EPD – Environmental Product Declaration

2202 MATRIX REVESTIMENTO FACHADA, 2203 MATRIX PROJEÇÃO, 4201 MATRIX CONTRAPISO AND 5201 MÚLTIPLO USO BY VOTORANTIM CIMENTOS - CAMAÇARI UNIT

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MORTAR

2202 MATRIX REVESTIMENTO FACHADA, 2203 MATRIX PROJEÇÃO, 4201 MATRIX CONTRAPISO AND 5201 MÚLTIPLO USO (CAMAÇARI UNIT)

1. COMPANY

Votorantim Cimentos is the market leader in cement in Brazil and the sixth largest global producer in terms of installed capacity, according to the Global Cement Report 2013 data. The company is part of the Votorantim Group and is present in 11 countries through the South America, North America, Europe, Asia and Africa. It is a large industry that produces cement, concrete, aggregates and complementary products such as mortar and lime.

Sustainability is an important pillar of Votorantim Cimentos strategy, Safety comes first, always.

The company promotes eco-efficiency by seeking to develop new products and innovative processes and ensure the open dialogue and relationships with our communities to perpetuate Votorantim Cimentos' legacy and support local development.

2. PRODUCT

This EPD covers 4 different mortars produced in Camaçari Unit.

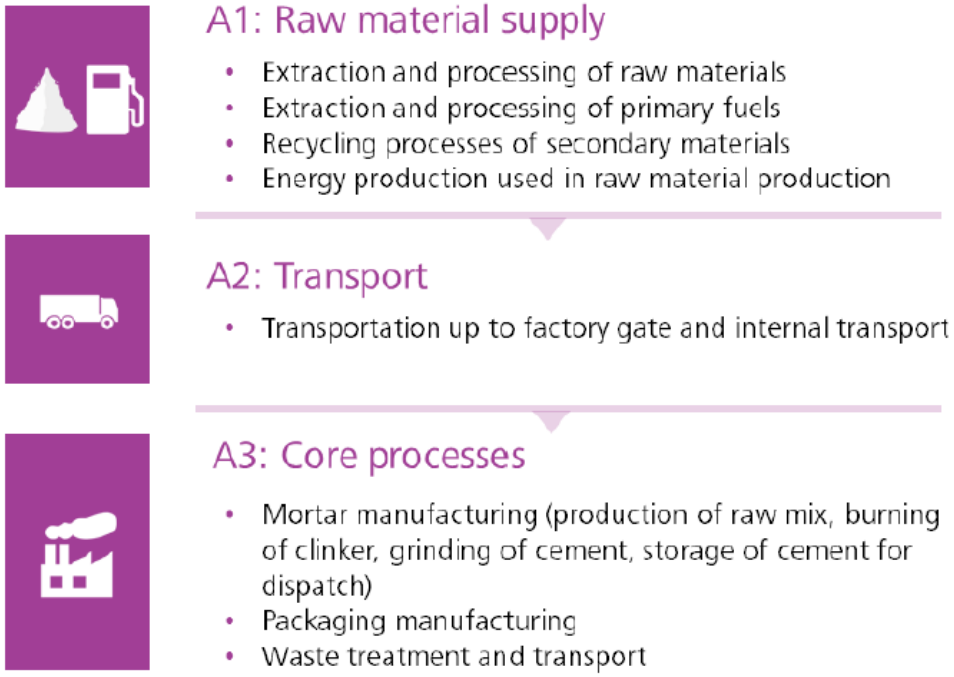
The mortar 2202 Matrix Revestimento Fachada, high workability and high adhesion. It is used for facade coating and indicated for wall coating in external areas, Mortar 2203 Matrix Massa de Projeção, for covering masonry walls indoors and outdoors with application through projection equipment, mortar 4201 Matrix Contrapiso, for regularization of floors and slabs in indoor and outdoor areas and Matrix 5201 Múltiplo Uso, for covering masonry walls, indoors and outdoors, and laying sealing masonry blocks.

2.1. FUNCTIONAL UNIT AND STUDIED SYSTEM

The life cycle assessment is based on the GCCA Tool for EPD of concrete and cement (v2.0), dated 13/09/2019 (thereafter referred to as "the tool"), verified as compliant in accordance with the PCRs (PCR 2012:01 Construction products and Construction services v.2.3, PCR 2012:01-SUB-PCR-G concrete and concrete elements (EN 16757:2017), PCR 2012:01-SUB-PCR-H cement and building lime (EN 16908:2017) and the General Programme Instructions (GPI 2.5) for the International EPD® System. This tool may be accessed at the following address: https://concrete-epd-tool.org/. Following the amendment of the tool (GCCA EPD Tool), the tool is extended to the EPDs of plaster (CPC 3741). CEN standard EN 15804 serves as the Core Product Category Rules (PCR).

