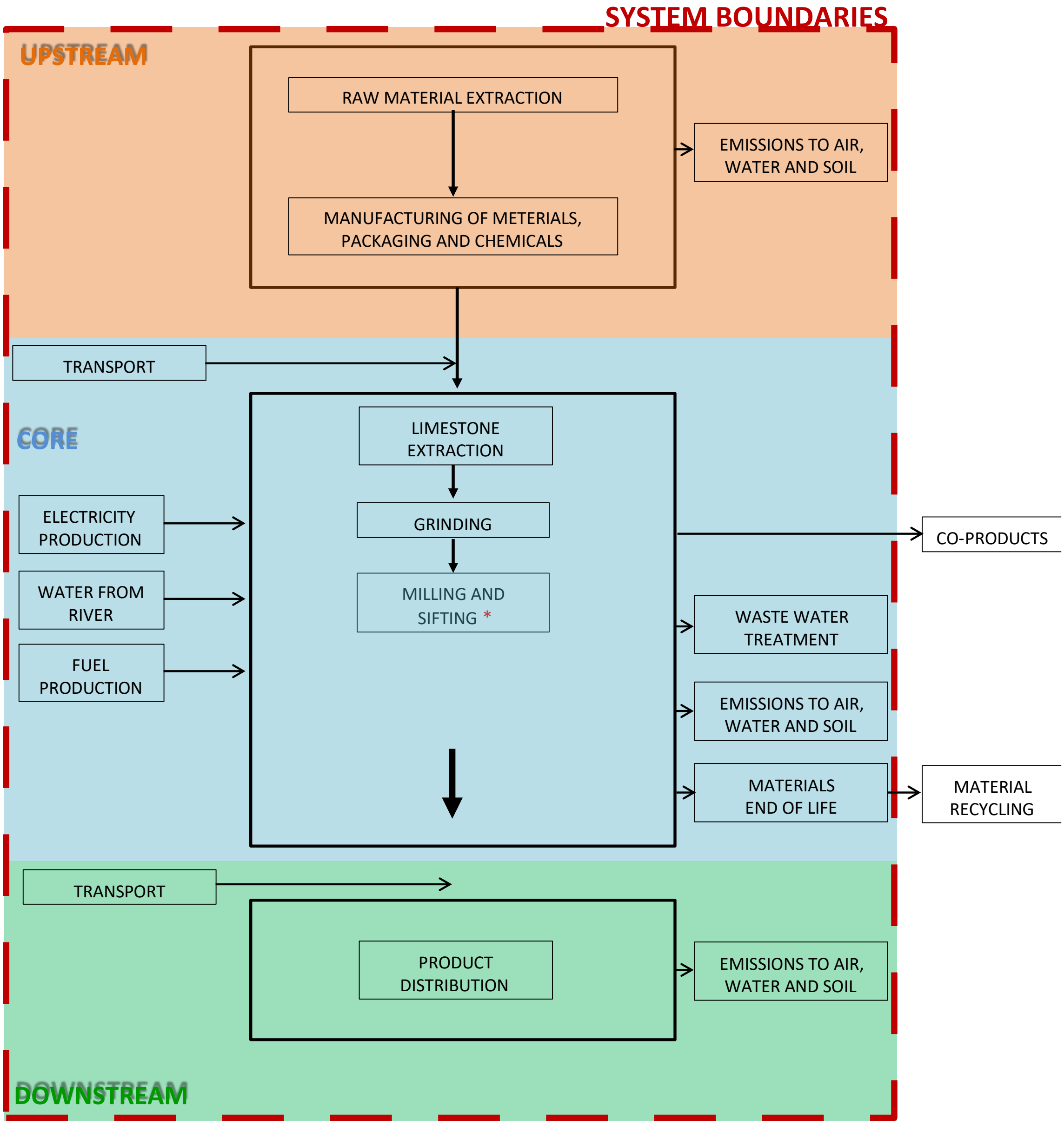
Environmental impacts due to the production and use of energy (electricity, natural gas and gasoline) and water were based on data reported in the company annual reports and allocated to the mass processed in each phase.

Downstream process: it consists in the “from gate to gate” process that includes:

- Distribution (transport) of the product to other companies that transform or blend the inert stone to other ingredients. In this case an average transport in national boundaries (roadway) was considered; another different distribution scenario of distribution in Europe by railway is also accounted.

