ENVIRONMENTAL PRODUCT DECLARATION

B-EPD .BE

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prefer

SIMPLY CONCRETE

Prefer

Carbstone Full

Sizes : 39/09/19, 39/14/19 , 39/19/19

ISSUED 3.04.2026
VALID UNTIL 3.04.2031

THIRD PARTY VERIFIED
in accordance with EN 15804+A2
and B-EPD PCR version 18.10.2022

FUNCTIONAL UNIT AND MODULES DECLARED

1 m² of load-bearing or non-bearing wall constructed with Full Carbstone blocks (39 × 14 × 19 cm), providing the intended structural function and performance over a reference service life of 100 years.

Cradle to grave

A1-A3	A4	A5	B1-B7	C1-C4	D
•	•	•	•	•	•

ENVIRONMENTAL PRODUCT DECLARATION

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings. This EPD is only valid when registered on www.b-epd.be. The FPS Public Health cannot be held responsible for the information provided by the owner of the EPD.

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1 PRODUCT DESCRIPTION

1.1 Product name

Carbstone Full block.
The reference block is BC14FULL -(39 × 14 × 19 cm).

1.2 Product description and intended use

Carbstone blocks composed of steel industry slags which is calcium-rich material.

The blocks are used as application in interior or exterior wall (constructive or non-constructive) for buildings.

A distinctive feature of Carbstone is that they absorb CO_2 through the carbonation process. This occurs because Carbstone use steel slag as an ingredient, which is a calcium-rich material. The calcium reacts with water and CO_2 to form calcium carbonate, a strong binder. As a result, the Carbstone uses CO_2 as a binding agent instead of cement. The building material has similar characteristics to a conventional concrete block; the difference lies in the permanent fixation of CO_2.

More information can be found on :
https://www.prefer.be
https://www.carbstone.be

1.3 Reference flow / Functional unit

The functional unit is 1 m² of wall constructed with Full Carbstone blocks (39 × 14 × 19 cm), providing the intended structural function and performance over a reference service life of 100 years. 1m ^{2} of walls correspond to 310,91 kg of blocks.

The results of the remaining sizes can be calculated by multiplying the results of size 39/14/19. with the conversion factors mentioned in section 13.

All the sizes of Carbstone blocks:

- BC09Full (l/w/h)– 39/09/19
- BC14Full (l/w/h)– 39/14/19
- BC19Full (l/w/h)– 39/19/19

Functional unit includes a specific glue to fix the blocks together.

Packaging is included in the declaration.

This EPD is a specific EPD from a single company.

1.4 Installation

Materials for fixing and installation are included. This EPD includes the impacts of all processes, fixing materials, jointing material or treatments necessary for installing/mounting the product according to following scenario.

- The installation of the blocks carried out manually.
- The blocks are fixed on site using glue (including packaging).
- Installation losses are accounted for 3% for the Carbstone
- Installation losses for the glue are accounted for 15%.

Detailed information on this scenario can be found in Chapter “10. Details of the underlying scenarios used to calculate the impacts".

1.5 Composition and content

Components	Composition / content / ingredients	Quantity
Product	– Stinox 2/6 – Mixed sand – Biogenic CO_2 – Water	– ± 15% - 45% – ± 45% - 75% – ± 6% - 12% – ± 1%
Fixation materials	– NA	
Jointing materials	– Sand/cement based glue	– 3 kg/FU
Packaging	– PET strips – Pallet	– 0,04 kg/FU – 0,21 -0,69 kg/FU

The product does not contain materials listed in the “Candidate list of Substances of Very High Concern for authorization”.