The functional unit is 1 metric tonne of mortar, defined in accordance with the tool. The Reference Service Life (RSL) is not specified.

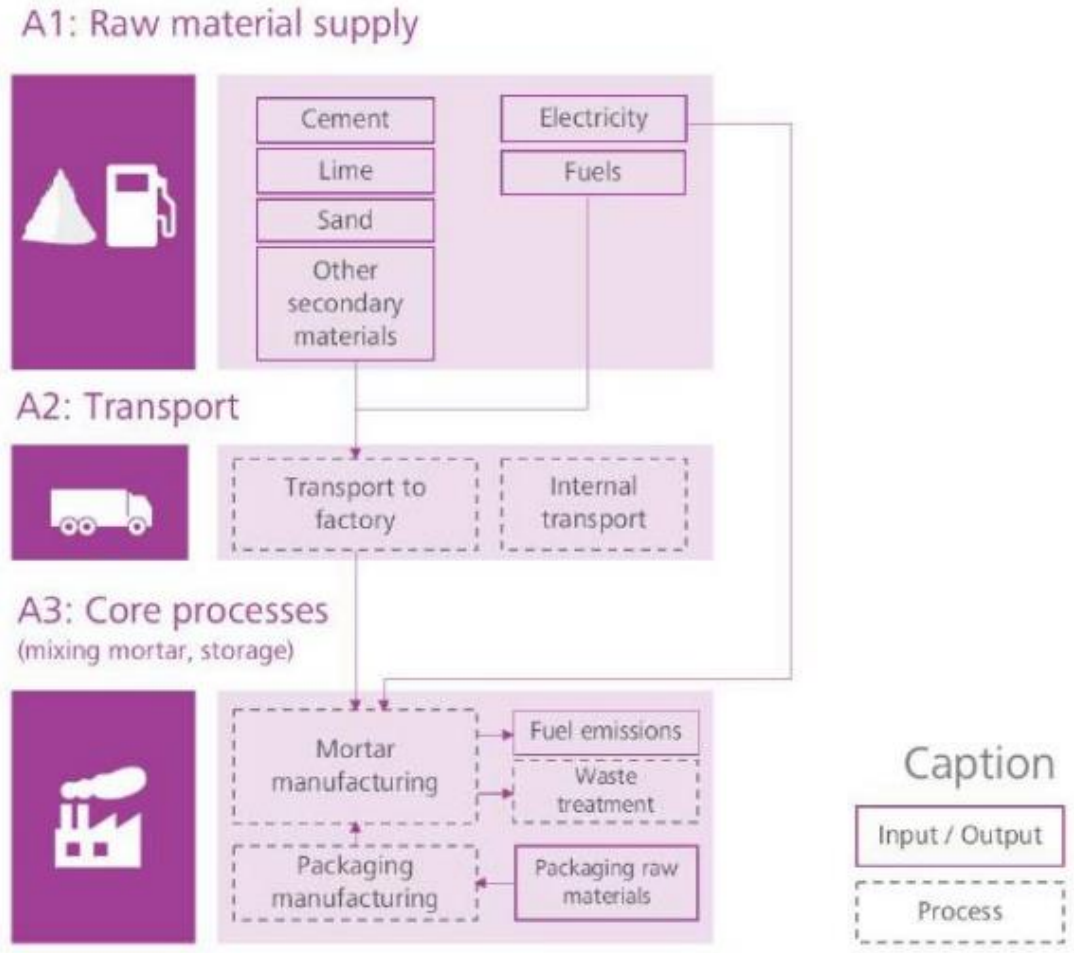
The following figure shows the studied system, split between 3 categories: A1 raw material supply, A2 transport and A3 core processes.



2.2. LIFE CYCLE STAGES

SYSTEM BOUNDARIES

The system boundaries are presented in the following figure and represent a cradle-to-gate approach.



