ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

Autoclaved Aerated Concrete

Manufactured by Nuh Yapı Ürünleri A.Ş.

"EPD of multiple products, based on the representative product, density ranges from 350 kg/m³ to 450 kg/m³ with representative density of 380 kg/m³"

Programme: The International EPD System
www.environdec.com
Programme Operator: EPD International AB
Licensee: EPD Türkiye
EPD Registration Number: EPD-IES-0022604
Version Date: 2025-08-18
Validity Date: 2030-08-17
Type of EPD: EPD of multiple products from a company

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com

Programme Information

The International EPD System: EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden, support@environdec.com

EPD Türkiye: NEF O9 B Blok No:7/15, 34415 Kağıthane/İstanbul, Türkiye
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CEN standard EN 15804 serve as the core Product Category Rules (PCR)

PCR 2019:14 Construction products, version 2.0.1., Construction EN 15804:2012+A2:2019/AC:2021 Sustainability of Construction Works , UN CPC code is 3755: Prefabricated structural components for building or civil engineering, of cement, concrete or artificial stone

PCR review was conducted by: The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@environdec.com. Review Chair: Review Chair: Rob Roewette, Noa Meron.

Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review.

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

x Individual EPD verification without a pre-verified LCA/EPD tool

Third party verifier: Stephen Forson ViridisPride

Approved by: The International EPD System

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No **X**

Nuh Yapı Ürünleri A.Ş. has the sole ownership, liability, and responsibility for this EPD.

Life Cycle Assessment (LCA) accountability: Furkan Can Akalın & Yıldıray Yılmaz - Metsims Sustainability Consulting
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EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

The EPD owner has the sole ownership, liability, and responsibility for this EPD.

How to Read This EPD?

An Environmental Product Declaration (EPD) is an ISO Type III Environmental Declaration based on ISO 14025 standard. An EPD transparently reports the environmental performance of products or services from a lifecycle perspective. The preparation of an EPD includes different stages, from acquiring raw materials to the end of life of the final product/service. EPDs are based on international standards and consider the entire value chain. Additionally, EPD is a third-party verified document. This EPD includes the following sections described below.

1. General and Program Information

The first part of an EPD has information about the name of the manufacturer and product/service and other general information such as the validity and expiration dates of the document, the name of the program operator, geographical scope, etc. The second page states the standards followed and gives information about the program operator, third-party verifier, etc. The followed Product Category Rule (PCR) is indicated on the second page.

2. Company and Product/Service Information

Information about the company and the investigated product is given in this section. It summarizes the characteristics of the product provided by the manufacturer. It also includes information about the product such as product composition and packaging.

3. LCA Information

Life Cycle Analysis (LCA) information is one of the most important parts of the EPD as it describes the functional/declared unit, time representativeness of the study, database(s) and LCA software, along with system boundaries. The table presented in this part has columns for each stage in the life cycle. The considered stages are marked 'X' whereas the ones that are not considered are labeled as 'ND' (Not Declared). Not all EPDs consider the full life cycle assessment for a product's entire life stages. The 'System Boundary' page is also the place where one can find detailed information about the stages and the assumptions made.

4. LCA Results

The results of the LCA analysis are presented in table format. The first column in each table indicates the name of the impact category and their measurement units are presented in the second column. These tables show an amount at each life cycle stage to see the impact of different indicators on different stages. Each impact can be understood as what is released through the production of the declared unit of the material. The benefits of reuse/recycling of the declared product are reflected in this section.

The first impact in the table is global warming potential (GWP), which shows how much CO_2 is released at each stage. Other impacts include eutrophication potential, acidification potential, ozone layer depletion, land use related impacts, etc. The second table provides results for resource use and the third table is about the waste produced during production. The fourth and final table shows the results for the GWP-GHG indicator, which is almost equivalent to the GWP-Total indicator mentioned previously. The only difference is that this indicator excludes the biogenic carbon content by following a certain methodology.

About the Company

Owner of the EPD: Nuh Yapı Ürünleri A.Ş.
Production Plant: Hacı Akif Mh.Nuh Çimento Cd. No:32 Hereke / KOCAELİ - TÜRKİYE

Nuh Yapı Ürünleri A.Ş. was established in 1995 in Hereke, Kocaeli, as a subsidiary of the Nuh Cement Group. The company initially started operations in the construction sector with the production of lime and autoclaved aerated concrete (AAC). Over time, it has expanded its product range in response to evolving market demands and R&D efforts.

Today, the company operates across various sectors including iron and steel, aluminum, chemicals, mining, paper, energy, water treatment, wastewater treatment, agriculture, and dental gypsum production. Through R&D projects supported by TÜBİTAK TEYDEP, the company developed thermal insulation boards from AAC and established a production process for aluminum paste, a key raw material in AAC manufacturing.

With its patented Alpha Gypsum Process, developed internally and protected by a detailed (examination-based) patent, Nuh Yapı Ürünleri manufactures and markets alpha gypsum domestically and internationally. Within the magnesium product line, the company has developed a petroleum coke combustion aid additive, which helps eliminate operational bottlenecks in cement kilns, thereby increasing production capacity and reducing shutdowns for cleaning.

