Environmental Product Declarations

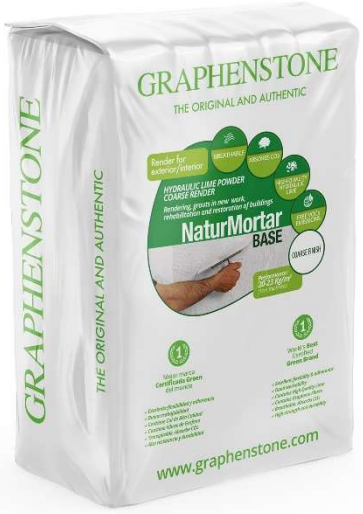
GRAPHENSTONE®

EPD®

ENVIRONMENTAL PRODUCT DECLARATION

Mortars Nature

Graphenstone®: NaturMortar Base, NaturMortar Fine and NaturMortar Glue



EPD® registration number: S-P-01619

Publication date: 2019/08/26

Scope of the EPD®: International

EPD® based on:
PCR 2012:01 Construction products and construction services v 2.3
Sub-PCR-A Mortars applied to a surface

Version: 1st

Valid until: 2024/08/25

UN CPC code: 37510

www.graphenstone.com

INDEX

ENVIRONMENTAL PRODUCT DECLARATION

GRAPHENSTONE® NATURMORTAR BASE

1. Programme related information

Name of the programme and programme operator	The international EPD® System, operated by EPD® International AB
Reference PCR document	PCR based on ISO 14025:2010 and EN 15804: A1 2012:01 Construction products and construction services v 2.3 Sub-PCR-A Mortars applied to a surface
EPD® Registration number	S-P-01619
Publication date	2019/08/26
Verification date	2019/08/25
Version	1st
EPD® Validity	5 years (2024/08/25)
Geographical scope of the EPD®	International
Further information on the next website	www.environdec.com

2. Product related information

2.1. Specification of manufacturing company

2.1.1. Company related information

Company responsible of EPD® publication	INDUSTRIA ESPAÑOLA PARA EL DESARROLLO E INVESTIGACIÓN 2100, S.A. (IEdiSA) Polígono industrial Poliviso. c/ Carpinteros, 25 41520 El Viso del Alcor, Sevilla - SPAIN
Contact	Laura García +34 955 292 068 / +34 955 529 935 quality@graphenstone.com www.graphenstone.com

2.1.2. Company description

IEdiSA is a company located in El Viso del Alcor (Sevilla). It is the world's leading manufacturer of eco-friendly products such as paints, coatings, mortars, adhesives and insulation with graphene technology under brand Graphenstone®. Its formulations improve in properties exponentially, mainly in the saving of the material consumption, since it is worked at nanoscales, achieving hardness, resistance and elasticity superior to any common coating.

2.1.3. Environmental Management Systems information

As a result of the company continuous concern about environmental improvement of its products, IEdiSA has the next certifications: ISO 9001 Quality Management Systems since 2013 (registration number: ES-0610/2013) and ISO 14001 Environmental Management Systems (registration number: ES-2013/0248).

2.1.4. Environmental policy of the company

IEdiSA believes that personal and business honesty is a core value of its internal relationships, with its suppliers, its customers, and the environment, so it is committed to complying with the laws, regulations and normative that competes both for quality and environment and with other internal commitments subscribed by the company itself.

IEdiSA manufactures products respecting the declared specifications and minimizing the environmental impacts associated to their activities, reducing waste, reusing water as a raw material, and manufacturing lime through an artisanal system, among other measures.

IEdiSA particularly considers suppliers and subcontractors to achieve Quality and Environment objectives, encouraging them to develop best environmental practice by creating a mutually cooperative relationship.

IEdiSA is committed to the continuous improvement of the productivity of its facilities through the rational use of natural resources and energy, reducing, whenever possible, waste generated in all operations and facilitating their recycling.

IEdiSA consumes in its facilities certified green electricity arise from 100% renewable sources.

2.1.5. Company logotype

IEdiSA is represented by two logotypes, the first is corresponding to own company logo and the second represents ***Graphenstone®*** products range.

IEdiSA
desarrollando el Futuro

GRAPHENSTONE®

2.2. Product specifications

2.2.1. UN CPC code

UN CPC 37510

2.2.2. Commercial name of the products

The present EPD® includes the next products: *Graphenstone® NaturMortar Base, Graphenstone® NaturMortar Fine* and *Graphenstone® NaturMortar Glue*.

Environmental Product Declaration has been based on mortar range *Graphenstone® NaturMortar Base*, so the declared environmental results as well as its further interpretation corresponds to the mentioned product.

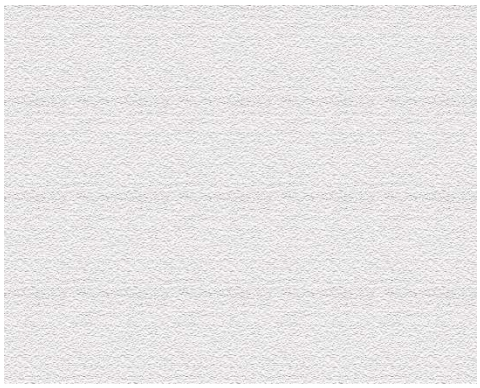
On the other hand, the environmental results corresponding to the product *Graphenstone® NaturMortar Fine* are attached in Annex I, which also are representative for the product range *Graphenstone® NaturMortar Glue,* since the existing difference among their life cycle environmental impacts are lower than 10%.