The Downstream process does not include the packaging of the product, because it is sold unpacked. Secondary transformation (e.g. by the company to which the inert material is sold), its transport to the end user and the use of the processed product are out of system boundaries.

Figure 2 shows the flow chart and system boundaries diagram of the **inert material from quarry**, divided into Upstream, Core and Downstream.



* It includes series of different milling and sifting processes

Fig.2 Flow chart and system boundaries of **inert material** production

Excluded lifecycle stages: Based on the definition of system boundaries and cut-off criteria, a number of processes were considered not relevant or not directly referred to the **inert material** lifecycle.

Excluded processes are the following:

- construction of buildings and machineries used in the Serra San Quirico site;
- production and maintenance of machineries with more than 5 years estimated lifetime;
- activity and travels of employers;
- product secondary processing/blending with other materials
- transport to the end user
- use and end of life of the product.

Not significant data were neglected. The considered cut-off is under the threshold of relevance (1% of total inputs), in accordance with the maximum percentage for exclusion, recommended by the PCR 2016:03 v.1.1, 2010:10 v.2.1, PCR under development for CPC 15200 e 15320 and GPI 2017-12-11 v.3.0.

More information:

The LCA has been performed in compliance with ISO 14040:2006, ISO 14025:2006 (Environmental labels and declarations - Type III) and the GPI (General Programme Instructions for the International EPD System), 2017-12-11 v.3.0.
The LCA refers to the PCR 2016:03 v.1.1 "*Preparations used in animal feeding for food-producing animals*" UN CPC 233 and PCR 2010:10 "*Mineral or chemical fertilizers*" UN CPC 3461, 3462, 3463, 3464 & 3465, waiting for the publication of the reference PCR for "*Micronized stone*" UN CPC 15200 and 15320.
Primary data have been collected in the Gola della Rossa production plant of Serra San Quirico (AN – IT) based on direct interviews with the employers involved in production processes during specific field-visits in different plant sections or derived from registered company reports. All quantities derive from primary data, as recommended by data quality requirements of reference PCR.
Environmental impacts due to the production and use of energy (electricity, natural gas and gasoline), and water were based on data registered in company reports. These data were subdivided per each phase according to company estimations and energy consumption recognition along the production chain, and allocated to the mass processed in each phase.

Secondary data refer to the Ecoinvent database v.3.4. The LCA has been performed based on the SimaPro 8.5.2.0 software, selected method GHG Protocol Method (WBCSD & WRI, 2009) for Green House Gas emissions from fossil sources, Biogenic carbon emissions, and Emissions from land transformation, updated to IPCC 2013 characterization factors; EPD 2013 Method (GPI, 2013) for Acidification Potential AP (non-baseline), Eutrophication Potential EP, Ozone Depletion Potential ODP, Abiotic Depletion ADP (elements e fossil fuels); CML-IA baseline Method (Guineè et al., 2002; Huijbregts et al., 2003) for Eutrophication Potential (EP), Ozone Depletion Potential (ODP), Human Toxicity Potential (HTP), Freshwater Aquatic EcoToxicity Potential (FAETP), Marine Aquatic EcoToxicity Potential (MAETP), Terrestrial Aquatic EcoToxicity Potential (TETP); AWARE Method (Boulay et al., 2017) for Water Scarcity Footprint (WSP); ReCiPe2008 Method (Goedkoop et al., 2009) for Photochemical Ozone Formation Potential (POFP) and Natural Land Transformation (NLR).

All primary and secondary data, selected database and accounting models are compliant with the PCR data quality requirements (par. 4.7).

The LCA study was performed by Emy Fuffa, Piero Farabollini and Paolo Ratini (University of Camerino – Italy).

Environmental performance

Potential environmental impact

This report was made for category 1, that is the family of inert material. All the products that fall within this macro family have been studied with the allocation method.
The product with the worst impacts was then chosen (CA100/150).
The assessed potential environmental impacts are reported in table 2, detailed into upstream, core and downstream processes. Values refer to the functional unit (**1 t of calcium carbonate**).

Tab.2 Environmental Impact Potentials referred to the **inert material** production system per FU (2021). Downstream scenario: distribution to Italy (roadway).