1.6 Reference service life

The reference service life is estimated at 100 years based on SBR 2011, update 2019: 21 Buitwanden, spouwbladen, binnenblad, steenachtig, betonsteen, blokken gelijmd.
The conditions under which this RSL is valid are as following: natural aging conditions, no moisture uptake

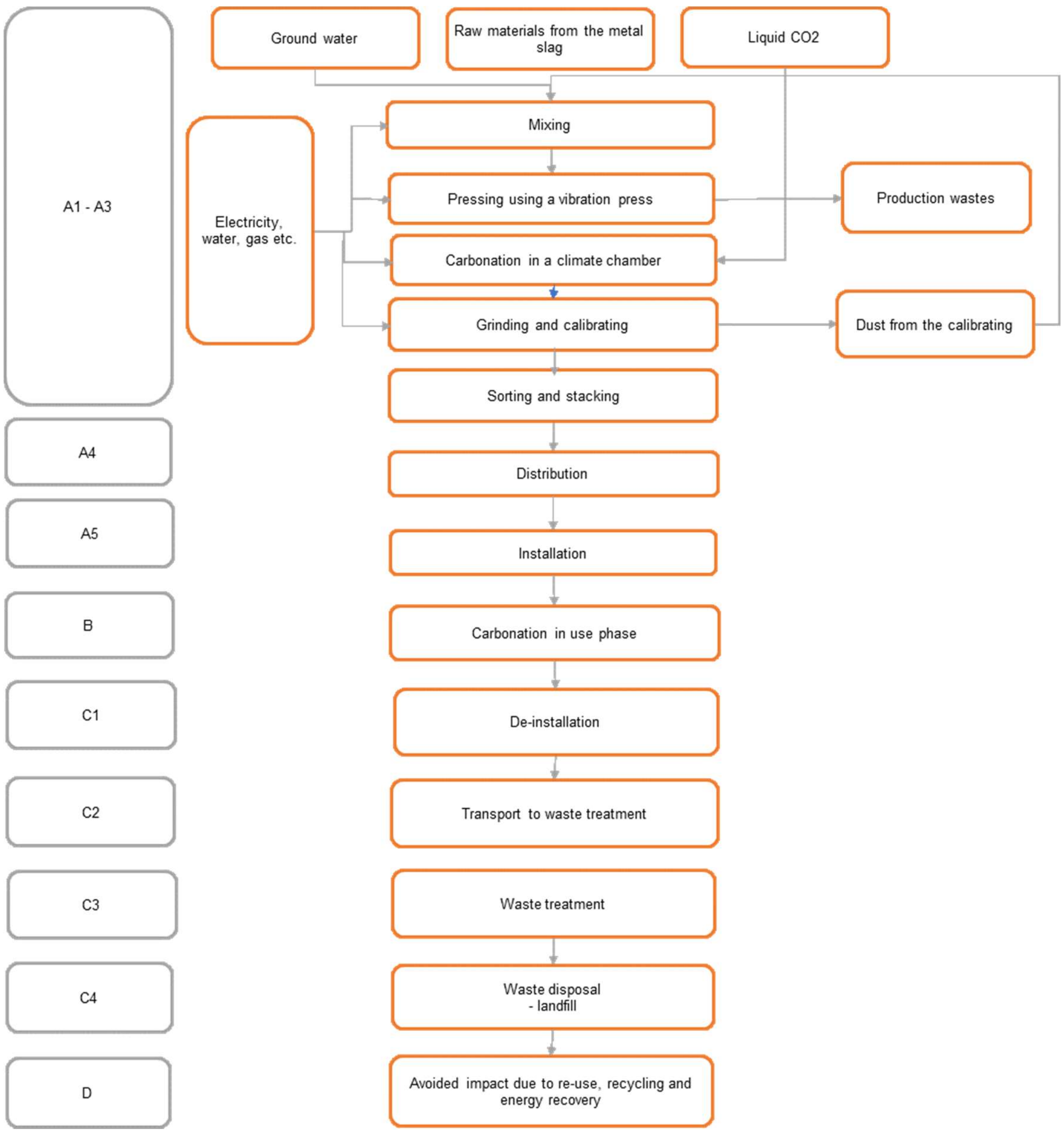
1.7 Description of geographical representativity

This B-EPD is representative of the Belgian market across all stages, including manufacturing, transportation, use, and end-of-life of the Carbstone blocks.