Figure 1. Illustration of Graphenstone® NaturMortar products range in its marketed presentation (bag of 25 kg).

2.2.3. Description of products and production process

The product range Graphenstone® Nature are mortars made from high quality natural hydraulic lime with no artificial hydraulicizer additives. They are characterized by its mechanical strength and workability, as well as for its breathability which avoids water condensations. Furthermore, these mortars absorb atmospheric CO_2 on places where they are applied, in addition to be suitable both in indoor and outdoor environments and they do not produce emissions of volatile compounds as well as formaldehyde. Mortars are presented in a single container composed by bags of 25 kg.
According to the intended function of each mortar, we can find three products range:

- ***Graphenstone® NaturMortar Base*** is a powder mortar suitable for rendering, grouting, rehabilitation and restoration processes on buildings. The product is used as gripping mortar, as well as first regulation coat, since it is composed of coarse aggregates.



- ***Graphenstone® NaturMortar Fine*** is a fine powder mortar suitable for plastering on new building, in addition to rehabilitation and restoration processes. The product is used for levelling, scraping, unifying, as well as to provide a medium grain finish on rendering.

- ***Graphenstone® NaturMortar Glue*** is an adhesive powder mortar suitable for bonding tiles and ceramics as well as for anchoring procedures of insulation boards and non-flooding solutions. Furthermore, it can also be used for rehabilitation and restoration processes on buildings.

The manufacturing process is defined as a batch process, and it consists on endless screw driven by an engine, which performs the mixing procedure of the aggregates on a hopper. Raw material is stored and dosed in silos before the mentioned treatment. Finally, the product is packed on bagging machine for its further distribution.

The entire production phases previously described are detailed at Figure 2.

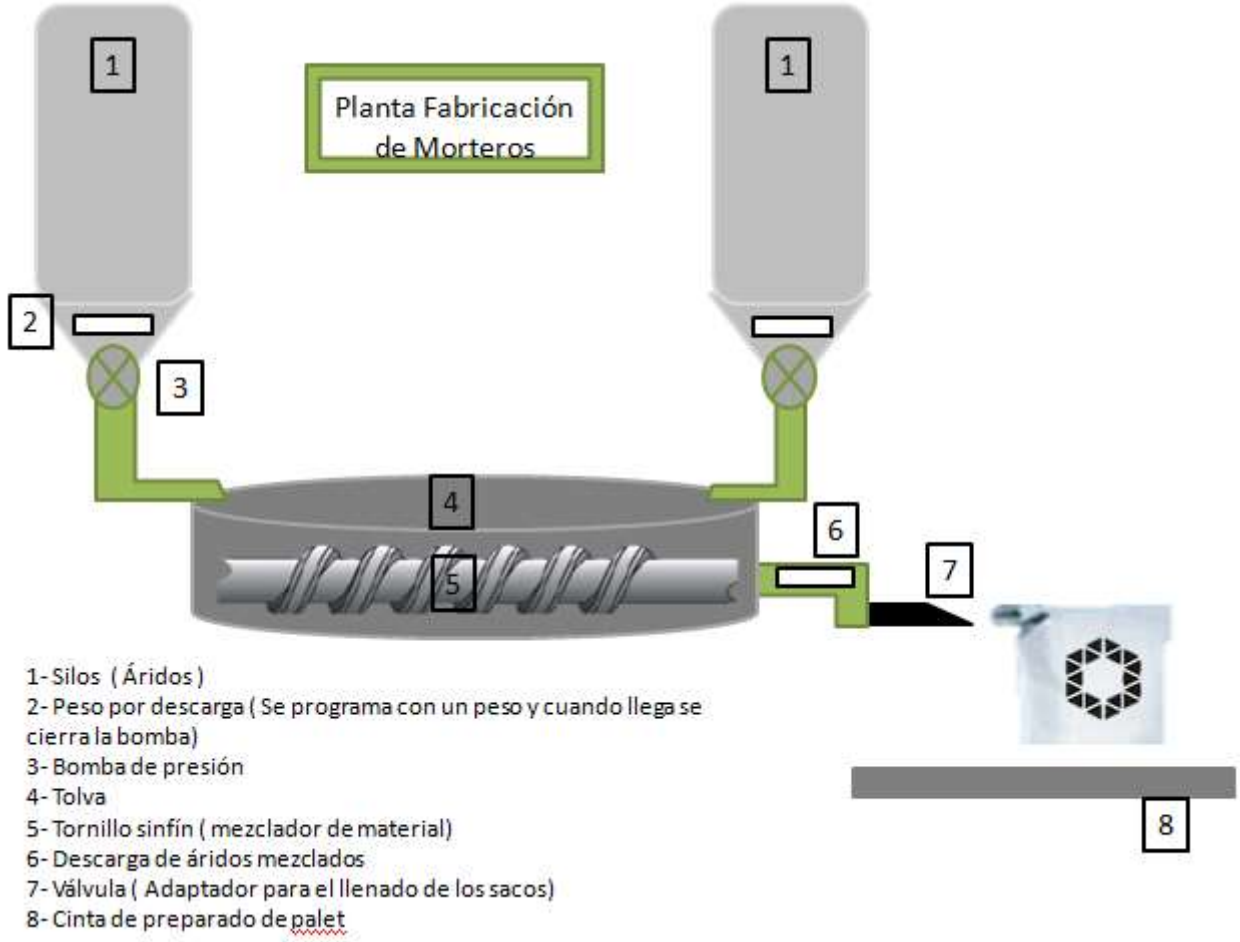


Figure 2. Production process

2.2.4. Content declaration

During the product life cycle, hazardous substances listed in “Candidate List of Substances of Very High Concern (SVHC) for authorization”, are not used in excess of 0.1% of the product weight.