FLOW DIAGRAM

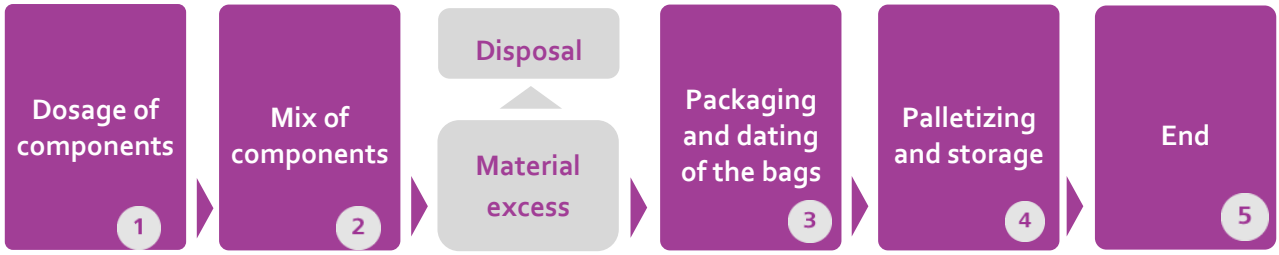
Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw materials	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

*MND – Module Not Declared

UPSTREAM PROCESSES: RAW MATERIAL ACQUISITION AND REFINEMENT

The raw material acquisition is made by the transport of materials to the industry.

CORE PROCESS: MORTAR PRODUCTION



Dosage of components 1

In this phase the percentage of the components is established according with the type of mortar to be produced. The dosage is done automatically.

Mix components 2

The machine mixes the raw materials, forming a perfectly homogeneous and high quality mortar.

Pack and date the bags 3

The packers controlled by computers put the mortar in bags of 20 kg or 50 kg (In this case). Then, the bags follow to an automatic palletizer.

Palletizing and Store in the inventory according with the mortar type 4

The bags are palletized and stored in silos.

2.3. DATA COLLECTION

All the data related with clinker and cement used to produce the mortars, as well the mortar production data are direct data from Votorantim Cimentos operation, extracted from SAP software and aggregated to determine the inputs and outputs used for the EPD calculation.

3. CONTENT DECLARATION

COMPONENT	CAS NUMBER	CONCENTRATION RANGE
Portland Cement	65997-15-1	5 - 25
Silica sand	14808-60-7	10 - 30
Sand calcium carbonate	471-34-1	40 - 65

The products does not contain any SVHC - Substances of Very High Concern, listed by European Chemicals Agency.

4. ENVIRONMENTAL PERFORMANCE-RELATED INFORMATION

The cradle-to-gate life cycle stages are broken down into 3 life cycle stages using terminology from EN 15804:

- A1: raw material extraction and processing, processing of secondary material input
- A2: transport to the manufacturer
- A3: manufacturing, including impacts from direct energy generation and waste disposal

These environmental performance-related information is representative of mortar production in 2018 calculated with the GCCA Tool for concrete and cement EPDs. Additional information on the impact calculation are available in the tool documentation (GCCA EPD Tool).
In agreement with the PCR, the environmental impact indicators are calculated using characterisation factors from the latest CML baseline indicators from the Institute of Environmental Sciences, Faculty of Science, University of Leiden, Netherlands (CML 2001 v4.21).

4.1. USE OF RESOURCES

MATRIX REVESTIMENTO FACHADA - CAMAÇARI UNIT		UNIT
RESOURCE USE	TOTAL (A1-A3)	
Renewable primary energy used as energy resource	305	MJ
Renewable primary energy used as raw materials	0.00	MJ
Total renewable primary energy	305	MJ
Non-renewable primary energy used as energy resource	1,357	MJ
Non-renewable primary energy used as raw materials	0.00	MJ
Total non-renewable primary energy	1,357	MJ
Secondary material	42.73	kg
Renewable secondary fuels	7.54	MJ
Non-renewable secondary fuels	21.23	MJ
Net fresh water	4.00	m^3

MATRIX PROJEÇÃO - CAMAÇARI UNIT		UNIT
RESOURCE USE	TOTAL (A1-A3)	
Renewable primary energy used as energy resource	306	MJ
Renewable primary energy used as raw materials	0.00	MJ
Total renewable primary energy	306	MJ
Non-renewable primary energy used as energy resource	1,387	MJ
Non-renewable primary energy used as raw materials	0.00	MJ
Total non-renewable primary energy	1,387	MJ
Secondary material	44.73	kg
Renewable secondary fuels	7.54	MJ
Non-renewable secondary fuels	21.23	MJ
Net fresh water	4.06	m^3