1.8 Description of the production process and technology

The blocks are produced in a continuous production process. First the raw materials are mixed and pressed into the blocks on a hydraulic and vibrating press. Then, the pressed blocks are placed in a climate chamber where the biogenic CO_2 is injected into the chamber for the period of 22 hours. During this period , the carbonation take place .After carbonation, the blocks sent to a stacking and packaging machine, which sorts the Carbstone blocks for storage and transportation to customers.

The diagram as displayed below shows the complete life cycle of the product, divided over the different EN 15804 modules.



2 TECHNICAL DATA / PHYSICAL CHARACTERISTICS

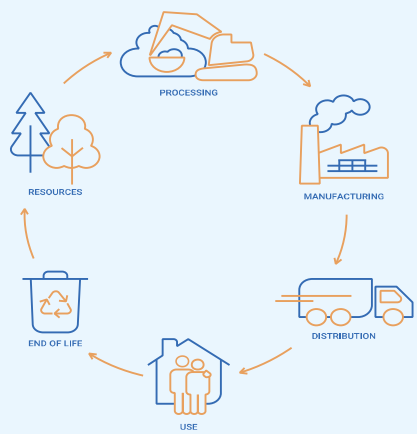
Technical property	Standard	Value	Unit	Comment
Gross volume mass	EN1991-1-2 ANB (2012)	2300	Kg/m^3	
Calculated value of thermal conductivity coefficient λ_{Ui}	EN1991-1-2 ANB (2012)	1,33	W/m.k	
Normalised compressive strength		15-20	N/mm^2	
Reaction to fire	EN1991-1-2 ANB (2012)	A1	/	
Frost/thaw resistance	NBN B15-231	Satisfied	/	

3 LCA-STUDY

3.1 Date of LCA-study

This LCA-study was finalized in March 2026.

The reference year 2025 was used for production data.



3.2 Software

For the calculation of the LCA results, the software program SimaPro 10.2 has been used.

3.3 Information on allocation

No allocation was applied in this study

3.4 Information on cut -off

Specific company data was used for modelling. It is assumed that all cut -of criteria of the EN 15804 + A2 (6.3.6) have been fulfilled. Therewith not more than 1% of renewable and non-renewable primary energy usage and 1% of the total mass input of that unit process is excluded. The total of neglected input flows per module is not more than 5% of energy usage and mass.

3.5 Information on excluded processes

Following processes were excluded from the inventory:
Capital goods and infrastructure processes, with exception of such processes that are included in the Ecoinvent background processes.

Moreover, auxiliary materials of which the impacts are estimated to be lower than 1% are excluded. Support functions as administrative departments, personal commuting are also not considered in the LCA.

3.6 Information on biogenic carbon modelling

The product contains no biogenic carbon at the factory gate.

The liquid CO_2 used in the production process is certified biogenic origin.

Although liquid biogenic CO_2 is injected during module A3, it is chemically transformed through carbonation. In accordance with EN 15804+A2, section 5.4.3, carbonation is reported under GWP-fossil. Consequently, the injected carbon is no longer considered biogenic, no permanent biogenic carbon storage is declared, and no biogenic carbon content is reported in modules A1–A3.

This confirms the physical flow: As the carbon becomes chemically bound to the calcium into calcium carbonate (CaCO3) the mineral form has to be considered from that point on. The carbon is also not released during the waste treatment at EOL. Therefor It can be considered as permanently store.

During the use phase, carbonation of the blocks continue over time due to the presence of remaining calcium hydroxide ($Ca(OH)_2$). The potential for additional carbonation is estimated by measuring the remaining hydroxides in the material, for example using thermogravimetric analysis (TGA). These hydroxides will gradually be converted into calcium carbonates over time.

The packaging uses wood.

The total biogenic carbon is reported in the table below.

.Biogenic carbon content	(kg C / FU)
Biogenic carbon content in product (at the gate)	0,00E+00
Biogenic carbon content in accompanying packaging (at the gate):	
- BC14Full	9,23E -02
- BC09Full	5,68E -02
- BC19Full	1,23E-01

3.7 Information on carbon offsetting

Carbon offsetting is not allowed in the EN 15804 + A2 and hence not taken into account in the calculations.