The verifier and the operator of the programme do not make any affirmation nor present any legality about the product.

The product under study is composed by the next materials:

RAW MATERIAL	PERCENTAGE
Aggregates	70%-90%
Hydraulic lime	10%-30%

2.2.5. Data quality and assignment of loads

Specific data have been taken for the quantities of materials and energy used during the product life cycle. These data have been supplied by IEdiSA, referring to year 2017, and come from primary data of manufacturing plant. The presented results on this document are valid for the EPD® until there are no substantial modifications that can affect the impacts of the product. Substantial modifications have taken into account when the impacts of the product increase more than 10% per functional unit.

Generic data have been taken for the impact per unit of matter or energy. These data have been gathered from Ecoinvent LCA database, version 3.4, which has a renowned international prestige. It has been selected as a reference database due to its coincidence with the flows of matter and energy on the following aspects:

- Geographic representativeness: data come from areas with the same legislative framework and electric mix.
- Technological equivalence: data derive from the same physical and chemical processes, or at least the same technological coverage.
- Limits to nature: data contain all quantitative information needed for EPD®
- Limits towards technical systems: the considered stages in the life cycle are equivalent.

2.3. Functional unit

Raw materials extraction and processing, transportation to factory, manufacturing, distribution to customer, installation, use, transportation to the waste manager and end of life of Graphenstone® NaturMortar Base product quantity needed to cover 1 m^2 of surface, guaranteeing their technical specifications. This amount corresponds to 26 kg of mortar applying a layer thickness of 12 mm. The Reference Service Life of the product is 60 years.

2.4. Differences regarding previous versions of the EPD®

The present document constitutes the EPD® first version of the products under study.

2.5. Methodology and hypothesis

It has been conducted a Life Cycle Assessment of the product including the entire stages of life cycle (from cradle to grave). The EPD® has been performed following the established guidelines of the next Product Category Rules (PCR): Construction products and construction services. 2012:01, version 2.3 and Sub-PCR-A Mortars applied to a surface. It has been used the impact method CML-IA baseline v 3.05, as well as EDIP 2003 v 1.06 for the calculation of waste production. With reference to loads assignment, the polluter pays principle has been followed. At the same time, in those processes where it has been necessary to make an allocation of charges, it has followed a criterion mass.

It have been used specific data with regard to raw materials and ancillary materials usage, in addition to power consumption, waste production and emissions produced to air, soil and water (non-existent). These data correspond to year 2017.

The power consumption at manufacturing plant is based on certified green electricity arise from 100% renewable sources. The electricity consumption of 1 MJ represents the emission of 3 g CO_2-eq.

In order to determine the emissions per kg of matter, kWh of energy or Tnkm conveyed, the Ecoinvent LCA database v. 3.4 has been used.

With reference to waste transportation from manufacturing plant and installation site to waste manager, it has been established a default distance of 50 km.

2.6. Description of processes and system boundaries

The present EPD® is structured by life cycle stages established according to the next reference standards: PCR Construction products and construction services v 2.3 and Sub-PCR-A Mortars applied to a surface, both based on UNE-EN 15804 regulation. This EPD® is from cradle to grave.

