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CLINKER

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CIMPOR - Indústria de Cimentos, S.A.



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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Programme operator:	Associação Plataforma para a Construção Sustentável www.clusterhabitat.pt geral@clusterhabitat.pt	 Cluster Habitat Sustentável
Address:	R. Coronel Veiga Simão Ed. CTCV Lufapo Hub 3025-307 Coimbra	
Email address:	deptecnico@clusterhabitat.pt	
Telephone number:	(+351) 912 219 974	
Website:	www.daphabitat.pt	
Logo:		

1.2. EPD owner

Name of the owner:	CIMPOR - Indústria de Cimentos, S.A.
Production sites:	Praceta Teófilo Araújo Rato, 2600 - 540 ALHANDRA Rua dos Troviscais 10, 3020 - 886 SOUSELAS Cerro da Cabeça Alta - Apartado 45, 8100 - 952 LOULÉ
Address (head office):	Rua Ramalho Ortigão n. 51, Pisos 7 e 8, 1070-229 Lisboa
Telephone number:	21 311 81 00
Email address:	dcomercial@cimpor.com
Website:	https://www.cimpor.com/
Logo:	
Information concerning the applicable management Systems:	CIMPOR is certified under NP EN ISO 14001:2015 Environmental Management Systems standard.
Specific aspects regarding production:	CAE 23510 – Cement Manufacturing
Organization's environmental policy:	Commitments undertaken by CIMPOR as part of its Corporate Environmental Policy: • Comply with environmental legislation, ensuring the adoption of best management practices and continuous improvement; • Assess the environmental impact of its activities and implement appropriate measures for their prevention and mitigation, considering the best available practices; • Improve efficiency in the use of raw materials, energy, and natural resources in general; • Develop, implement, and maintain Environmental Management Systems in all our cement plants

and grinding stations, certifying them in accordance with internationally recognized standards;

- Invest in R&D projects aimed at improving products and processes for the benefit of the environment;
- Continuously improve environmental performance by meeting and updating environmental targets, providing the necessary financial resources, and ensuring appropriate training and awareness for employees and other internal stakeholders;
- Communicate environmental commitments and performance at all levels of the company, to the public, and to other stakeholders, while maintaining an open dialogue with all.

1.3. Information concerning the EPD

Authors:	C5Lab - Sustainable Construction Materials Association	
Contact of the authors:	Edifício Central Park, Rua Central Park 6 2795-242 LINDA-A-VELHA Email: info@c5lab.pt	
Issue date:	08/06/2026	
Registration date:	04/08/2026	
Registration number:	DAP 016:2026	
Valid until:	07/06/2031	
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD for clinker produced at the Alhandra, Loulé and Souselas manufacturing plants belonging to CIMPOR - Cimentos de Portugal, SGPS, S.A.	
Type of EPD	Cradle to gate EPD (A1-A3).	
Geographical representation	Portugal	

1.4. Demonstration of verification

External independent verification, accordingly, with the standard ISO 14025:2010 and EN 15804:2012+A2:2019	
Certification Body	Verifier(s)
	
(CERTIF – Associação para a Certificação)	(Marisa Almeida Helena Gervásio)

1.5. EPD registration

Programme Operator

(Plataforma para a Construção Sustentável)

1.6. PCR (Product Category Rules) basic model

Name:	RCP de modelo base para produtos e serviços de construção
Issue date:	June 2025
Number of registrations on the database:	RCP-mb001
Version:	Version 3.1
Identification and contact of the coordinator(s):	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Dinis Silvestre jose.silvestre@ist.utl.pt
Identification and contact of the authors:	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Silvestre jds@civil.ist.utl.pt Fausto Freire Cristina Rocha Ana Paula Duarte Ana Cláudia Dias Helena Gervásio Victor Ferreira Ricardo Mateus António Baio Dias
Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016 12/08/2023 – 30/11/2023
Valid until:	01/06/2027

CEN standard EN 15804 serves as the core Product Category Rules (PCR).