As of 2024, Nuh Yapı Ürünleri has also introduced a new product line for dental gypsum, expanding its innovation-driven approach into the healthcare field.

About the Product

Product Description:

AAC (Autoclaved Aerated Concrete) wall blocks are lightweight, mineral-based building elements produced using a mixture of sand, cement, lime, gypsum, water, and aluminum paste. During the production process, chemical reactions create millions of air pores, resulting in natural insulation and reduced weight. This EPD is a representative EPD for AAC wall blocks and covers the product classes G2/350, G2/400, and G3/500. Within the assessed product group, densities range from a minimum of 350 kg/m³ to a maximum of 450 kg/m³. For modelling in this study, a product with a density of 350 kg/m³ was selected as the declared product. This selection does not imply that the 350 kg/m³ product represents the other classes; it is simply the specific product modelled within the scope of the representative EPD.

Applications:

AAC wall blocks are used in residential, commercial, and industrial buildings. Typical applications include interior and exterior walls, infill walls in frame structures, and non-load-bearing partition walls.

Advantages:

Excellent thermal insulation without the need for additional materials

A1-class non-combustible material, resistant up to 1000 °C

High sound insulation

Lightweight and easy to cut, shape, and install

Reduces dead load, mortar, and plaster usage

Speeds up wall construction and lowers labor costs

Environmentally friendly and recyclable

Technical Specifications

Technical Characteristic	Relevant Standard	Value	Unit
Compressive Strength	TS EN 772-1	1.5-5.0	N/mm²
Gross Dry Unit Volume Weight	TS EN 772-13	300-600	kg/m³
Moisture Movement (Shrinkage)	TS EN 680	Max. 0.2	mm/m
Thermal Conductivity	TS EN 12667	0.075-0.16	W/m.K
Water Vapor Permeability	TS EN ISO 12572	5/10	μ
Fire Resistance	EN 13501-1	A1	Class
Initial Shear Bond Strength	TS EN 1052-3	Max 0.3	N/mm²

System Boundaries & Description

A1 - Raw Material Supply

This stage covers the extraction, processing, and pre-treatment of raw materials prior to their delivery to the manufacturing site. The environmental impacts associated with raw materials such as cement, lime, aluminum powder, sand, water, and other inputs used in autoclaved aerated concrete (AAC) production are evaluated at this stage. In order to reduce the consumption of natural silica sand, alternative materials such as waste-derived sands from ceramic production and ground granulated blast furnace slag (GGBFS) are partially used as substitutes. Additionally, fresh (uncured) AAC slurry is reintroduced into the production process, and broken cured AAC pieces are also collected and reused in the raw mix formulation. These internal recycling practices contribute to minimizing raw material demand and reducing environmental impacts associated with resource extraction.

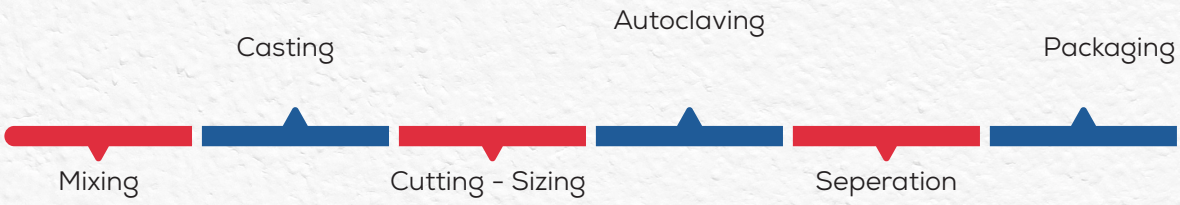
A2 - Raw Material Transport

Transport information for raw materials is supplied by the manufacturer, including distance and transport mode details. Based on this data, the environmental impacts associated with the transportation of raw materials to the production site are calculated, considering both routes and transportation types (e.g., road, rail, or sea). All raw materials and packaging used in the product were supplied domestically by road.

Transport Mode	Type
Road	Vehicle: Lorry Size Class: 16-32 metric ton Emission Standard: EURO6 Fuel Type: Diesel

A3 - Manufacturing

This stage accounts for the environmental impacts associated with the manufacturing processes of the autoclaved aerated concrete (AAC) product. All energy-related input data, including electricity and steam consumption, are provided by the manufacturer. At Nuh Yapı, electricity and steam are used during production, with steam being generated on-site using coal as the primary energy source. Additionally, the impacts of packaging materials used for the final product are included in this stage. The manufacturing stage encompasses all processes up to the point where the product is ready for dispatch, as illustrated in the production flow diagram below.



System Boundaries & Description

Scenarios used are realistic and representative of one of the most probable alternatives and shall not include processes or procedures that are not in current use, or which have not been demonstrated to be practical. (For module A4, A5, B1-B7, C1-C4, & D)

A4 - Product Transport

This stage includes the transportation of the finished product from the manufacturing facility to the customer. Transport distances and routes are determined based on information provided by the manufacturer. Depending on the customer's location, the product is primarily delivered by road (truck), rail, or seaway. While the main transport mode is typically road, rail and maritime transport are also used where applicable. The environmental impacts of these transport activities are calculated based on transport type, distance traveled, and payload.