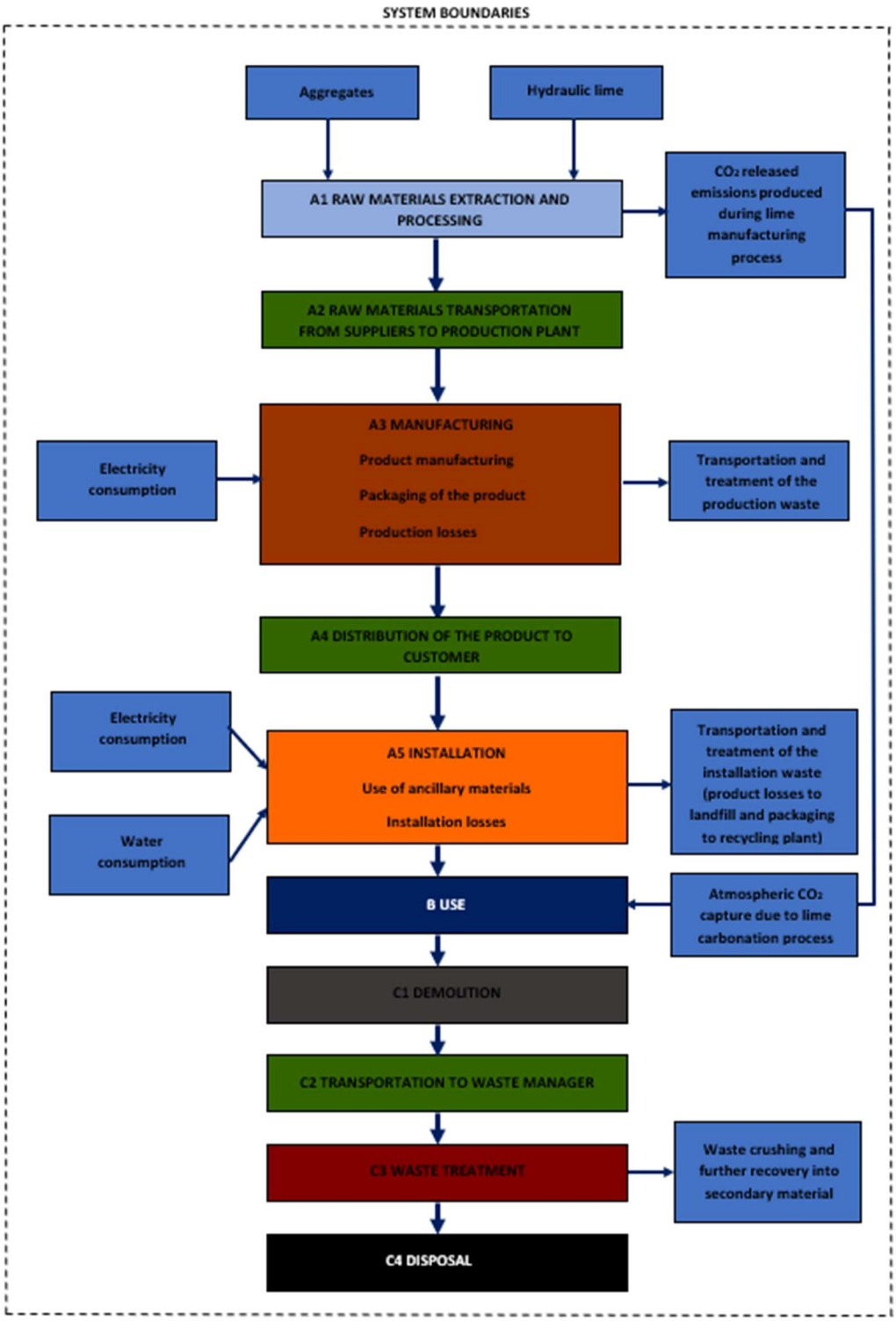


Figure 3. System boundaries and description of significant processes.

2.6.1. Product stage A1-A3

Product stage is structured by the following modules: Raw materials extraction and processing (A1), Raw materials transportation to production plant (A2) and Manufacturing (A3). As allowed by UNE-EN 15804 regulation, the results of A1, A2 and A3 modules have been grouped into a single stage (A1-A3).

A1-RAW MATERIALS EXTRACTION AND PROCESSING

This module takes into account the extraction and processing of raw materials, as well as the produced energy prior to manufacturing process under study. As can we see at Figure 4, the production of calcium hydroxide generates CO_2 during transformation of $CaCO_3$ to lime (calcium oxide). The same amount of CO_2 released to the atmosphere by decarbonation is subsequently fixed during use phase of the product, when lime becomes to calcium carbonate. As a consequence, the emissions of CO_2 produced on this module only come from the production of electricity and heat, which are significantly low due to the use of biomass at manufacturing plant.

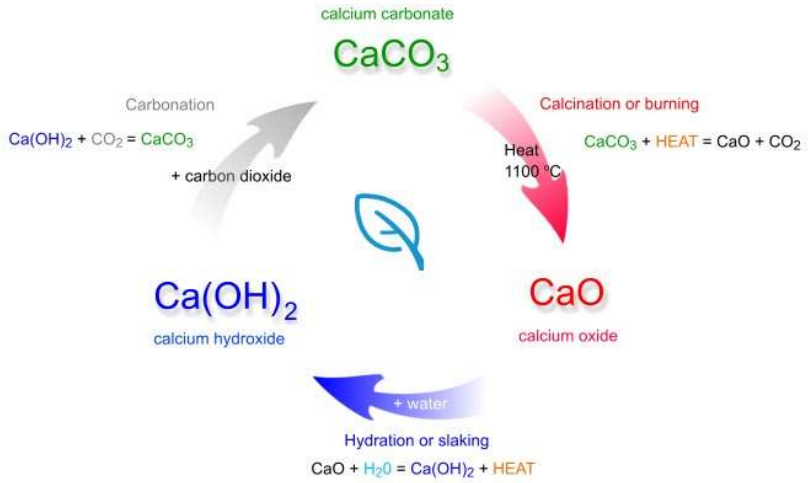


Figure 4. Lime cycle: Calcium carbonate-Calcium oxide-Calcium hydroxide.

A2-RAW MATERIALS TRANSPORTATION

This module includes the transportation of all raw materials from the supplier to manufacturing plant. It has been entered the specific distance and type of lorry for each raw material.

A3-MANUFACTURING

This module includes the consumption of power, additives and packaging materials during manufacturing process. At the same time, it also assess the emissions of production plant which

are not originated from the fossil fuels combustion (non-existent), as well as the transportation of produced waste to the manager and its further treatment.