1.7. C-PCR (Complementary Product Category Rules)

Name:	Cement and building lime - Environmental product declarations - Product category rules complementary to EN 15804
Issue date:	March 2022
Number of registrations on the database:	EN 16908:2017+A1:2022
Version:	2017+A1:2022
Identification and contact of the coordinator(s):	CEN/TC 51 - Cement and building limes CEN/TC 51/WG 6 - Definitions and terminology of cement
Identification and contact of the authors:	-
Composition of the Sectorial Panel:	-
Consultation period:	-
Valid until:	-

1.8. Information concerning the product/product class

Identification of the product:	Cement Clinker												
Illustration of the product:													
Brief description of the product:	Portland cement clinker is produced by sintering a carefully formulated mixture of raw materials containing CaO, SiO ₂ , Al ₂ O ₃ and Fe ₂ O ₃ , along with other minor constituents. It is one of the main constituents of Portland cement due to its hydraulic properties, which allow it to react with water (setting) to form hardened products that provide strength, durability and stability.												
Main technical characteristics of the product:	The Cement Clinker product class comprises a set of three products that are produced at the three manufacturing plants, the composition of which is listed in Table 1. As a hydraulic material, clinker is predominantly composed of calcium silicates, which together account for at least two thirds of its mass. The remainder includes phases containing aluminium and iron, as well as other compounds. The mass ratio between calcium oxide and silica must be at least 2.0 and the magnesium oxide content must not exceed 5.0%. Table 1: Composition of the 'cement clinker' product class. <table><tr><th>Composition</th><th>Value</th><th>Units</th></tr><tr><td>Tricalcium Silicate C3S</td><td>20-65</td><td rowspan="4">%</td></tr><tr><td>Dicalcium silicate C2S</td><td>10-55</td></tr><tr><td>Tricalcium aluminate C3A</td><td>0-15</td></tr><tr><td>Tetracalcium ferroaluminate C4AF</td><td>5-15</td></tr></table>	Composition	Value	Units	Tricalcium Silicate C3S	20-65	%	Dicalcium silicate C2S	10-55	Tricalcium aluminate C3A	0-15	Tetracalcium ferroaluminate C4AF	5-15
Composition	Value	Units											
Tricalcium Silicate C3S	20-65	%											
Dicalcium silicate C2S	10-55												
Tricalcium aluminate C3A	0-15												
Tetracalcium ferroaluminate C4AF	5-15												
Description of the product's application/use:	Cement clinker is the main constituent of cements produced according to EN 197-1.												
Placing on the market / Rules of application in the market / Technical rules of the product:	NP EN 197-1:2012 – Cement - Part 1: Composition, specifications, and conformity criteria for common cements.												
Quality control	CIMPOR is certified under Quality Management Systems standard, EN ISO 9001:2015, thus assuring the manufacturing quality control within the industrial plants.												
Special delivery conditions:	Cement clinker can be delivered in bulk.												
Components and substances to declare:	The product does not contain substances included in the 'Candidate List of Substances of Very High Concern (SVHCs) for authorisation' in concentrations exceeding the registration thresholds set by the European Chemicals Agency (ECHA), i.e., greater than 0.1% by weight (w/w).												
Where explanatory material may be obtained:	Clinker is an intermediate product used in cement production and is not marketed directly to the public. For detailed information on the product, please contact CIMPOR at the following email address: dcomercial@cimpor.com.												