Transport Mode	Type
Road	Vehicle: Lorry Size Class: 16-32 metric ton Emission Standard: EURO6 Fuel Type: Diesel
Sea	Vehicle: Bulk Carrier DWT (Load Capacity): 50000 tonnes Fuel Type: Heavy Fuel Oil

A5 - Installation

This stage accounts for the environmental impacts associated with the installation of the product at the construction site. In this study, 14 kg of mortar used during the assembly of the autoclaved aerated concrete (AAC) blocks is included. Additionally, the end-of-life treatment of packaging materials is considered within this stage and assessed accordingly.

B1 – Use

During the use phase, the cement and lime content within AAC blocks, both containing calcium oxide (CaO), contribute to the absorption of carbon dioxide (CO_2) from the atmosphere via the natural carbonation process. Theoretical CO_2 uptake over the product's service life is estimated based on the CaO content, following the methodology described in Hartmut B. Walther (2022). A recarbonation rate of 85% over a 50-year period is assumed in this assessment.

$$CO_2\ absorbation\ rate = \left(Cement\ in\ the\ product(kg) \times Cement\ CaO\ rate(\%)\right) + \left(Lime\ in\ the\ product(kg) \times Lime\ CaO\ rate(\%)\right) \times {CO_2 MW\left(\frac{g}{mol}\right)} \Big/ {CaO\ MW\ \left(\frac{g}{mol}\right)}$$

CaO ratio in cement (%)	65
CaO ratio in lime (%)	80
CO_2 molecular weight (g/mol)	44
CaO molecular weight (g/mol)	56
Service year (year)	50
CO_2 absorption rate	72.7
CO_2 absorption rate 85% recarbonation rate	61.8

System Boundaries & Description

B2 – Maintenance

AAC blocks are inherently durable and stable, requiring no maintenance throughout their service life. Therefore, this module does not contribute any environmental impacts.

B3 – Repair

Due to their structural integrity and resistance to common forms of degradation, AAC blocks do not require repair during their use phase. As a result, no environmental burdens are associated with this stage.

B4 – Replacement

The longevity of AAC blocks eliminates the need for replacement under normal use conditions. Hence, this module is considered to have no impact.

B5 – Refurbishment

Refurbishment activities are not applicable to AAC blocks, as the material maintains its performance without the need for renewal or upgrade. No related environmental impact is reported in this module.

B6 – Operational Energy Use

AAC blocks function as passive construction elements and do not require any operational energy input during their use. Accordingly, no energy-related emissions or impacts are assigned to this phase.

B7 – Operational Water Use

There is no operational water demand associated with AAC blocks. The material does not require water during its use phase, and thus this module does not contribute to water-related environmental impacts.

C1 - Demolition

The energy required for the demolition or deconstruction of the AAC blocks is estimated at 10 kWh diesel per ton of product according to PCR 2019:14 v2.0.0 . Accordingly, for a reference product weight of 380 kg, a total of 3.8 kWh of diesel is assumed to be consumed during demolition.

C2 - Waste Transport

This stage covers the transportation of the demolished material to a disposal or recycling facility. An average transport distance of 80 km by truck with 50% load factor is assumed according to PCR 2019:14 v2.0.0. The transport parameters used in the calculation are as follows:

Transport Mode	Type
Vehicle Type	Vehicle: Lorry Size Class: 16-32 metric ton Emission Standard: EURO5 Fuel Type: Diesel
Distance	100 km

System Boundaries & Description

C3 - Waste Processing

This stage covers the activities involved in the treatment of the product after its demolition and prior to its final disposal or recovery. In this study, it is assumed that AAC waste is sorted to enable potential recycling or material recovery. If recycling is feasible, the AAC material can be crushed and repurposed, for example, as a secondary aggregate in new construction applications. The environmental impacts associated with these processing steps are calculated based on the technologies employed and the efficiency of the recovery systems used.

C4 - Disposal

At this stage, the final fate of the product is determined. It is assumed that a portion of the AAC waste is recycled, substituting natural aggregate in concrete production. In line with data from the Cement Sustainability Initiative (CSI), a substitution rate of 30% is applied in this study, while the remaining 70% of the product is considered to be landfilled. The environmental impacts related to landfilling – including emissions from decomposition and loss of material value – are calculated accordingly.

D - Reuse, recovery, or recycling potential

This module quantifies the potential environmental benefits associated with reusing or recycling the product after its end-of-life. The recycled AAC material, when used as a partial replacement for natural aggregates in concrete production, contributes to resource conservation and reduction of associated emissions. In this study, a 30% substitution rate is assumed, and the resulting environmental benefits are allocated to this module. These benefits include avoided raw material extraction, reduced processing impacts, and a contribution to overall waste minimization in future production cycles.

LCA Information

Declared unit: 1 m³ (380 kg) of Autoclaved Aerated Concrete (AAC) block with 50 years lifespan produced by Nuh Yapı.

Conversion factor: 0.0025 m³ / kg

Time representativeness: Full year of 2024 (2024-01-01 to 2024-12-31).