With regard to the environmental impacts arise from losses of manufacturing process, it have been allocated to the three modules included at Product Stage (A1-A3). At the same time, it has been taken into account the transportation and subsequent disposal on landfill of these losses as inert waste.

2.6.2. Construction process stage A4-A5

Construction process stage is structured by the modules Distribution of the product to customer (A4), and Installation (A5).

A4-DISTRIBUTION OF THE PRODUCT TO CUSTOMER

Module A4 Distribution of the product to customer includes the transportation of the finished product from manufacturing plant to installation site. With reference to distance calculation, it has been performed a weighted average of the existing distance between production plant and the different countries where the product is marketed according to its percentage of sales. The main parameters which this module has been based, are described in the next table:

Type	Parameter	Unit (expressed per Functional Unit)
Truck	Type of vehicle and fuel consumption, type of vehicles used for transport	Lorry > 32 Ton. Diesel consumption of 31,1 L/100 Km Transoceanic freight ship
	Distance	700 km by lorry 3.022 km by freight ship
	Capacity utilization (including empty returns)	% assumed on Ecoinvent v. 3.4
	Packaging Mass of the product (including packaging)	0,104 kg (paper bag) 26,1 kg

Table 1. Specifications for product transportation

A5-INSTALLATION

Module A5 Installation includes all the materials, as well as the needed energy used for the installation of the product. At the same time, it also takes into account the transportation and further treatment of the produced waste during this phase.

With regard to the previous point, installation losses of 2% has been estimated, which it has been considered its transportation to waste manager and their subsequent disposal on landfill as inert waste.

Following the polluter pays principle, in the case of waste from product packaging it has only been taken into account its transportation to waste manager, due to these materials are potentially recyclables.

During the product installation process, several types of instruments and ancillary materials are required (detailed in the next table below), which their environmental impacts regarding to product life cycle have not been considered, since these are negligible due to the number of reuses performed with the mentioned elements. As an exception, it only has been taken into account the electricity consumption arise from the mechanical shaker needed for product mixing.

The most common installation scenario for the product under study is the application by spraying machine, brush and trowel.

Parameter	Value/Description
Ancillary materials for installation	Mechanical shaker, bucket, brush, trowel, spraying machine .
Water use	5,2 l (0,2 l / per kg of product)
Other resources use	None
Quantitative description of energy type (regional mix) and consumption during the installation process	Spanish electric mix 0,08kWh (Mechanical shaker)
Direct emissions to air, soil and water	None
Waste of materials at place, before the processing of waste, generated during the installation of the product (specified by type)	**Product losses:** 0,52 kg (2% of the product weight) **Packaging waste:** Paper bag 0,104 kg
Output flow of materials (specified by type) resulting from the processing of waste at the site, i.e. during collection for recycling, recovery (recovery) or discharge (specifying the route)	Packaging waste are 100% collected and processed as recovered material. Product losses are disposed on landfill as inert waste.

Table 2. Specifications for product installation

2.6.3. Use stage B1-B7

B1-USE

This module includes all environmental aspects and impacts during the normal use of the product, with the exception of water and power consumption.

The environmental impacts of the product show negative values on this module over Global Warming indicator, since any type of material is consumed nor any emission is released during

the Reference Service Life of the product. Furthermore, as has been stated previously at section A1 (Raw materials extraction and processing), the product under study captures atmospheric CO_2 where it is applied due to the lime cycle. This chemical process has been estimated as 39g of CO_2 fixation per kg of mortar.

B2-MAINTENANCE

The product under study does not require any type of maintenance during its Reference Service Life (60 years).

B3-REPAIR

The product under study does not require any type of repair during its Reference Service Life (60 years).

B4-REPLACEMENT

The product under study does not require any type of replacement during its Reference Service Life (60 years).

B5-REFURBISHMENT

The product under study does not require any type of refurbishment during its Reference Service Life (60 years).

B6-OPERATIONAL ENERGY USE

The product under study does not require any type of energy consumption during its Reference Service Life (60 years).

B7-OPERATIONAL WATER USE

The product under study does not require any type of water consumption during its Reference Service Life (60 years).

2.6.4. End of life stage C1-C4

This stage includes the transportation and further treatment of the produced waste once Reference Service Life of the product has elapsed. End of life stage is structured by the following modules: C1 Demolition, C2 Transport to waste manager, C3 Waste processing and C4 Disposal.

The End of life scenario considered for this studio, is based on the fact that the entire product weight is crushed and subsequently recovered into secondary material, which it will be incorporated on a new product life cycle. Therefore, following the polluter pays principle, it has only been taken into account the waste transportation to recycling plant.

On the other hand, it has been considered that the environmental impacts arise from the demolition of building where the product is installed, as well as the impacts resulting from the separation of materials performed in waste treatment processes, are negligible in comparison with the rest of impacts produced during the product life cycle.

Product range	Graphenstone® NaturMortar Base
Collection process specified by type	26 kg (mixed with the rest of building waste)
Recovery system specified by type	100% of the product weight is crushed and recovered into secondary material
Disposal specified by type	There is not any disposal scenario
Assumptions for the development of the scenario (e.g. transportation)	Truck with trailer with an average load of 16-32 Tn and diesel consumption of 25 litres per 100 km 50 km of average distance to the landfill

Table 3. Specifications for End of life of the product

2.6.5. Additional information beyond product life cycle

BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES:

The potential benefits of the recycling of factory waste and the recycling of the product after the end of its useful life have not been taken into account.