3.8 Additional or deviating characterization factors

EN 15804 + A2: The characterization factors from EC-JRC (version 3.1) were applied according to the guidelines provided in section 6.5 of the standard. Substances in the method may be renamed by PRé Sustainability in order to meet the naming as used in SimaPro.

The indicators as listed in section 7.2.3 of the EN 15804 + A2 are declared. No additional or deviating characterisation factors were used.

3.9 Description of the variability

The functional unit : 1m^2 is produced at one production site. The blocks have the same length and height:

- Length: 39 cm
- Height: 19 cm

The difference exists in the widths of the blocks:

- Width: 9 cm for the BC09 Full
- Width: 14 for the BC14Full
- Width 19 cm for the BC19Full.

In this EPD the Carbstone BC14Full is reported as it is the most selling product in 2025.

The amount of glue and the amount of Carbstone (in mass) differ when other sizes are used.

3.10 Specificity

The data used for the LCA are specific for this product which is manufactured at single production sites.

3.11 Period of data collection

Manufacturer specific data have been collected for the year 2025.

3.12 Information on data collection

Data is collected over the year 2025 by Prefer. The total inputs per product as well as the amount of product manufactured (measures by m^2) are documented by Prefer and used for the LCA.

3.13 Database used for background data

The Ecoinvent 3.11 database (which was the most recent version of the database at the moment of initiating the study) is used for the background data.

Where available, product specific data were used. Verified LCAs, EPDs, or production data supplied by manufacturers were used in the modelling.

3.14 Energy mix

Part of the consumed electricity is produced on site by PV panels (approximately 50%). The additionally purchased electricity is modelled based on the residual mix for Belgium (as included in Ecoinvent 3.11.).

4 PRODUCTION SITES

Manufacturing site located at Flémalle, Belgium

5 SYSTEM BOUNDARIES

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	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 = included in the EPD

☐ = module not declared

This EPD covers the cradle to grave with the following modules; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport), A5 (Assembly), B5 (Refurbishment) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary are included. Flows leaving the system are modelled up to the moment of reaching the end-of-waste status or final disposal. No co-product allocation is applied in the LCA.

6 POTENTIAL ENVIRONMENTAL IMPACTS PER REFERENCE FLOW

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	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 total (kg CO2 equiv/FU)	-2,07E+01			4,01E+00	-1,87E-01	-5,81E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,82E+00	3,52E-01	1,74E-02	-3,61E-01
GWP fossil (kg CO2 equiv/FU)	-2,09E+01			4,00E+00	-2,00E-01	-5,81E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,82E+00	3,47E-01	1,73E-02	-4,04E-01
GWP biogenic (kg CO2 equiv/FU)	2,41E-01			2,75E-03	1,26E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,25E-03	4,42E-03	3,54E-05	4,27E-02
GWP luluc (kg CO2 equiv/FU)	9,96E-03			1,33E-03	5,44E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,03E-04	5,33E-04	3,23E-06	-4,56E-04
ODP (kg CFC 11 equiv/FU)	7,07E-08			1,97E-09	6,98E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,98E-10	1,33E-09	7,14E-12	-3,56E-10
AP (mol H+ eq/FU)	4,25E-02			1,29E-02	2,80E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,85E-03	1,98E-03	1,16E-04	-2,47E-03
EP - freshwater (kg (PO4)3- equiv/FU)	2,67E-04			2,93E-05	1,33E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,33E-05	7,84E-06	9,88E-08	-6,37E-06
EP - marine (kg (PO4)3- equiv/FU)	8,94E-03			4,28E-03	7,34E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,95E-03	6,85E-04	4,92E-05	-9,65E-04
EP - terrestrial (kg (PO4)3- equiv/FU)	1,03E-01			4,71E-02	8,25E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,14E-02	7,61E-03	5,40E-04	-1,11E-02
POCP (kg Ethene equiv/FU)	3,61E-02			1,95E-02	3,15E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,87E-03	2,32E-03	2,02E-04	-3,28E-03
ADP Elements (kg Sb equiv/FU)	2,78E-04			1,35E-05	1,05E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,14E-06	5,66E-06	2,16E-08	-2,04E-06
ADP fossil fuels (MJ/FU)	9,26E+01			4,46E+00	4,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,03E+00	8,32E+00	1,75E-02	-6,00E+00
WDP (m^3 water eq deprived /FU)	4,24E+00			2,20E-01	1,72E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,00E-01	1,10E-01	1,57E-03	-3,06E+00