MATRIX CONTRAPISO - CAMAÇARI UNIT		UNIT
RESOURCE USE	TOTAL (A1-A3)	
Renewable primary energy used as energy resource	299	MJ
Renewable primary energy used as raw materials	0.00	MJ
Total renewable primary energy	299	MJ
Non-renewable primary energy used as energy resource	1,074	MJ
Non-renewable primary energy used as raw materials	0.00	MJ
Total non-renewable primary energy	1,074	MJ
Secondary material	6.73	kg
Renewable secondary fuels	7.54	MJ
Non-renewable secondary fuels	21.23	MJ
Net fresh water	3.73	m^3

MATRIX MÚLTIPLO USO - CAMAÇARI UNIT		UNIT
RESOURCE USE	TOTAL (A1-A3)	
Renewable primary energy used as energy resource	299	MJ
Renewable primary energy used as raw materials	0.00	MJ
Total renewable primary energy	299	MJ
Non-renewable primary energy used as energy resource	1,302	MJ
Non-renewable primary energy used as raw materials	0.00	MJ
Total non-renewable primary energy	1,302	MJ
Secondary material	37.28	kg
Renewable secondary fuels	7.04	MJ
Non-renewable secondary fuels	19.82	MJ
Net fresh water	3.94	m^3

4.2. POTENTIAL ENVIRONMENTAL IMPACTS

MATRIX REVESTIMENTO FACHADA - CAMAÇARI UNIT		**UNIT**
ENVIRONMENTAL IMPACTS	**TOTAL (A1-A3)**	
Global warming potential, GWP (100 years)	204	kg CO_2-eq.
Depletion potential of the stratospheric ozone layer, ODP	1.29E-05	kg CFC 11-eq.
Acidification potential of soil and water, AP	1.05	kg SO_2-eq.
Eutrophication potential, EP	0.18	kg PO_4^{3-}-eq.
Formation potential of tropospheric ozone, POCP	0.045	kg C_2H_4-eq
Abiotic depletion potential for non-fossil resources, ADP-elements	4.27E-04	kg Sb-eq.
Abiotic depletion potential for fossil resources, ADP-fossil fuels	1,312	MJ

MATRIX PROJEÇÃO - CAMAÇARI UNIT		UNIT
ENVIRONMENTAL IMPACTS	TOTAL (A1-A3)	
Global warming potential, GWP (100 years)	206	kg CO_2-eq.
Depletion potential of the stratospheric ozone layer, ODP	1.32E-05	kg CFC 11-eq.
Acidification potential of soil and water, AP	1.06	kg SO_2-eq.
Eutrophication potential, EP	0.18	kg PO_4^{3-}-eq.
Formation potential of tropospheric ozone, POCP	0.045	kg C_2H_4-eq
Abiotic depletion potential for non-fossil resources, ADP-elements	4.31E-04	kg Sb-eq.
Abiotic depletion potential for fossil resources, ADP-fossil fuels	1,341	MJ

MATRIX CONTRAPISO - CAMAÇARI UNIT		UNIT
ENVIRONMENTAL IMPACTS	TOTAL (A1-A3)	
Global warming potential, GWP (100 years)	187	kg CO_2-eq.
Depletion potential of the stratospheric ozone layer, ODP	9.74E-06	kg CFC 11-eq.
Acidification potential of soil and water, AP	0.99	kg SO_2-eq.
Eutrophication potential, EP	0.17	kg PO_4^{3-}-eq.
Formation potential of tropospheric ozone, POCP	0.042	kg C_2H_4-eq
Abiotic depletion potential for non-fossil resources, ADP-elements	3.76E-04	kg Sb-eq.
Abiotic depletion potential for fossil resources, ADP-fossil fuels	1,033	MJ

MATRIX MÚLTIPLO USO - CAMAÇARI UNIT		UNIT
ENVIRONMENTAL IMPACTS	TOTAL (A1-A3)	
Global warming potential, GWP (100 years)	194	kg CO_2-eq.
Depletion potential of the stratospheric ozone layer, ODP	1.23E-05	kg CFC 11-eq.
Acidification potential of soil and water, AP	1.01	kg SO_2-eq.
Eutrophication potential, EP	0.18	kg PO_4^{3-}-eq.
Formation potential of tropospheric ozone, POCP	0.043	kg C_2H_4-eq
Abiotic depletion potential for non-fossil resources, ADP-elements	4.16E-04	kg Sb-eq.
Abiotic depletion potential for fossil resources, ADP-fossil fuels	1,258	MJ