PARAMETER		UNIT	Upstream	Core	Downstream	TOTAL
Global warming potential (GWP)	Fossil	kg CO_2 eq.	316	0,06	0,09	316
	Biogenic	kg CO_2 eq.	0,15	0,01	0,00	0,16
	Land use and land transformation	kg CO_2 eq.	4,72	0,00	0,01	4,73
	TOTAL	kg CO_2 eq.	321	0,07	0,10	321
Acidification potential (AP)		kg SO_2 eq.	1,12	0,00	0,00	1,12
Eutrophication potential (EP)		kg PO_4^{3-} eq.	0,23	0,00	0,00	0,23
Formation potential of tropospheric ozone (POFP)		kg NMVOC eq.	1,26	0,00	0,00	1,26
Abiotic depletion potential – Elements		kg Sb eq.	0,00	0,00	0,00	0,00
Abiotic depletion potential – Fossil resources		MJ, net calorific value	4739	0,93	0,01	4740
Water scarcity potential		m^3 eq.	17,4	0,04	0,00	17,4

Reference to characterisation factors used: GWP: IPCC 2013; AP: Hauschild & Wenzel (1998); EP: Heijungs et al. (1992); POFP: Van Zelm et al 2008; ADP: Oers, et al (2002); Water Scarcity Potential: AWARE v.1 Boulay et al., 2017;

<u>Global Warming Potential</u>: core processes generate the highest impact mainly due to the grid electricity absorption and methane used for heat production. The upstream phase generates 5,8% of the total impact due to the production of chemical products that constitute explosives, detonators and fuses. The downstream phase contributes with 1%, due to the transport of the product.
<u>Acidification Potential</u>: the core processes generate highest impacts, mainly due to the grid electricity absorption. The upstream phase generates 4,1% of the total impact, due to the use of chemical products. The downstream phase contributes to 0,6%, due to the transport of the product.
<u>Eutrophication Potential</u>: core processes generate the highest impact due to the grid electricity absorption. The upstream phase generates 5,8% of the total impact, mainly due to the production of chemical products. The downstream phase contributes to 0,6%, due to the transport of the product.

<u>Photochemical Formation Oxidation Potential</u>: core processes generate the most of the impact , mainly due to the grid electricity absorption and methane used for heat production. The upstream phase generates 8% of the total impact due to the use of chemical products.

Results are shown in Figure 3.

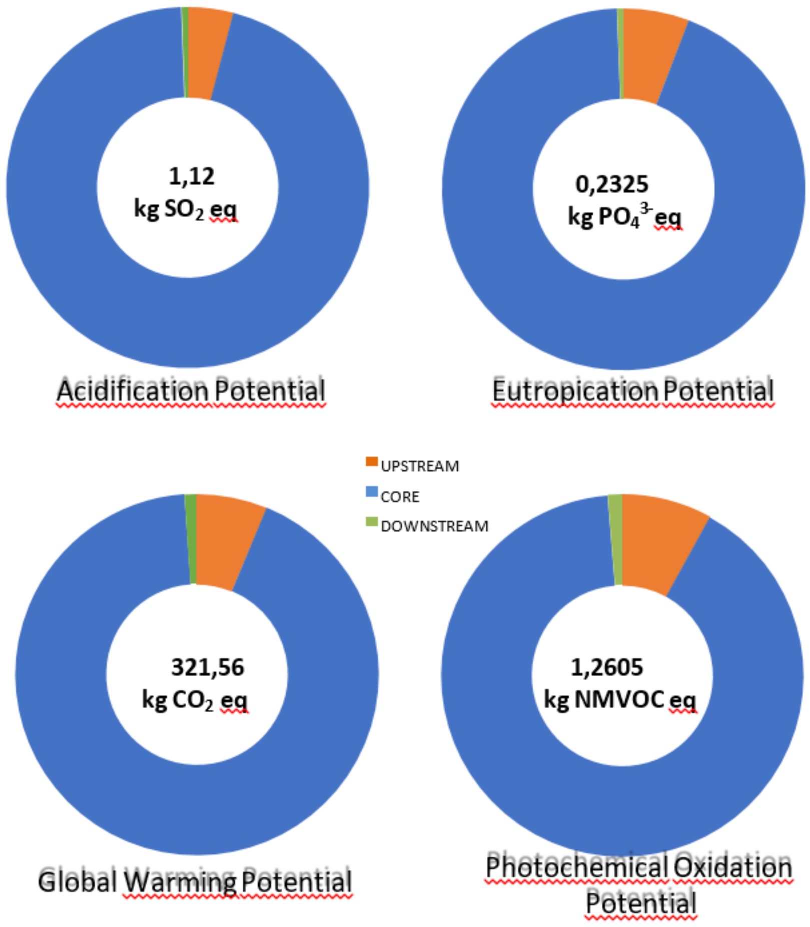


Fig.3 LCA based estimated values of environmental impacts of **1 t of calcium carbonate**

In general, energy use is the most relevant aspect in terms of environmental impact management, particularly referring to GWP, AP, EP and POFP assessed values. The hotspots highlighted by results constitute the starting point to identify and develop solutions to mitigate impacts and optimizing the whole process, for a continuous improvement on company management.

