

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

CEMACON EVOCERAMIC PLUS GRINDED FIRED CLAY BRICKS — BIHARIA PLANT
CEMACON SA



EPD HUB, HUB-7922
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Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

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GENERAL INFORMATION

MANUFACTURER

Manufacturer	CEMACON SA
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Contact details	office@cemacon.ro
Website	www.cemacon.ro

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
c-PCR	-
Sector	Construction product
Category of EPD	Design phase EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4, D
EPD author	Stefan Cosuta, Envirocert SRL, www.envirocert.ro
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Afzal khan Peerukhan as an authorized verifier for EPD Hub

This EPD is intended for business-to-business communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	CEMACON EVOCERAMIC PLUS GRINDED FIRED CLAY BRICKS — BIHARIA PLANT
Additional labels	-
Product reference	-
Place(s) of raw material origin	ROMANIA
Place of production	Str. Caramizii, No. 1, Biharia, Bihor County, Romania
Place(s) of installation and use	Romania, Hungary
Place(s) of end-of-life	-
Period for data	design/projected values derived from calendar year 2025 standard-range production data
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3 (%)	0
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	87,3

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tone
Declared unit mass	1000 kg
Mass of packaging	4,478 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	145
GWP-total, A1-A3 ($kgCO_2e$)	139
Secondary material, inputs (%)	0,06
Total energy use, A1-A3 (kWh)	538
Net freshwater use, A1-A3 (m^3)	0,66

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

CEMACON is one of the leading Romanian manufacturers in the construction materials industry, with a history dating back to 1969 and more than five decades of experience. The company was the leader of the Romanian brick market in 2023, 2024 and 2025 and the leader of the Romanian masonry market in 2025(*), and it is the largest producer with Romanian capital. CEMACON operates 7 high-tech production lines across 3 industrial platforms.

As part of Paval Holding, CEMACON benefits from continuous strategic investment and the integration of innovative technologies aimed at sustainable development.

Core Values and Vision

The company's philosophy is built on the intersection of innovation and experience. CEMACON focuses on:

- Operational Excellence: Recognized with the "Best Managed Companies" certification for three consecutive years (2023, 2024 and 2025).
- Sustainability: Developing durable masonry solutions designed to support industry growth while ensuring the well-being of the community.
- Collaboration: Fostering a diverse work environment where ideas translate into high-quality products and solid professional relationships.

Manufacturing and Innovation

Beyond its core ceramic masonry block range, CEMACON has expanded its manufacturing footprint with a dedicated lintel production line at the Recea platform, opened in 2018, and a facing brick production line within the Recea Industrial Park, opened in 2023, alongside the Biharia platform, integrated into the group in 2023. The company's commitment to a sustainable future is reflected in its own photovoltaic park supplying renewable energy to production, the reintegration of production waste into the raw material recipe, and the use of recyclable raw materials and packaging.

(*)According to Neomar Analysis of Romanian Wall-Building Materials Market 2014 – 2025





PRODUCT DESCRIPTION

This Environmental Product Declaration is a Design EPD, covering the rectified ceramic masonry blocks product range (Evoceramic PLUS) manufactured by CEMACON S.A. within its production plant in Biharia, Bihor County, Romania. As these product configurations are newly developed, the environmental data presented in this EPD is derived from the specific manufacturing consumption data of the equivalent standard (non-rectified) Evoceramic blocks produced on the same production line at the Biharia plant, adjusted to account for the additional grinding/rectification process applied to the fired blocks. The Evoceramic PLUS range consists of precision-rectified ceramic blocks, ground after firing to tight dimensional tolerances, enabling thin-layer mortar joint application in place of conventional masonry mortar. As the raw clay mix, manufacturing methodology, and essential raw materials are standardized across the designated production line (shared with the standard Evoceramic range), the environmental impact results are presented for 1 ton (1,000 kg) of finished product.

Reference standard: EN 771-1+A1:2015
Products covered by this EPD:

Product	Compression resistance (N/mm2)	Thermal conductivity (W/m*K))
Evoceramic PLUS 30NF	11	0.208
Evoceramic PLUS 25NF	10	0.284
Evoceramic PLUS 15NF	7.5	0.288
Evoceramic PLUS 12NF	7.5	0.309
Evoceramic PLUS 10NF	7.5	0.239

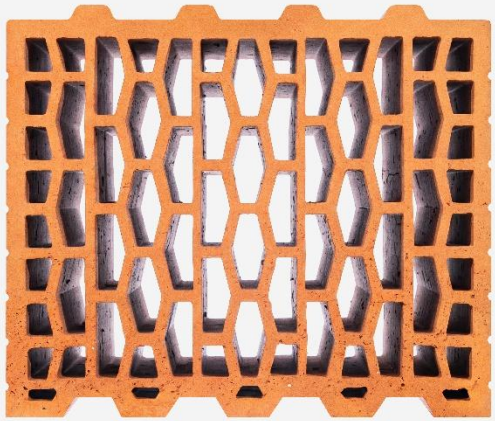
Construction and Materials
Cemacon Evoceramic PLUS blocks are engineered using the same specialized, optimized clay mixtures and burning processes as the standard Evoceramic range, combined with a post-firing rectification process to establish a highly durable, dimensionally precise, structurally stable, and thermally efficient configuration:
Fired Clay Core Matrix: Formulated from natural clay reserves and burned at high industrial temperatures to guarantee excellent mechanical load-bearing resistance, dimensional stability, and prolonged service longevity.
Optimized Perforation Geometry: Designed with variable internal volumes of hollow cavities to secure structural lightweight properties while maximizing thermal and acoustic resistance according to specific application requirements.
Precision Rectification: Following firing, the bed faces of each block are mechanically ground to tight dimensional tolerances, enabling the use of thin-layer (thin-bed) mortar joints instead of conventional masonry mortar, reducing mortar consumption and improving thermal continuity across the wall assembly.