History of the LCA studies: Not Applicable

1.9. Calculation rules of the LCA

Declared unit:	One tonne of cement clinker
System boundaries:	Cradle to Gate EPD, corresponding to the product stage (modules A1-A3). From the extraction and processing of raw materials in the quarries to the ensiling procedure.
Criteria for the exclusion:	Processes that fulfil the exclusion criteria stipulated in EN 15804 of 1% use of primary energy (renewable and non-renewable) and 1% of the inputs (in mass) of the process, not exceeding 5% of the total use of mass and energy in the product stage, A1-A3, were excluded from this EPD: - Liquid Oxygen; - Biocides; - Corrosion protectors; - Descalers; - CO₂ bottles for Inertisation; - Baghouse filters.
Assumption and limitations:	The primary data used represents the production of three products classified as 'Cement Clinker', produced at CIMPOR's three manufacturing plants. The LCA calculation was carried out for each of the three products individually, and the result of the impact assessment was consolidated by means of the weighted average, using the clinker production volume of each manufacturing plant as the weighting factor. Electricity production was calculated using information obtained directly from the regulator of energy production and electricity infrastructure in Portugal. The energy and water consumption of administrative areas, as well as the generation of wastewater and solid waste from these areas, are excluded from the system boundaries. Additionally, environmental impacts related to the construction and maintenance of infrastructure and equipment are not considered as well. As specified in EN 16908:2017+A1:2022, if waste is used for energy recovery, for reasons of transparency two values can be specified when reporting the results in the 'Global Warming Potential' impact indicator: The impacts caused by emissions including the processing, incineration and co-incineration of waste ('gross' value); and the environmental impacts caused excluding the incineration of waste ('net' value).
Quality and other characteristics about the information used in the LCA:	The quality analysis was carried out on the basis of the 'UN Environmental Global guidance on LCA database development' in accordance with the criteria stipulated in Annex E of EN 15804:2012 + A2:2019. Data quality was categorised broadly between fair and very good on a five-level qualitative scale from very poor to very good. The information on cement clinker production is less than 5 years old (reference year: 2023), using mostly primary data collected directly from industrial statistics from the three manufacturing plants, and is representative of the reality of production. The information for background processes not provided by the manufacturing plants, and over which CIMPOR has no direct influence, was obtained using generic data from the Ecoinvent 3.11 database (updated in March 2025). These were selected in order to provide geographical and technological coverage that fulfils the data quality criteria stipulated in Annex E of EN 15804:2012+A2:2019. The GHG emission from electricity was 0,169 kg CO₂ eq/kWh. The LCA was carried out using SimaPro 10.3 software and the results obtained are considered to be robust.
Allocation rules:	Since the inventory data collected relates only to the production of cement clinker, no allocation procedure is deemed necessary. The polluter pays principle was applied to waste consumed in the process and waste produced that is subject to recovery processes.
Software used for the assessment:	SimaPro 10.3 - PRé Sustainability
Background database used for the LCA:	Ecoinvent Database v3.11 – Ecoinvent
Comparability of EPD for construction products:	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15948 and according to the comparability conditions determined by ISO 14025.

1.10. Use of the average environmental performance

The 'Cement Clinker' product class is produced by CIMPOR at the Alhandra, Loulé and Souselas manufacturing plants and is used as an intermediate product in the manufacture of cement. Its production method is the same (dry method), varying only in the mixing ratio of raw materials, the consumption of energy, water and auxiliary materials, among other minor parameters.

Although these factors may vary between manufacturing plants, the environmental impact indicators for CIMPOR cement clinkers are in a sufficiently close range to justify the application of a representative EPD for the intended use. In other words, they provide the basis for the environmental assessment of clinker and cement production by CIMPOR.

The average variation from the declared value (for the core environmental impact indicators) is around 9.7% per cent. Higher variability is observed in the category's eutrophication potential aquatic freshwater (15.4 %) and eutrophication potential aquatic marine (16.4 %). There are also occasions with greater differences, although these occur in optional impact categories or secondary indicators.

In addition, the clinker manufacturing life cycle inventory was calculated individually for each manufacturing plant, instead of using an average of the inputs and outputs of the unit processes, thus ensuring greater robustness of the life cycle assessment model. Subsequently, the results of the impact assessment were consolidated by means of a weighted average, using the clinker production volume in each of the three manufacturing plants as a weighting factor.

1.11. Technical information for Reference Service Life (RSL)

Not Applicable.