Use of resources

Tab.3 Total renewable and non-renewable resources used in the **inert material** production system (2021)

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - RENEWABLE	Used as ENERGY carrier	MJ, net calorific value	0,55	53,8	0,04	54,4
	Used as RAW MATERIALS	MJ, net calorific value	0,23	14,0	0,02	14,2
	TOTAL	MJ, net calorific value	0,78	67,5	0,07	68,3
Primary energy resources - NON RENEWABLE	Used as ENERGY carrier	MJ, net calorific value	20,6	350	0,02	370
	Used as RAW MATERIALS	MJ, net calorific value	0,00	0,00	0,00	0,00
	TOTAL	MJ, net calorific value	20,6	350	0,02	371
Secondary Material		kg	0,00	0,00	0,00	0,00
Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00
Non-Renewable secondary fuels		MJ	0,00	0,00	0,00	0,00
Net use of fresh water		m3	0,00	0,10	0,00	0,10

Waste production and output flows

Waste production

Tab.4 Total waste generation for the **inert material** production system (2021)

PARAMETER	UNIT	Upstream	Core	Downstream	TOTAL
Hazardous waste disposed	kg	0,00	0,00	0,00	0,00
Non-hazardous waste disposed	kg	0,05	0,70	0,11	0,86
Radioactive waste disposed	kg	0,00	0,00	0,00	0,00

Output flows

Tab.5 Total output flows for the **inert material** production system (2021)

PARAMETER	UNIT	Upstream	Core	Downstream	TOTAL
Components for reuse	kg	0,00	0,00	0,00	0,00
Material for recycling	kg	0,00	0,00	0,00	0,00
Materials for energy recovery	kg	0,00	0,00	0,00	0,00
Exported energy, electricity	MJ	0,00	0,00	0,00	0,00
Exported energy, thermal	MJ	0,00	0,00	0,00	0,00

Other environmental indicators

Environmental Impact Potentials referred to the **inert material** for the downstream scenario (distribution to Europe) have been calculated, the deviations are minimal and concern fractions of units of the various indicators.

Other impact categories were considered in the analysis such as:

- *Human, Fresh-water, Marine and Terrestrial Toxicity Potential* (HTP, FAETP, MAETP inf. And TETP respectively) assessed based on the CML-IA;
- *Natural Land Transformation (NLR*) – assessed based on ReCiPe2008
- *Ozone Layer Depletion (ODP)-assessed based on EPD 2018.*

Glossary

Biogenic carbon: carbon which is contained in biomass [ISO 14067:2010]

Biogenic carbon dioxide (CO_2): CO_2 obtained by the oxidation of biogenic carbon [ISO 14067:2010]

Carbon dioxide equivalent (CO_2 equivalent): unit for comparing the radiative forcing of a greenhouse gas to carbon dioxide. The carbon dioxide equivalent is calculated using the mass of a given greenhouse gas multiplied by its global warming potential [ISO 14064:2006]

Carbon footprint: net amount of greenhouse gas emissions and greenhouse gas removals, expressed in carbon dioxide (CO_2) equivalents. The CO_2 equivalent is calculated using the mass of a given greenhouse gas multiplied by its global warming potential. [ISO 14067:2010]

Functional unit: quantified performance of a product system for use as a reference unit [ISO 14040:2006]

Global warming potential (GWP): factor describing the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time [ISO 14064:2006]

Life cycle assessment (LCA): compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040:2006]

Raw material: primary or secondary material that is used to produce a product. Secondary material includes recycled material. [ISO 14040:2006]

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PCR 2019 "Micronized stone from quarry for uses other than construction" UN CPC 15200 and 15320 under revision of TC of EPD International AB

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PCR 2010:10 v.2.1 "Mineral or chemical fertilizers" UN CPC 3461, 3462, 3463, 3464 & 3465

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