4.3. WASTE PRODUCTION

MATRIX REVESTIMENTO FACHADA - CAMAÇARI UNIT		UNIT
Waste*	TOTAL (A1-A3)	
Hazardous waste disposed	0.00	kg
Non-hazardous waste disposed	36.27	kg
Radioactive waste disposed	0.00	kg

MATRIX PROJEÇÃO - CAMAÇARI UNIT		UNIT
Waste*	TOTAL (A1-A3)	
Hazardous waste disposed	0.00	kg
Non-hazardous waste disposed	36.27	kg
Radioactive waste disposed	0.00	kg

MATRIX CONTRAPISO - CAMAÇARI UNIT		UNIT
Waste*	TOTAL (A1-A3)	
Hazardous waste disposed	0.00	kg
Non-hazardous waste disposed	36.27	kg
Radioactive waste disposed	0.00	kg

MATRIX MÚLTIPLO USO - CAMAÇARI UNIT		UNIT
Waste*	TOTAL (A1-A3)	
Hazardous waste disposed	0.00	kg
Non-hazardous waste disposed	33.98	kg
Radioactive waste disposed	0.00	kg

*The contribution of activities upstream of the clinker manufacturing are not included in the results.

4.4. OTHER ENVIRONMENTAL INDICATORS

MATRIX REVESTIMENTO FACHADA - CAMAÇARI UNIT		UNIT
Output flows	**TOTAL (A1-A3)**	
Components for re-use	0.00	kg
Materials for recycling	0.01	kg
Materials for energy recovery	0.00	kg
Exported energy	0.00	MJ

MATRIX PROJEÇÃO - CAMAÇARI UNIT		UNIT
Output flows	**TOTAL (A1-A3)**	
Components for re-use	0.00	kg
Materials for recycling	0.01	kg
Materials for energy recovery	0.00	kg
Exported energy	0.00	MJ

MATRIX CONTRAPISO - CAMAÇARI UNIT		UNIT
Output flows	**TOTAL (A1-A3)**	
Components for re-use	0.00	kg
Materials for recycling	0.01	kg
Materials for energy recovery	0.00	kg
Exported energy	0.00	MJ

MATRIX MÚLTIPLO USO - CAMAÇARI UNIT		UNIT
Output flows	**TOTAL (A1-A3)**	
Components for re-use	0.00	kg
Materials for recycling	0.01	kg
Materials for energy recovery	0.00	kg
Exported energy	0.00	MJ

4.5. ADDITIONAL INFORMATION

The production of 2202, 2203, 4201 and 5201 Matrix mortars is in line with Votorantim Cimentos vision, which includes Customer Focus, Empowered People, Best in Class Operations and Sustainable Practices. We believe that cement production must use clean technologies that constantly improve natural resource allocation, reduce emissions and waste. The company invests in R&D to develop new technologies and improve existing ones to promote eco-efficiency in its processes and products. Moreover, we are committed to protecting water sources and biodiversity, through the management of protected areas in the boundaries of our units.

5. PROGRAMME-RELATED INFORMATION

PROGRAMME:	THE INTERNATIONAL EPD® SYSTEM EPD INTERNATIONAL AB BOX 210 60 SE-100 31 STOCKHOLM SWEDEN WWW.ENVIRONDEC.COM
EPD registration number:	S-P-01121
Published:	02-12-2019
Valid until:	02-12-2024
Product Category Rules:	PCR 2012:01 Construction products and Construction services, Version 2.3
Product group classification:	UN CPC 3741 PLASTER
Reference year for data:	2018
Geographical scope:	Brazil

PRODUCT CATEGORY RULES (PCR):
PCR 2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES, VERSION 2.3

PCR review was conducted by:
The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com.

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

☐ EPD Process Certification (internal) ☒ EPD Verification (external)

Third party verifier: Maurizio Fieschi, fieschi@studiofieschi.it, www.studiofieschi.it
Approved by: The International EPD® System

5.1. MANDATORY STATEMENTS

Environmental Product Declaration in accordance with ISO 14025 and EN 15804.
EPD of construction products may not be comparable if they do not comply with EN 15804.
EPDs within the same product category but from different programmes may not be comparable.

5.2. CONTACT INFORMATION

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6. REFERENCES

General Programme Instructions of the International EPD® System. Version 2.5.
PCR 2012:01 Construction products and Construction services, Version 2.3
GCCA Tool for EPD of concrete and cement (v2.0): LCA core model and database report v2.0/CML v4.7
Amendment: Plasters, lime and cement clinker products
VOTORANTIM CIMENTOS. Integrated Report 2018. Published in May 2019. São Paulo.

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