GWP TOTAL = TOTAL GLOBAL WARMING POTENTIAL (CLIMATE CHANGE); GWP-LULUC = GLOBAL WARMING POTENTIAL (CLIMATE CHANGE) LAND USE AND LAND USE CHANGE; ODP = OZONE DEPLETION POTENTIAL; AP = ACIDIFICATION POTENTIAL FOR SOIL AND WATER; EP = EUTROPHICATION POTENTIAL; POCP = PHOTOCHEMICAL OZONE CREATION; ADPE = ABIOTIC DEPLETION POTENTIAL – ELEMENTS; ADPF = ABIOTIC DEPLETION POTENTIAL – FOSSIL FUELS; WDP = WATER USE (WATER (USER) DEPRIVATION POTENTIAL, DEPRIVATION-WEIGHTED WATER CONSUMPTION)

7 RESOURCE USE

	Production	Construction process stage		Use stage							End-of-life stage				
	A1 Raw material / A2 Transport / A3 manufacturing	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
PERE (MJ/FU, net calorific value)	2,86E+01	9,24E-01	1,11E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,21E-01	1,54E+00	9,27E-03	-1,53E+00
PERM (MJ/FU, net calorific value)	1,68E-01	0,00E+00	2,52E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT (MJ/FU, net calorific value)	2,87E+01	9,24E-01	1,14E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,21E-01	1,54E+00	9,27E-03	-1,53E+00
PENRE (MJ/FU, net calorific value)	9,27E+01	4,47E+00	4,33E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,03E+00	8,32E+00	1,75E-02	-6,00E+00
PENRM (MJ/FU, net calorific value)	2,57E-01	0,00E+00	3,86E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT (MJ/FU, net calorific value)	9,30E+01	4,47E+00	4,36E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,03E+00	8,32E+00	1,75E-02	-6,00E+00
SM (kg/FU)	1,51E-01	0,00E+00	2,26E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF (MJ/FU, net calorific value)	3,42E-02	0,00E+00	5,13E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF (MJ/FU, net calorific value)	2,21E-02	0,00E+00	3,32E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW (m^3 water eq/FU)	1,72E+00	7,04E-03	5,45E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,20E-03	3,19E-03	5,22E-04	-2,17E+00

PERE = USE OF RENEWABLE PRIMARY ENERGY EXCLUDING RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PERM = USE OF RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PERT = TOTAL USE OF RENEWABLE PRIMARY ENERGY RESOURCES; PENRE = USE OF NON-RENEWABLE PRIMARY ENERGY EXCLUDING NON-RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PENRM = USE OF NON-RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PENRT = TOTAL USE OF NON-RENEWABLE PRIMARY ENERGY RESOURCES; SM = USE OF SECONDARY MATERIAL; RSF = USE OF RENEWABLE SECONDARY FUELS; NRSF = USE OF NON-RENEWABLE SECONDARY FUELS; FW = NET USE OF FRESH WATER

8 WASTE CATEGORIES & OUTPUT FLOWS

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	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 (kg/FU)	8,00E-04			3,87E-04	6,12E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,76E-04	3,52E-05	2,78E-06	-3,55E-05
Non-hazardous waste disposed (kg/FU)	3,73E+00			2,72E+00	4,60E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,24E+00	2,55E-02	3,14E+00	-6,29E-02
Radioactive waste disposed (kg/FU)	9,32E-04			1,67E-05	3,35E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,60E-06	1,02E-04	9,87E-08	-7,18E-05
Components for re-use (kg/FU)	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (kg/FU)	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery (kg/FU)	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy (MJ/FU)	0,00E+00			0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