Based on the system boundaries indicated in the reference standards PCR Construction products and construction services v. 2.3 and Sub-PCR-A Mortars applied to a surface, the following processes have not been taken into account:

- Manufacturing of the production of capital goods with an expected lifetime of over three years, buildings and other capital goods.
- The maintenance activities of the production plant.
- Transport carried out by workers on the home-factory-home journey.

2.7. EPD® comparisons within the same product category

“EPD of construction products may not be comparable if they do not comply with EN 15804”
“Environmental product declarations within the same product category from different programs may not be comparable”

2.8. EPD® validity

The present EPD® has a five years validity from its publication date.
In case of changes that lead to a deterioration in any of the environmental impact indicators of the product life cycle of more than 10% over the current declaration, the EPD® must be updated.

3. Environmental performance related information

3.1. Potential environmental impacts

This section indicates the potential impacts over the environment of the *Graphenstone® NaturMortar Base* product life cycle, based on the stated guidelines of PCR 2012:01 Construction products and construction services v 2.3 and Sub-PCR-A Mortars applied to a surface.

On the other hand, the environmental results corresponding to the product *Graphenstone® NaturMortar Fine* are attached in Annex I, which also are representative for the product range *Graphenstone® NaturMortar Glue,* since the existing difference among their life cycle environmental impacts are lower than 10%.

Indicator	Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
	A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Abiotic depletion of resources (Elements) (Kg-eq Sb)	7,88E-05	3,28E-06	1,72E-06	0	Not relevant	6,44E-07	Not relevant	0	MND	**8,45E-05**
Abiotic depletion of resources (Fossil) (MJ)	1,66E+02	3,71E+01	4,54E+00	0	Not relevant	3,13E+00	Not relevant	0	MND	**2,11E+02**
Global Warming (kg CO_2-eq)	2,22E+01	2,42E+00	5,31E-01	-1,00E+00	Not relevant	2,08E-01	Not relevant	0	MND	**2,44E+01**
Ozone layer depletion (Kg CFC 11-eq)	1,54E-06	4,53E-07	4,56E-08	0	Not relevant	3,86E-08	Not relevant	0	MND	**2,08E-06**
Photochemical oxidation (kg ethyene-eq)	3,85E-03	8,40E-04	1,05E-04	0	Not relevant	3,14E-05	Not relevant	0	MND	**4,83E-03**
Acidification (kg SO_2-eq)	5,31E-02	2,26E-02	1,78E-03	0	Not relevant	4,87E-04	Not relevant	0	MND	**7,79E-02**
Eutrophication (kg PO_4^{3-}-eq)	2,18E-02	2,74E-03	5,51E-04	0	Not relevant	1,04E-04	Not relevant	0	MND	**2,52E-02**

Table 3. Potential environmental impacts of the life cycle of 1m² of Graphenstone® NaturMortar Base.

3.2. Resources use

Indicator		Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
		A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Non-renewable resources (MJ)	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
	Energy resources	1,66E+02	3,71E+01	4,54E+00	0	Not relevant	3,13E+00	Not relevant	0	MND	**2,11E+02**
	Total	1,66E+02	3,71E+01	4,54E+00	0	Not relevant	3,13E+00	Not relevant	0	MND	**2,11E+02**
Renewable resources (MJ)	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
	Energy resources	2,38E+01	7,50E-01	6,67E-01	0	Not relevant	4,73E-02	Not relevant	0	MND	**2,52E+01**
	Total	2,38E+01	7,50E-01	6,67E-01	0	Not relevant	4,73E-02	Not relevant	0	MND	**2,52E+01**
Secondary resources	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
Material (kg) Energy (MJ)	*Energy resources (renewable and non-renewable)*	0	0	0	0	0	0	0	0	MND	**0**
Total amount of water (water footprint) (m^3)		1,34E-01	7,74E-03	9,19E-03	0	Not relevant	6,06E-04	Not relevant	0	MND	**1,52E-01**
Amount of water used directly (m^3)		0	0	5,20E-03	0	0	0	0	0	MND	**5,20E-03**

Table 4. Use of resources of the life cycle of 1m^2 of Graphenstone® NaturMortar Base.

3.3. Other indicators describing waste categories

Indicator	Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
	A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Hazardous waste (kg)	2,46E-04	2,06E-05	6,06E-06	0	Not relevant	1,89E-06	Not relevant	0	MND	**2,74E-04**
Non-hazardous waste (kg)	2,99E+00	2,24E+00	6,31E-01	0	Not relevant	1,55E-01	Not relevant	0	MND	**6,02E+00**
Radioactive waste (kg)	1,01E-03	2,63E-04	3,13E-05	0	Not relevant	2,20E-05	Not relevant	0	MND	**1,33E-03**
Components for reuse (kg)	0	0	0	0	0	0	0	0	MND	**0**
Materials for recycling (kg)	0	0	1,04E-01	0	0	0	2,60E+01	0	MND	**2,61E+01**
Materials for energy recovery (kg)	0	0	0	0	0	0	0	0	MND	**0**
Exported energy (MJ)	0	0	0	0	0	0	0	0	MND	**0**

Table 5. Other indicators describing waste categories of the life cycle of 1m² of Graphenstone® NaturMortar Base.