Database(s) and LCA software: Ecoinvent 3.10 and SimaPro 9.6

Geographical scope:

Module A1 and A2 Material suppliers are located in Türkiye (TR)

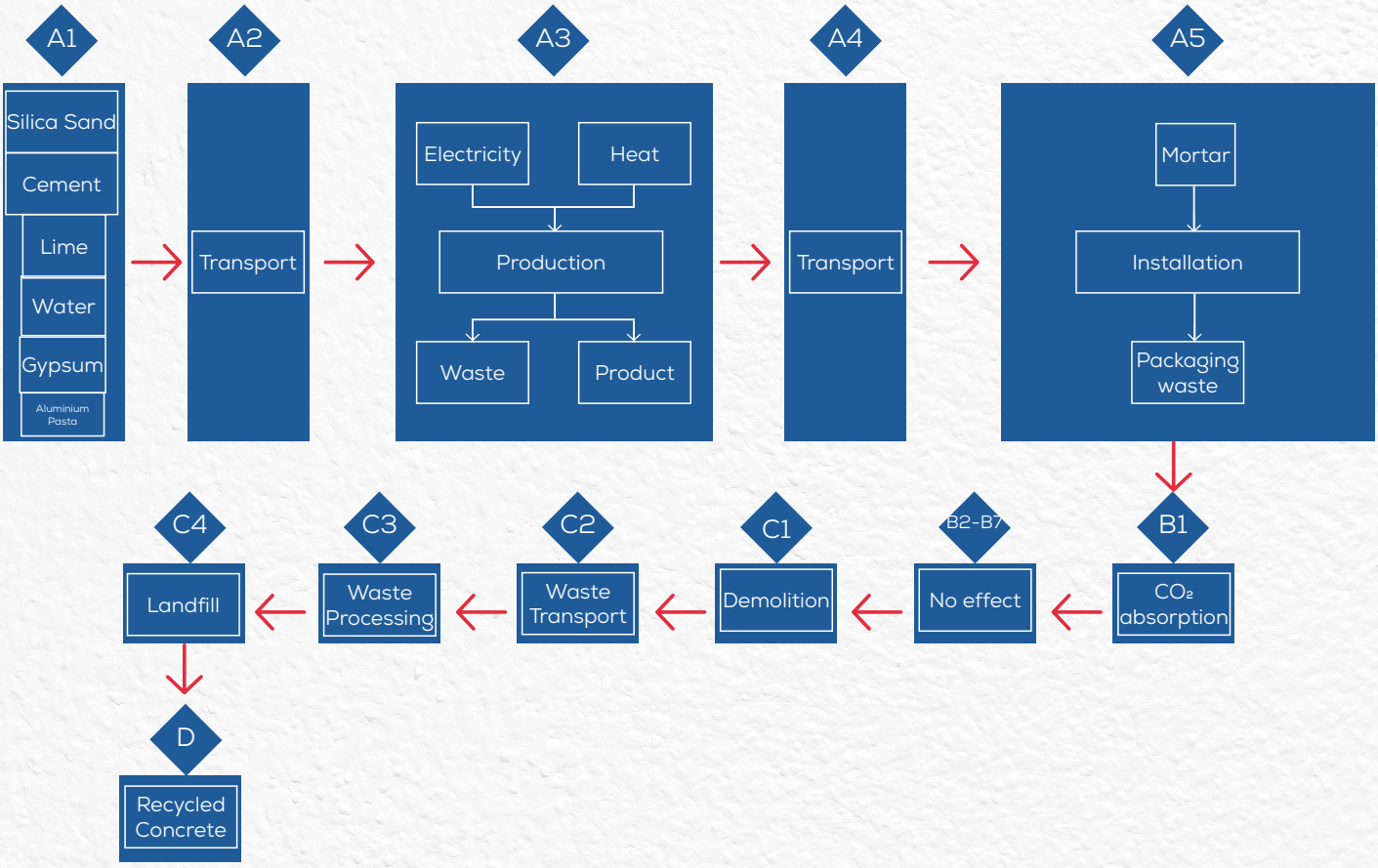
Module A3 production is located in Türkiye (TR)

Module A4 transport locations are Global (Türkiye, European, America, Asia)

Module A5, B, C and D scenarios are for Global

Description of system boundaries: Cradle to grave and module D (A + B + C + D)

Process flow diagram:



Source of Electricity

The electricity data modelled for the production processes is taken from Ecoinvent 3.10 dataset that represents medium voltage electricity production in Türkiye with the reference year, 2021. The dataset consist the following production percentages for electricity. Coal, 37%, Hydro, 33%, Natural gas, 17 %, Wind, 8%, Geothermal, 3%, Biogas, 1%, Other, 1%, Biomass, <1%. The Climate impact (GWP-GHG) impact of the electricity is 0.575 kg CO_2 eq. / kWh.

Allocation

Source of raw material, water consumption, energy consumption and raw material transportation were weighted according to 2024 production figures. In addition, hazardous and non-hazardous waste amounts were also allocated from the 2024 total waste generation.