1.12. Flow diagram of input and output of the process

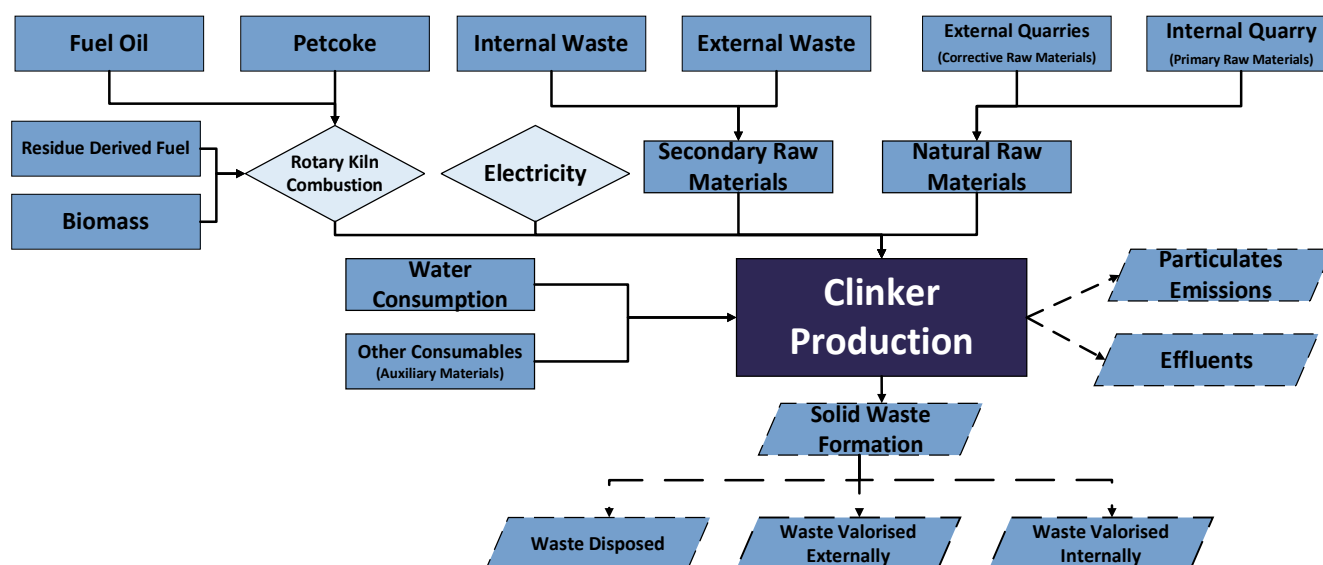


Figure 1: Simplified flowchart for cement clinker production inventory.

2. CORE ENVIRONMENTAL IMPACT INDICATORS

2.1. Description of the system boundaries

(✓ = included; ND = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction 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
✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: Electricity consumption represents 15% or less of total energy consumption in phases A1-A3. Therefore, it is not necessary to assess the total GWP of electricity used in primary processes.

The boundaries of the system are delimited for the Product Stage, covering modules A1-A3. All the clinker produced in the three manufacturing plants is produced using a variant of the dry production method, as described in the following points:

Extraction and Preparation of Natural Raw Materials in the Quarry

Clinker production begins in the quarries, where the main natural raw materials (limestone and marl) are extracted. Located on the perimeters of the manufacturing plants, the quarries are open-cast and blasted using explosives. After the blasting phase, the raw material is in the form of blocks up to 1 m³ in size, which need to be transported to a crusher in order to reduce their particle size. Once a reasonable particle size has been achieved, the raw material is stored in pre-homogenisation facilities.

Raw Meal Milling

In a mill, natural raw materials are subjected to a milling process together with secondary raw materials (such as pyrite ash) and corrective raw materials (e.g. sand), in predetermined doses according to the quality of the desired end product. The result is 'raw meal', a fine-grained mixture with controlled proportions of raw materials.

At the same time, during the raw meal milling process, the raw material is dried using the heat energy contained in the rotary kiln exhaust gases. After milling, the raw meal is stored in silos. Secondary and/or corrective raw materials are transported to the industrial unit, predominantly by road, from external quarries, raw material suppliers or as waste from other sectors.

Sintering

The raw meal is then extracted from the silos and placed in a system of cyclone towers to be preheated raw meal is then introduced into the rotary kiln, moving along it by the action of rotation and gravity promoted by its slight inclination. Inside, temperatures reach 1450°C and various physical-chemical reactions take place, resulting in the production of clinker, an artificial rock with hydraulic properties. The fossil and alternative fuels used in the rotary kiln are transported to the manufacturing plants, mainly by road, from fuel suppliers or as waste from other sectors.

Cooling and Storage of Clinker

Finally, the material is submitted to a system of coolers, where the thermal energy can be partially recovered by reintroducing the cooling air as secondary combustion air, and then stored in silos in order to proceed to the next stage of the cement production chain.

2.1.1. Justification for the exemption to declare modules C and D

Cement clinker is an intermediate product that is physically integrated with other products during the cement production phase (e.g. gypsum, limestone), producing a fine, homogeneous mixture called cement.

It is not possible to separate it from the other components at the end of its life, and there is no biogenic carbon in the product. In accordance with standard EN 15804:2012+A2: 2019, the product is exempt from declaring modules C1, C2, C3, C4 and D, with only modules A1-A3 being declared, corresponding to the product stage.