4. Interpretation of results

As we can see in Figure 5 and Table 7, the environmental impacts of *Graphenstone® NaturMortar Base* product life cycle concerning the needed amount to cover 1 m^2 of surface are mainly produced on Product Stage (A1-A3). Hence, this stage registers the greater impacts values over the entire environmental indicators under study, representing between 93% (Abiotic depletion of resources-Elements) and 68% (Acidification) of the total impacts life cycle.

Secondly, module A4 Distribution of the product to customer, shows a moderate environmental contribution over a large part of the assessed indicators, particularly in the case of Acidification, since it registers the maximum value of the stage (29%). On the other hand, module A5 Installation presents a slight contribution over the environmental impacts of the product, with values around 2% in all impact categories.

With reference to Use stage (B), it can be observed an impact with negative value over Global Warming indicator, as a result of the environmental benefits arise from the atmospheric CO_2 capture, which it is produced during the carbonation process of lime contained in the product, once the mortar is applied on installation site. Likewise, this stage does not present an impact contribution over the rest of indicators under study, since the product does not require any type of maintenance nor any matter and energy consumption.

Regarding to End of life stage, module C2 Transport to waste manager shows a very slight to negligible environmental contribution over the total impacts of the product life cycle, representing at most 2% in the case of the indicator with the greater value. Finally, module C4 Disposal does not present any impact over product life cycle, since the entire product is recovered as secondary material.

Impact category	A1-A3 Product stage	A4 Distribution	A5 Installation	B Use	C2 Transport to waste manager	C4 Disposal
Abiotic depletion of resources (Elements)	93,3%	3,9%	2,0%	0%	0,8%	0%
Abiotic depletion of resources (Fossil)	78,8%	17,6%	2,2%	0%	1,5%	0%
Global Warming	91,2%	9,9%	2,2%	-4,1%	0,9%	0%
Ozone layer depletion	74,2%	21,8%	2,2%	0%	1,9%	0%
Photochemical oxidation	79,8%	17,4%	2,2%	0%	0,6%	0%
Acidification	68,1%	29,0%	2,3%	0%	0,6%	0%
Eutrophication	86,5%	10,9%	2,2%	0%	0,4%	0%

Table 7. Potential environmental impacts of the life cycle of 1m² of Graphenstone® NaturMortar Base. In percentage

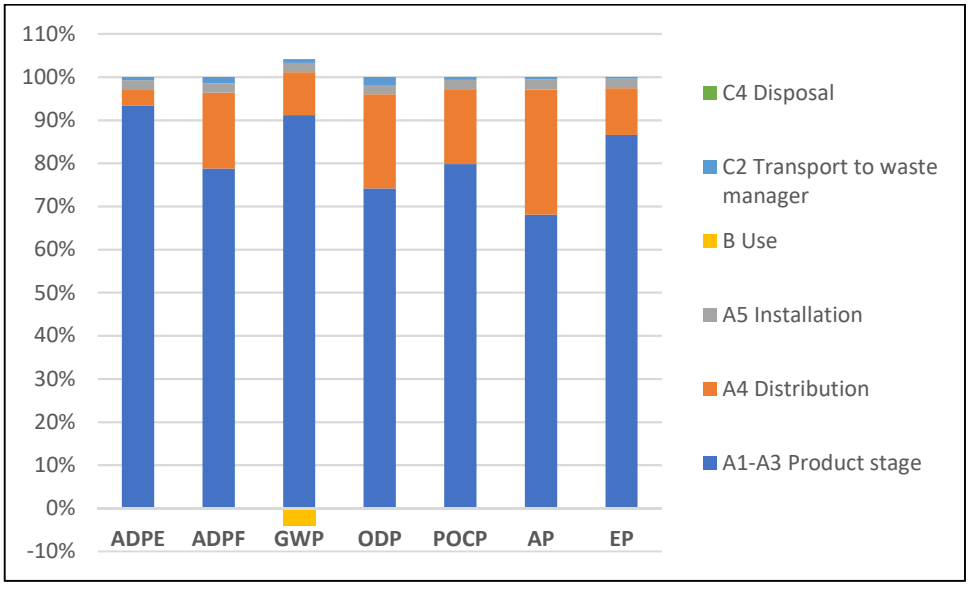


Figure 5. Potential environmental impacts of the life cycle of 1m² of Graphenstone® NaturMortar Base.

CHART CAPTION

ADPE: Abiotic depletion of resources-Elements, **ADPF:** Abiotic depletion of resources-Fossil, **GWP:** Global Warming, **ODP:** Ozone layer depletion, **POCP:** Photochemical oxidation, **AP:** Acidification, **EP:** Eutrophication

5. Differences regarding previous version of the EPD®

See section 2.4.