LCA Information

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource recovery stage
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport	Waste Processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	TR	TR	TR	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO
Share of specific data	72%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - Products	-12% +46%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

(ND = Not declared, X = Module included)

Cut-Off Criteria

The criteria for exclusion were set so that individual input flows less than 1% of the total, with a cumulative limit of less than 5%, could be omitted. This was contingent upon confirming that these excluded flows did not significantly alter the reported data, with "significant" defined as affecting the total by less than 5%.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

Reference Service Life (RSL)

The service life of autoclaved aerated concrete (AAC) products is generally considered to be approximately 50 years under proper use and maintenance conditions. Unless exceptional circumstances occur, they maintain their durability and functionality throughout this period.

Background Data

For all LCA modelling and calculation, Ecoinvent database (v3.10) and SimaPro (v9.6) LCA software were used. Characterization factors of EN 15804 reference package based on EF 3.1 are utilized. Impact of infrastructure and capital goods are excluded from the analysis.

LCA Modelling and Calculation Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The regional energy datasets were used for all energy calculations.

LCA Information

Data Quality

The EPD is based on data collected by Nuh Yapı from one site over one year from January 2024. The EPD is representative of the production of autoclaved aerated concrete. The use and end-of-life stage of the EPD covers mostly Europe. The EPD study is representative, with the selected product having a density of 380 kg/m³. Within the relevant product group, densities range from a minimum of 350 kg/m³ to a maximum of 450 kg/m³, with no changes to the product recipes. Due to the weight differences, the GWP values vary between -12% and +46%, while the variations in other LCA indicators range from -12% to +46%. Background data was sourced from the Ecoinvent 3.10 database. No fair, poor or very poor data was found during the assessment of relevant data using EN 15804:2012+A2:2019, Annex E, only E.2.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of product	Collected data	EPD owner	2024	Primary data	24%
Generation of electricity used in manufacturing of product	Database	Ecoinvent v3.10	2024	Primary data	0%
Transport of raw materials to manufacturing site	Database	Ecoinvent v3.10	2024	Primary data	3%
Production of raw materials	Collected data	EPD owner	2024	Primary data	45%
Production of packaging	Database	Ecoinvent v3.10	2024	Primary data	0%
Total share of primary data, of GWP-GHG results for A1-A3					72%

Content Declaration

The content declaration is provided as intervals due to confidentiality reasons.

Content Name	Weight, %	Post-consumer material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kgC/declared unit
Silica Sand	50 – 55 %	0	0	0
Cement	25 – 25 %	0	0	0
Lime	5 – 10 %	0	0	0
Water	5 – 10 %	0	0	0
Gypsum	5 – 10 %	0	0	0
Aluminium Powder	<1 %	0	0	0
Total	**100 %**	**0**	**0**	**0**

Packaging Materials

Material Name	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C/ declared unit
Euro pallet	0.34	<1 %	0.160
Polypropylene Film	0.35	<1 %	0
Total	**0.69**	**<1 %**	**0.160**

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO_2.

ENVIRONMENTAL PERFORMANCE

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks

Mandatory impact category indicators according to EN 15804

Results per functional unit

Impact category	indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
Climate change - total	GWP-total	kg CO_2 eq.	1.72E+02	6.39E+00	3.99E+00	-5.38E+01	0.00E+00	1.37E+00	1.19E+01	1.00E+00	1.82E+00	2.89E-03
Climate change - fossil	GWP-fossil	kg CO_2 eq.	1.72E+02	6.38E+00	3.39E+00	-5.38E+01	0.00E+00	1.37E+00	1.19E+01	9.95E-01	1.82E+00	3.81E-03
Climate change - biogenic	GWP-biogenic	kg CO_2 eq.	-5.16E-01	1.12E-03	5.93E-01	0.00E+00	0.00E+00	1.20E-04	2.01E-03	1.22E-03	4.60E-04	-5.51E-04
Climate change - land use and land-use change	GWP-luluc	kg CO_2 eq.	2.90E-01	2.68E-03	9.40E-04	0.00E+00	0.00E+00	1.19E-04	4.73E-03	5.12E-03	8.77E-04	-3.65E-04
Ozone depletion	ODP	kg CFC 11 eq.	7.31E-07	8.89E-08	1.27E-08	0.00E+00	0.00E+00	2.10E-08	1.66E-07	1.08E-08	5.04E-08	2.92E-09
Acidification	AP	mol H+ eq.	6.73E-01	2.76E-02	1.04E-02	0.00E+00	0.00E+00	1.24E-02	3.97E-02	7.79E-03	1.32E-02	1.17E-03
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.	6.12E-02	5.07E-04	3.38E-04	0.00E+00	0.00E+00	3.99E-05	9.33E-04	4.93E-04	1.43E-04	-1.27E-04
Eutrophication aquatic marine	EP-marine	kg N eq.	1.24E-01	8.24E-03	3.11E-03	0.00E+00	0.00E+00	5.74E-03	1.28E-02	2.73E-03	5.13E-03	1.07E-03
Eutrophication terrestrial	EP-terrestrial	mol N eq.	1.27E+00	9.01E-02	3.39E-02	0.00E+00	0.00E+00	6.28E-02	1.40E-01	2.89E-02	5.61E-02	1.14E-02
Photochemical ozone formation	POCP	kg NMVOC eq.	4.00E-01	3.34E-02	9.57E-03	0.00E+00	0.00E+00	1.87E-02	5.52E-02	8.60E-03	1.97E-02	3.41E-03
Depletion of abiotic resources - minerals and metals	ADP- minerals &metals*	kg Sb eq.	1.18E-04	1.99E-05	9.23E-06	0.00E+00	0.00E+00	4.77E-07	3.81E-05	7.11E-07	2.64E-06	-2.21E-06
Depletion of abiotic resources - fossil fuels	ADP-fossil*	MJ, net calorific value	1.12E+03	8.90E+01	1.72E+01	0.00E+00	0.00E+00	1.79E+01	1.67E+02	1.21E+01	4.28E+01	4.31E-01
Water use	WDP*	m^3	4.45E+01	4.91E-01	5.96E-01	0.00E+00	0.00E+00	5.26E-02	9.12E-01	1.88E-01	1.82E+00	-6.87E+00

Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption
General Disclaimer	It is discouraged to use the results of modules A1-A3 without considering the results of module C.
Disclaimer 1	The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator

ENVIRONMENTAL PERFORMANCE

Additional mandatory and voluntary impact category indicators

Results per functional unit

Impact category	Indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
Climate Change -GWP-GHG	GWP-GHG	kg CO_2 eq.	1.72E+02	6.39E+00	3.99E+00	-6.18E+01	0.00E+00	1.37E+00	1.19E+01	1.00E+00	1.82E+00	3.44E-03
Acronyms	GWP-GHG = Global warming potential greenhouse gas.											
General disclaimer	It is discouraged to use the results of modules A1-A3 without considering the results of module C.											
Disclaimer 1	The GWP-GHG indicator is termed GWP-IOBC/GHG in the ILCD+EPD+ data format. The indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero											

Resource use indicators according to EN 15804

Results per functional unit

indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
PERE	MJ, net calorific value	1.33E+02	1.23E+00	6.05E+00	0.00E+00	0.00E+00	1.10E-01	2.19E+00	2.25E+00	3.90E-01	-4.14E-01
PERM	MJ, net calorific value	5.14E+00	0.00E+00	-5.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ, net calorific value	1.38E+02	1.23E+00	9.09E-01	0.00E+00	0.00E+00	1.10E-01	2.19E+00	2.25E+00	3.90E-01	-4.14E-01
PENRE	MJ, net calorific value	1.10E+03	8.90E+01	2.89E+01	0.00E+00	0.00E+00	1.79E+01	1.67E+02	1.21E+01	4.28E+01	4.31E-01
PENRM	MJ, net calorific value	1.18E+01	0.00E+00	-1.18E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, net calorific value	1.12E+03	8.90E+01	1.70E+01	0.00E+00	0.00E+00	1.79E+01	1.67E+02	1.21E+01	4.28E+01	4.31E-01
SM	kg	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, net calorific value	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, net calorific value	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	1,09E+00	1,20E-02	1,43E-02	0,00E+00	0,00E+00	1,28E-03	2,23E-02	5,22E-03	4,26E-02	-1,60E-01
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										
General disclaimer	It is discouraged to use the results of modules A1-A3 without considering the results of module C.										

ENVIRONMENTAL PERFORMANCE

Waste indicators according to EN 15804

Results per functional unit

indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
HWD	kg	7.51E+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
NHWD	kg	3.04E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+02	0.00E+00
RWD	kg	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
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed										
General disclaimer	It is discouraged to use the results of modules A1-A3 without considering the results of module C.										