9 IMPACT CATEGORIES ADDITIONAL TO EN 15804

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	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
PM (disease incidence)	5,43E-07			3,19E-07	4,95E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,45E-07	3,83E-08	2,91E-09	-7,08E-08
IRHH (kg U235 eq/FU)	1,14E+00			2,45E-02	4,33E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,12E-02	1,22E-01	1,71E-04	-8,54E-02
ETF (CTUe/FU)	4,89E+01			7,53E+00	3,64E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,42E+00	8,58E-01	2,42E-02	-7,42E-01
HTCE (CTUh/FU)	4,24E-09			6,79E-10	2,65E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,09E-10	1,16E-10	2,21E-12	-1,39E-10
HTnCE (CTUh/FU)	2,03E-07			3,54E-08	1,05E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,61E-08	5,07E-09	6,25E-11	-2,51E-09
Land Use Related impacts (dimensionless)	1,04E+02			3,36E+01	7,13E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,53E+01	6,36E+00	9,28E-01	-5,49E+00

HTCE = HUMAN TOXICITY – CANCER EFFECTS; HTNCE = HUMAN TOXICITY – NON CANCER EFFECTS; ETF = ECOTOXICITY – FRESHWATER; (POTENTIAL COMPARATIVE TOXIC UNIT)
PM = PARTICULATE MATTER (POTENTIAL INCIDENCE OF DISEASE DUE TO PM EMISSIONS);
IRHH = IONIZING RADIATION – HUMAN HEALTH EFFECTS (POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235);

9.1 Environmental impact categories explained

Global Warming Potential

The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.

It is split up in 4:

- Global Warming Potential total (GWP-total) which is the sum of GWP-fossil, GWP-biogenic and GWP-luluc
- Global Warming Potential fossil fuels (GWP-fossil) : The global warming potential related to greenhouse gas (GHG) emissions to any media originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc).
- Global Warming Potential biogenic (GWP-biogenic) : The global warming potential related to carbon emissions to air (CO_2, CO and CH_4) originating from the oxidation and/or reduction of aboveground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO_2 uptake from the atmosphere through photosynthesis during biomass growth - i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood.
- Global Warming Potential land use and land use change (GWP-luluc): The global warming potential related to carbon uptakes and emissions (CO_2, CO and CH_4) originating from carbon stock changes caused by land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).

Ozone Depletion

Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

Acidification potential

Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.

Eutrophication potential

The potential to cause over-fertilization of water and soil, which can result in increased growth of biomass and following adverse effects.

It is split up in 3:

- Eutrophication potential - freshwater: The potential to cause over-fertilization of freshwater, which can result in increased growth of biomass and following adverse effects.
- Eutrophication potential - marine: The potential to cause over-fertilization of marine water, which can result in increased growth of biomass and following adverse effects.
- Eutrophication potential - terrestrial: The potential to cause over-fertilization of soil, which can result in increased growth of biomass and following adverse effects.

Photochemical ozone creation

Chemical reactions brought about by the light energy of the sun creating photochemical smog. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.

Abiotic depletion potential for non-fossil ressources

Consumption of non-renewable resources, thereby lowering their availability for future generations. Expressed in comparison to Antimonium (Sb).

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.

Abiotic depletion potential for fossil ressources

Measure for the depletion of fossil fuels such as oil, natural gas, and coal. The stock of the fossil fuels is formed by the total amount of fossil fuels, expressed in Megajoules (MJ).

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.

Ecotoxicity for aquatic fresh water	The impacts of chemical substances on ecosystems (freshwater). 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.
Human toxicity (carcinogenic effects)	The impacts of chemical substances on human health via three parts of the environment: air, soil and water. 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.
Human toxicity (non-carcinogenic effects)	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.
Particulate matter	Accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)
Resource depletion (water)	Accounts for water use related to local scarcity of water as freshwater is a scarce resource in some regions, while in others it is not. 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.
Ionizing radiation - human health effects	This impact category deals mainly with the eventual impact on human health of low dose ionizing radiation of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.
Land use related impacts	The indicator is the “soil quality index” which is the result of an aggregation of following four aspects: – Biotic production – Erosion resistance – Mechanical filtration – Groundwater The aggregation is done based on a JRC model. The four aspects are quantified through the LANCA model for land use. 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.