6. Verification

CEN standard EN 15804 served as the core PCR	
Product Category Rule	2012:01. Construction products and construction services v 2.3 Sub-PCR-A Mortars applied to a surface
Product Category Rule (CPR) has been verified by	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contactar vía info@environdec.com
Independent verification of EPD® and data according to ISO 14025: 2010	External verification of EPD®
Third part verifier	Marcel Gómez Ferrer Marcel Gómez Consultoría Ambiental Tlf. 0034630643593 Email: info@marcelgomez.com
Accredited or approved by:	The International EPD System®, Operated by EPD® International AB www.environdec.com Sweden

7. References

- GENERAL PROGRAMME INSTRUCTIONS for Environmental Product Declarations, EPD®. v 2.5
- ISO 14025: Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures (2010)
- ISO 14040: Environmental management-Life Cycle Assessment-Principles and framework (2006)
- ISO 14044: Environmental management-Life Cycle Assessment-Requirements and guidelines (2006)
- PCR 2012:01 Construction products and construction services v 2.3
- Sub-PCR-A Mortars applied to a surface
- Requirements for Environmental Product Declarations. MSR 1992:2 Rev 2009). Swedish Environmental Management Council
- UNE-EN 15804:2012+A1:2014 Sostenibilidad en la construcción. Declaraciones Ambientales de Producto

ANNEX I. Environmental performance of GRAPHENSTONE® NaturMortar Fine

♦ Potential environmental impacts

Indicator	Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
	A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Abiotic depletion of resources (Elements) (Kg-eq Sb)	1,36E-05	5,68E-07	3,46E-07	0	Not relevant	1,11E-07	Not relevant	0	MND	**1,47E-05**
Abiotic depletion of resources (Fossil) (MJ)	2,88E+01	6,42E+00	1,04E+00	0	Not relevant	5,42E-01	Not relevant	0	MND	**3,68E+01**
Global Warming (kg CO_2-eq)	3,84E+00	4,18E-01	1,16E-01	-1,73E-01	Not relevant	3,60E-02	Not relevant	0	MND	**4,24E+00**
Ozone layer depletion (Kg CFC 11-eq)	2,67E-07	7,85E-08	1,09E-08	0	Not relevant	6,67E-09	Not relevant	0	MND	**3,63E-07**
Photochemical oxidation (kg ethyene-eq)	6,67E-04	1,45E-04	2,54E-05	0	Not relevant	5,43E-06	Not relevant	0	MND	**8,43E-04**
Acidification (kg SO_2-eq)	9,18E-03	3,91E-03	5,00E-04	0	Not relevant	8,43E-05	Not relevant	0	MND	**1,37E-02**
Eutrophication (kg PO_4^{3-}-eq)	3,78E-03	4,75E-04	1,36E-04	0	Not relevant	1,80E-05	Not relevant	0	MND	**4,41E-03**

Table 8. Potential environmental impacts of the life cycle of 1m2 of Graphenstone® NaturMortar Fine.

♦ Use of resources

Indicator		Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
		A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Non-renewable resources (MJ)	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
	Energy resources	2,88E+01	6,42E+00	1,04E+00	0	Not relevant	5,42E-01	Not relevant	0	MND	**3,68E+01**
	Total	2,88E+01	6,42E+00	1,04E+00	0	Not relevant	5,42E-01	Not relevant	0	MND	**3,68E+01**
Renewable resources (MJ)	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
	Energy resources	4,11E+00	1,30E-01	2,57E-01	0	Not relevant	8,18E-03	Not relevant	0	MND	**4,51E+00**
	Total	4,11E+00	1,30E-01	2,57E-01	0	Not relevant	8,18E-03	Not relevant	0	MND	**4,51E+00**
Secondary resources	*Material resources*	0	0	0	0	0	0	0	0	MND	**0**
Material (kg) Energy (MJ)	*Energy resources (renewable and non-renewable)*	0	0	0	0	0	0	0	0	MND	**0**
Total amount of water (water footprint) (m^3)		2,32E-02	1,34E-03	1,72E-03	0	Not relevant	1,05E-04	Not relevant	0	MND	**2,64E-02**
Amount of water used in core process (m^3)		0	0	0	0	0	0	0	0	MND	**0**

Table 9. Use of resources of the life cycle of 1m^2 of Graphenstone® NaturMortar Fine.

♦ Other indicators describing waste categories

Indicator	Product stage	Construction stage		Use stage	End of life stage				Module D	TOTAL
	A1-A3	*A4*	*A5*	*B1-B7*	*C1*	*C2*	*C3*	*C4*		
Hazardous waste (kg)	4,25E-05	3,56E-06	1,53E-06	0	Not relevant	3,27E-07	Not relevant	0	MND	**4,79E-05**
Non-hazardous waste (kg)	5,17E-01	3,89E-01	1,11E-01	0	Not relevant	2,68E-02	Not relevant	0	MND	**1,04E+00**
Radioactive waste (kg)	1,75E-04	4,56E-05	9,21E-06	0	Not relevant	3,80E-06	Not relevant	0	MND	**2,33E-04**
Components for reuse (kg)	0	0	0	0	0	0	0	0	MND	**0**
Materials for recycling (kg)	0	0	1,80E-02	0	0	0	4,50E+00	0	MND	**4,52E+00**
Materials for energy recovery (kg)	0	0	0	0	0	0	0	0	MND	**0**
Exported energy (MJ)	0	0	0	0	0	0	0	0	MND	**0**

Table 10. Other indicators describing waste categories of the life cycle of 1m^2 of Graphenstone® NaturMortar Fine.