Output flow indicators

Results per functional unit

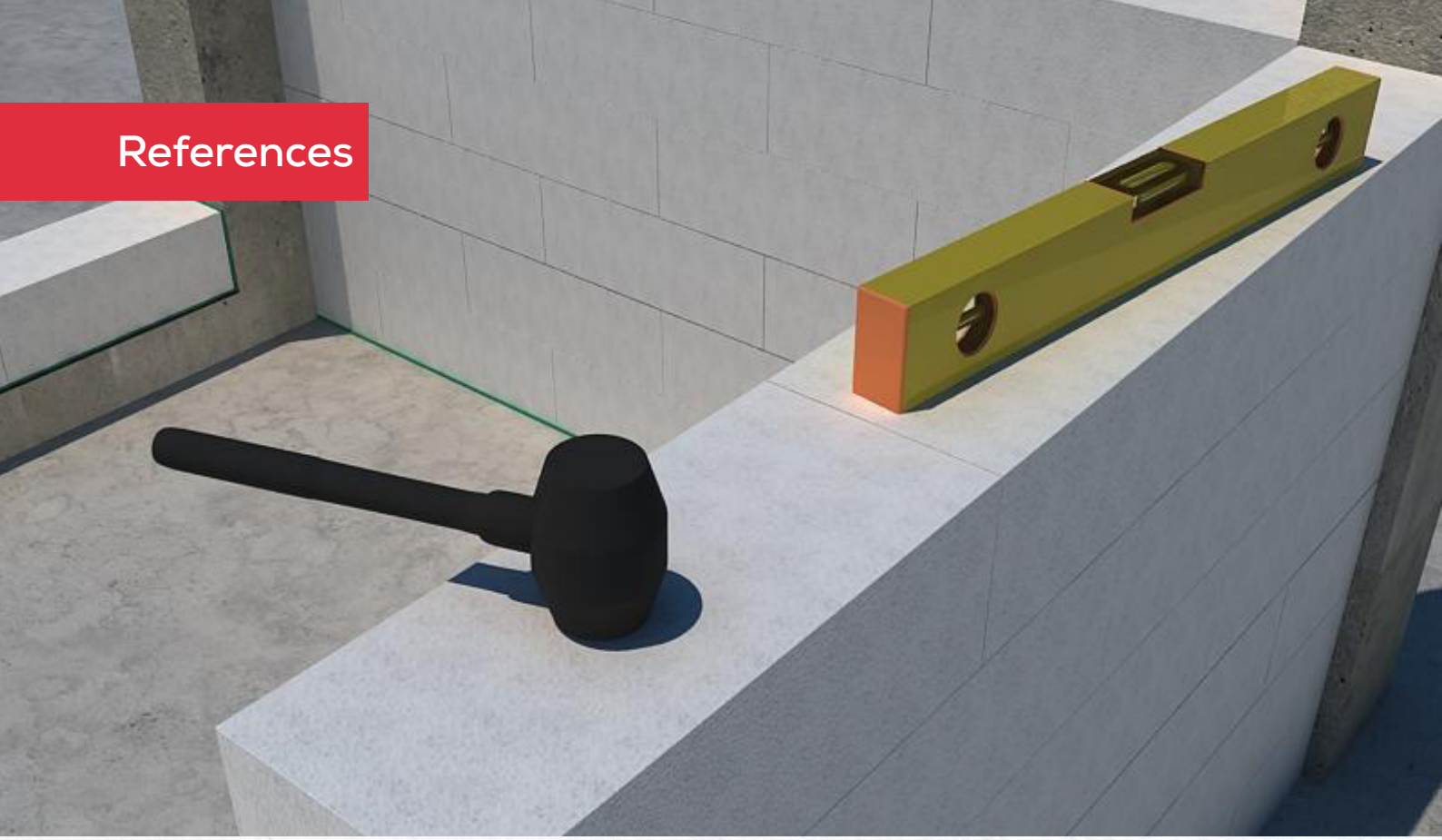
indicator	Unit	A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E+02	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	3.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ, net calorific value	0.00E+00	0.00E+00	5.92E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ, net calorific value	0.00E+00	0.00E+00	1.19E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy.										
General disclaimer	It is discouraged to use the results of modules A1-A3 without considering the results of module C.										

VERSION HISTORY

Version History

Original version of the EPD, 2025-08-15.

References



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ADDITIONAL LCA RESULTS

The table below shows the ratio of mandatory indicator results for the selected density to the minimum and maximum density values. For example, a value of 146% indicates that it is 1.46 times the representative value, while a value of 88% indicates it is 0.88 times the representative value for GWP-Total indicator.

Additional LCA results for the product range

Mandatory indicators	Unit	Min (350 kg / m³)	Representative (380 kg / m³)	Max (450 kg / m³)
GWP-total	kg CO_2 eq.	88%	1.72E+02	146%
GWP-fossil	kg CO_2 eq.	88%	1.72E+02	146%
GWP-biogenic	kg CO_2 eq.	99%	-4.18E-01	99%
GWP-luluc	kg CO_2 eq.	108%	2.90E-01	101%
ODP	kg CFC 11 eq.	89%	7.31E-07	154%
AP	mol H+ eq.	95%	6.73E-01	117%
EP-freshwater	kg P eq.	97%	6.12E-02	108%
EP-marine	kg N eq.	92%	1.24E-01	123%
EP-terrestrial	mol N eq.	92%	1.27E+00	125%
POCP	kg NMVOC eq.	91%	4.00E-01	131%
ADP- minerals &metals*	kg Sb eq.	91%	1.18E-04	127%
ADP-fossil*	MJ	92%	1.12E+03	134%
WDP*	m³	94%	4.45E+01	130%

ADDITIONAL LCA RESULTS

In compliance with the PCR requirements, 100% end-of-life scenarios have been modelled for the product. Tables below present the results for modules C4 and D, based on these scenarios, covering all mandatory impact indicators as specified in EN 15804.