10 DETAILS OF THE UNDERLYING SCENARIOS USED TO CALCULATE THE IMPACTS

10.1 A1 - raw material supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process. These are materials of Orbix, water, glue, PET strips, pallet and biogenic liquid CO_2. Primary data of the production process at Orbix has been used to model the materials.

10.2 A2 – transport to the manufacturer

The raw materials are transported to the manufacturing site. All distances were provided by Prefer.

10.3 A3 - Manufacturing

Manufacturing assumed energy consumption, liquid CO_2, and emissions as inventoried by Prefer. Impacts were calculated per m^2 of product.

10.4 A4 – transport to the building site

Prefer reported that deliveries are made to several distributor locations. The average distance to the distributors is 32 km. There is also flat rate that should be used in the absence of specific data, which is the case here. This distance from the distributor to the construction site is 35 km.

Fuel type and consumption of vehicle or vehicle type used for transport	Lorry 16-32 ton (EURO 5)
Distance	67 km
Capacity utilisation (including empty returns)	50%
Bulk density of transported products	Ecoinvent
Volume capacity utilisation factor	Ecoinvent

The following transport steps apply:

- 100% is transported over 32 km from supplier to distributors with a 16-32 ton lorry (Ecoinvent record: ‘Transport, freight, lorry 16-32 metric ton, EURO5 {RER}| transport, freight, lorry 16-32 metric ton, EURO5 | Cut-off, U’)
- 100% is transported over 35 km from distributor to construction site with a 16-32 ton lorry (Ecoinvent record: ‘Transport, freight, lorry 16-32 metric ton, EURO5 {RER}| transport, freight, lorry 16-32 metric ton, EURO5 | Cut-off, U’)

A5 – installation in the building

At the construction site, packaging materials are released. Also 3% material losses have been taken into account of the Carbstone and 15% of the glue.

Installation is manual.
At the construction site, packaging materials are released for which the end-of-life processes are considered. For the pallet it is assumed that 40 % is recycled, 40% incinerated and 20% reused. For the PET strips 100 % incineration is assumed.

Parts of the installation	quantity	Description
Material losses – Carbstone Material losses – glue	*3%* *15%*	THE QUANTITY OF MATERIAL LOST DUE TO CUTTING IT IN THE RIGHT SHAPE
Packaging – Wooden Pallet Packaging – PET straps	0,1% 0,4 %	THE PACKAGING WASTE AT THE CONSTRUCTION SITE

10.5 B – use stage (excluding potential savings)

B1 – Use: In the use phase, carbonation also takes place over the years. This is because there are still CaOH present that will eventually react withCO_2 from the ambient air, this is converted to calcium carbonates. The carbonation of the blocks in the use phase it is 1,87%.

B2 – Maintenance: The product does not require maintenance.

B3 – Repair: No repairs are needed under normal circumstances. Incidental repairs due to unforeseen circumstances are not foreseen in the LCA.

B4 – Replacement: No replacements are foreseen with normal use of the product.

B5 – Refurbishment: The product does not require refurbishment

B6 – Operational Energy Use: The product does not use energy during its use phase.

B7 – Operational Water Use: The product does not use water during its use phase.

10.6 C - End of life

The Carbstone has a similar function to concrete, therefore it was also chosen to follow this waste scenario. This means 99% recycling and 1% landfill. This differs from the concrete waste scenario prescribed by B-EPD, the OVAM prescribes (based on Article 4.3.2 Vlarema) that construction rubble must be completely separated and recycled. As it is difficult in practice to recycle all construction rubble 100%, a conservative approach of 1% landfill has been assumed.