2.2. Core environmental impact indicators

	Global warming potential – total ¹ ;	Global warming potential fossil;	Global warming potential - biogenic;	Global warming potential land use and land use change;	Depletion potential of the stratospheric ozone layer;	Acidification potential;
	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP
Unit	kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CFC 11 eq.	mol H ⁺ eq.
Modules A1-A3	8.94E+02	8.93E+02	1.85E-01	5.55E-01	5.45E-06	4.12E-01

LEGEND:

 Product stage

¹Net Figure – Global warming potential – Total: 8.24E+02 kg CO₂ eq.

	Eutrophication potential aquatic freshwater;	Eutrophication potential aquatic marine;	Eutrophication potential terrestrial;	Formation potential of tropospheric ozone;	Abiotic depletion potential for non-fossil resources;	Abiotic depletion potential for fossil resources potential;	Water (user) deprivation potential;
	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals&metals	ADP-fossil	WDP
Unit	Unit	kg N eq.	mol N eq.	Kg CO ₂ eq.	kg Sb eq.	MJ, P.C.I	m ³ World eq. deprived
Modules A1-A3	4.23E-03	4.35E-01	1.46E+00	1.81E+00	1.28E-04	3.25E+03	2.72E+01

LEGEND:

 Product stage

2.3. Additional environmental impact indicators

	Potential incidence of disease due to PM emissions	Potential Human exposure efficiency relative to U235	Potential Comparative Toxic Unit for ecosystems	Potential Comparative Toxic Unit for humans, cancer effects	Potential Comparative Toxic Unit for humans, not cancer effects	Potential soil quality index
	PM	IRP	ETP-fw	HTP-c	HTP-nc	SQP
Unit	Disease Incidence	kBq U 235 eq.	CTUe	CTUh	CTUh	-
Modules A1-A3	9.64E-06	5.34E+00	2.47E+02	1.44E-08	4.13E-07	1.01E+03

LEGEND:

 Product stage

2.4. Indicators describing resource use

	Primary energy					
	EPR	RR	TRR	EPNR	RNR	TRNR
Unit	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.
Modules A1-A3	2.64E+02	0.00E+00	2.64E+02	3.25E+03	0.00E+00	3.25E+03

LEGEND:

 Product stage

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials; RR = use of renewable primary energy resources used as raw materials; TRR = total use of renewable primary energy resources (EPR + RR); EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; RNR = use of non-renewable primary energy resources used as raw materials; TRNR = total use of non-renewable primary energy resources (EPNR + RNR);

	Secondary materials and fuels, and use of water			
	MS	CSR	CSNR	Net use of fresh water
Unit	kg	MJ, P.C.I.	MJ, P.C.I.	m ³
Modules A1-A3	5.71E-02	1.81E+02	1.19E+03	7.27E-01

LEGEND:

 Product stage

MS = use of secondary material; CSR = use of renewable secondary fuels; CSNR = use of non-renewable secondary fuels.

2.5. Other environmental information describing different waste categories

	Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Unit	kg	kg	kg
Modules A1-A3	9.90E-02	3.22E+01	1.26E-03

LEGEND:

 Product stage

2.6. Environmental information describing output flows

	Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
Unit	kg	kg	kg	MJ
Modules A1-A3	0.00E+00	1.78E+00	0.00E+00	0.00E+00
LEGEND:  Product stage				

2.7. Information describing the biogenic carbon content at the factory gate

Biogenic carbon content*	Units**	Modules A1-A3 (results)
Biogenic carbon content in product	Kg C	Not Applicable
Biogenic carbon content in accompanying packaging	Kg C	Not Applicable
* 1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂ .		

3. REFERENCES

- ✓ Instruções Gerais do Sistema DAPHabitat, Versão 3.1, june 2025 (em www.daphabitat.pt);
- ✓ RCP – modelo base para produtos e serviços de construção. Sistema DAPHabitat. Versão 3.1, june 2025 (em www.daphabitat.pt);
- ✓ NP ISO 14025:2009 Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos;
- ✓ EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;
- ✓ EN 15942:2021 Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ Technical Committee CEN/TC 51 and Technical Committee CEN/TC 51/WG6, “EN 16908:2017+A1:2022 - Cement and building lime - Environmental product declarations - Product category rules complementary to EN 15804,” Belgium, 2022
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