Additional LCA results for 100% landfill scenario

Impact category	Mandatory indicators	Unit	C4	D
Climate change - total	GWP-total	kg CO_2 eq.	2.38E+00	0.00E+00
Climate change - fossil	GWP-fossil	kg CO_2 eq.	2.38E+00	0.00E+00
Climate change - biogenic	GWP-biogenic	kg CO_2 eq.	6.38E-04	0.00E+00
Climate change - land use and land-use change	GWP-luluc	kg CO_2 eq.	1.23E-03	0.00E+00
Ozone depletion	ODP	kg CFC 11 eq.	6.87E-08	0.00E+00
Acidification	AP	mol H+ eq.	1.68E-02	0.00E+00
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.	1.97E-04	0.00E+00
Eutrophication aquatic marine	EP-marine	kg N eq.	6.42E-03	0.00E+00
Eutrophication terrestrial	EP-terrestrial	mol N eq.	7.01E-02	0.00E+00
Photochemical ozone formation	POCP	kg NMVOC eq.	2.51E-02	0.00E+00
Depletion of abiotic resources - minerals and metals	ADP- minerals &metals*	kg Sb eq.	3.69E-06	0.00E+00
Depletion of abiotic resources - fossil fuels	ADP-fossil*	MJ	5.83E+01	0.00E+00
Water use	WDP*	m^3	2.59E+00	0.00E+00

Additional LCA results for 100% recycling scenario

Impact category	Mandatory indicators	Unit	C4	D
Climate change - total	GWP-total	kg CO_2 eq.	0.00E+00	9.64E-03
Climate change - fossil	GWP-fossil	kg CO_2 eq.	0.00E+00	1.27E-02
Climate change - biogenic	GWP-biogenic	kg CO_2 eq.	0.00E+00	-1.84E-03
Climate change - land use and land-use change	GWP-luluc	kg CO_2 eq.	0.00E+00	-1.22E-03
Ozone depletion	ODP	kg CFC 11 eq.	0.00E+00	9.72E-09
Acidification	AP	mol H+ eq.	0.00E+00	3.91E-03
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.	0.00E+00	-4.23E-04
Eutrophication aquatic marine	EP-marine	kg N eq.	0.00E+00	3.57E-03
Eutrophication terrestrial	EP-terrestrial	mol N eq.	0.00E+00	3.80E-02
Photochemical ozone formation	POCP	kg NMVOC eq.	0.00E+00	1.14E-02
Depletion of abiotic resources - minerals and metals	ADP- minerals &metals*	kg Sb eq.	0.00E+00	-7.36E-06
Depletion of abiotic resources - fossil fuels	ADP-fossil*	MJ	0.00E+00	1.44E+00
Water use	WDP*	m^3	0.00E+00	-2.29E+01

ABBREVIATIONS

Abbreviation	Definition
ADP	Abiotic depletion potential for fossil resources (MJ)
ADP-fossil	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-minerals&metals	Acidification Potential (mol H+ eq.)
AP	Chemical Abstracts Service Number
CAS No.	European Committee for Standardization
CEN	Chlorofluorocarbon-11 Equivalents
CFC-11 eq.	Components for Reuse (kg)
CFR	Co-location centre
CLC	Carbon Dioxide Equivalents
CO_2 eq.	Central product classification
CPC	European Community Number
EC No.	Exported Energy, Electricity (MJ)
EEE	Exported Energy, Thermal (MJ)
EET	Environmental Footprint
EF	European Norm (Standard)
EN	Eutrophication Potential
EP	Freshwater eutrophication potential (kg P eq.)
EP-freshwater	Marine eutrophication potential (kg N eq.)
EP-marine	Terrestrial eutrophication potential (mol N eq.)
EP-terrestrial	Use of net fresh water (m^3)
FW	Greenhouse gas
GHG	Globally harmonized system of classification and labelling of chemicals
GHS	Global
GLO	General Programme Instructions
GPI	Global Reporting Initiative
GRI	Global Warming Potential (kg CO_2 eq.)
GWP	Global Warming Potential from biogenic sources (kg CO_2 eq.)
GWP-biogenic	Global Warming Potential from fossil sources (kg CO_2 eq.)
GWP-fossil	Global Warming Potential for greenhouse gases (kg CO_2 eq.)
GWP-GHG	Global Warming Potential from land use and land use change (kg CO_2 eq.)
GWP-luluc	Total Global Warming Potential (kg CO_2 eq.)

ABBREVIATIONS

GWP-total	Hazardous Waste (disposed) (kg)
HW	International Organization for Standardization
ISO	Kilogram
kg	Kilograms of Carbon
kg C	Kilograms of Carbon Dioxide Equivalent
kg CO_2 eq.	Cubic Meter
m^3	Materials for Energy Recovery (kg)
MER	Megajoule
MJ	Material for Recycling (kg)
MR	Nitrogen Equivalents
N eq.	Not Declared
ND	Non-Hazardous Waste (disposed) (kg)
NHW	Non-Methane Volatile Organic Compounds
NMVOC	Use of non-renewable secondary fuels (MJ)
NRSF	Ozone Depletion Potential (kg CFC-11 eq.)
ODP	Phosphorus Equivalents
P eq.	Use of non-renewable primary energy excluding non-renewable primary energy
PENRE	resources used as raw materials (MJ)
PENRM	Use of non-renewable primary energy resources used as raw materials (MJ)
PENRT	Total use of non-renewable primary energy resources (MJ)
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ)
PERM	Use of renewable primary energy resources used as raw materials (MJ)
PERT	Total use of renewable primary energy resources (MJ)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
RSF	Use of renewable secondary fuels (MJ)
RW	Radioactive Waste (disposed) (kg)
Sb eq.	Antimony Equivalents
SM	Use of secondary material (kg)
SVHC	Substances of Very High Concern
TR	Türkiye
WDP	Water Deprivation Potential (m^3)

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