C1: Impacts are assumed to be zero, given that energy use for de-installation is negligible.
C2: The following transport distances are considered:
From construction/demolition site to sorting plant/crusher/collection point: 30 km, from sorting plant to landfill: 50 km.
C3: Is modelled based on 99% recycling for the blocks. The adhesive follows the scenario finishing layers stuck to stony waste.
C4: Represents final disposal through landfill, with remaining 1% of the demolition waste allocated to landfill as per current practice

Type of vehicle (truck/boat/etc.)	Fuel consumption (litres/km)	Distance (km)	Capacity utilisation (%)	Density of products (kg/m3)	Assumptions
Truck 16-32 ton	0,256	30	50	Ecoinvent scenario	Ecoinvent scenario
Truck 16-32 ton	0,256	80	50	Ecoinvent scenario	Ecoinvent scenario

End-of-life modules – C3 and C4

Parameter	Value (%)
Wastes collected separately	0
Wastes collected as mixed construction waste	0
Waste for re-use	0 kg
Waste for recycling	99%
Waste for energy recovery	0 kg
Waste for final disposal	1%

10.7 D – Benefits and loads beyond the system boundaries

In Module D, benefits and load of recycling and energy recovery are assumed outside the system boundary. The blocks, including both end-of-life products and installation losses, are assumed to be largely recycled.

For material recycling, the avoided impacts from the production of a functional equivalent primary material are declared. Additionally, the burdens of processing from the point of reaching the end-of-waste status to the point of reaching the functional equivalence of the avoided primary product.

Net flows of secondary material leaving the system for recycling are calculated as per the provisions of the EN 15804 + A2. In case the net output of secondary material is negative, the impacts of a substituting primary materials are declared in module D.

Given the small amounts of packaging material (merely primary materials) no substitution of materials or energy are considered for packaging materials.

QUANTITATIVE DESCRIPTION OF THE LOADS BEYOND THE SYSTEM BOUNDARIES	-	No loads
QUANTITATIVE DESCRIPTION OF THE BENEFITS BEYOND THE SYSTEM BOUNDARIES	-	Avoided production of stone granulates is considered

11 RELEASE OF DANGEROUS SUBSTANCES TO INDOOR AIR, SOIL AND WATER DURING THE USE STAGE

11.1 Indoor air

No emissions to indoor air occur during the use-phase

11.2 Soil and water

No emissions to soil and water occur during the use-phase

12 DEMONSTRATION OF VERIFICATION

EN 15804:2012+A1:2019+A2 serves as the core PCR

Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010
Internal ☐ External ☒

Third party verifier: Vinçotte NV
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13 TECHNICAL INFORMATION FOR SCENARIO DEVELOPMENT

Carbstone blocks can be installed manually.

Sensitivity analysis for variation in width

Variation in the Climate Change total values for the blocks with different width compared to the representative was analysed, resulting in the Table below. To understand the consequences for the Climate Change total score, the following formula is used.

Y = X*Variation

Where:

X – environmental impact value obtained for the representative product
Y – interpolated value for the new board thickness

Table Sensitivity analysis for variation in width

Product group	Products	Width, cm	Variation
Full with glue	*BC09 Full*	*9*	*0,63*
	BC14Full	*14*	*1*
	BC19 Full	*19*	*1,37*

14 APPLICATION UNIT

This table gives information on the applied representative product. The table gives information on the length, width and height.

Product	Length	Width	Height
Carbstone BC14 Full	*39 cm*	*14 cm*	*19 cm*

The application unit is 1 m^2 of wall made of Cabstones.

15 ADDITIONAL INFORMATION ON REVERSIBILITY

Description	Type of fixing	Level of reversibility	Simplicity of disassembly	Speed of disassembly	Ease of handling (size and weight)	Robustness of material (material resistance to disassembly)	Comment
Stones joint together to form an internal wall	Sand/cement based glue.	Non reversible connections			Material easy to manipulate by hand, one worker should be sufficient	.	

16 BIBLIOGRAPHY

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Afval en mest verwerkingsselectiesysteem, houtafval. Bron: https://afss.emis.vito.be/afvalstroom/houtafval#group_legislation.

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Project report: LCA Prefer Carbstone, for B-EPD commissioned by Prefer Construct

Verifier

Ramses Sterckx Vinçotte NV
Date of verification: 03.03.2026
External independent verification of the declaration and data according to EN ISO 14025 and relevant PCR documents

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