Manufacturing and Sustainability
The production process takes place specifically within Cemacon's dedicated ceramic manufacturing plant in Biharia, Bihor County, Romania, operating under standardized, high-performance industrial procedures. The manufacturing process relies on natural, mineral-based raw materials, utilizing high-temperature firing processes that establish a chemically stable, inert, and ecological material profile.

Product Benefits
Optimized Thermal Performance: Due to the natural insulating properties of fired clay coupled with an advanced hollow core geometry, the blocks effectively maintain constant indoor living environments, lowering seasonal heating or cooling resource consumption and saving associated energy expenditures. The thin-layer mortar joints enabled by the rectification process further reduce thermal bridging at the joints compared to conventional thick mortar beds.
Microclimate & Health Safety: Burned at extreme temperatures, the blocks achieve Euroclass A1 reaction to fire without emitting any toxic smoke or gases during fire exposure, and exhibit a safe mineral profile that respects surrounding air and water quality.

Longevity & Circular Economy: The structural durability and atmospheric wear resistance ensure that the masonry elements maintain structural stability over decades. At the end of the building life cycle, the masonry elements can be completely crushed, recycled, and diverted back into secondary industrial loops, preserving natural mineral reserves.
Precision & Execution Efficiency: Ground to strict dimensional tolerances, these masonry units allow for precise, rapid interlocking alignments, significantly reduced thin-layer mortar consumption, short on-site construction times, and cleaner structural jobsites.

Further information can be found at: www.cemacon.ro



PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	0	-
Minerals	100	Romania
Fossil materials	0	-
Bio-based materials	0	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0,016
Biogenic carbon content in packaging, kg C	1,642

1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tone
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	years

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Not declared = ND

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is used in modelling the electricity mix utilized in the factory.

A1 – Raw material supply

This stage includes the extraction, processing, and delivery of the primary materials that form the Cemacon Evoceramic PLUS fired clay masonry units. As no independent production history exists yet for the rectified PLUS configurations, the raw material inputs are modeled identically to the equivalent standard (non-rectified) Evoceramic blocks manufactured on the same production line at the Biharia plant, since the green body composition and firing recipe are unchanged by the downstream rectification process. The formulation is based on a natural composition consisting primarily of clay as the structural mineral base, combined with lignite coal as a combustible additive that supports the internal firing process. To optimize the internal porosity and thermal performance of the ceramic blocks, the mixture incorporates biogenic secondary materials and organic manufacturing residues — specifically seed husks and sawdust — alongside fly ash used as a filler. Process water used for humidifying the clay stockpiles is sourced from the company's own drilled wells at the Biharia site. The environmental burdens of all material inputs, including upstream extractions and the biogenic carbon storage of organic resources, are tracked and allocated to the declared unit of 1 tonne (1,000 kg) of finished product, utilizing the Ecoinvent database to model the upstream impacts of raw material production.

A2 – Transport to factory

This stage covers the transportation of raw materials from the suppliers to the Cemacon manufacturing plant in Biharia (Bihor County), and is modeled identically to the standard Evoceramic range, since the incoming raw material logistics are unaffected by the downstream rectification process. It includes inbound logistics for clay, lignite coal, and the biogenic and mineral pore-forming additives (seed husks, sawdust, fly ash), as well as facility

operational components. Clay, the raw material with the highest volume share by far, is sourced from the company's own quarry located in the immediate vicinity of the plant, using diesel earth-moving equipment, ensuring minimal transport-related impacts for the dominant input. The remaining raw materials are sourced from domestic suppliers within Romania, delivered predominantly by heavy-duty trucks. Transport distances and vehicle types are derived directly from the company's internal logistics records, and load factors are defined based on actual operational data to ensure the highest level of accuracy. Assumptions on empty-return trips and consolidation of loads are specified for the LCA modelling to reflect the regional transport infrastructure.

A3 – Manufacturing, Finishing and Packaging

In this stage, the raw materials are transformed into finished, rectified fired clay masonry units. Key processes at the Cemacon Biharia manufacturing facility include:

- Preparation and Mixing: crushing, grinding, and precise dosing of clay, water, lignite coal, and the biogenic and mineral pore-forming agents, followed by intensive mixing to ensure a completely homogeneous composition.
- Shaping and Cutting: the prepared clay mass is extruded through specialized dies to form continuous columns with precise internal geometries, which are subsequently cut into specific unit dimensions.
- Drying and Firing: the green blocks undergo controlled drying across a series of tunnel dryers, followed by high-temperature firing in a tunnel kiln where structural sintering and ceramic bonding occur, and where the lignite coal content of the mix contributes to the internal combustion process during firing.
- Rectification (Grinding): following firing, the bed faces of each block are mechanically ground to tight dimensional tolerances on dedicated grinding equipment, enabling thin-layer mortar joint application. As no independent metering yet exists for this new process line, the incremental electricity consumption and the resulting ceramic grinding dust/swarf waste stream are modeled based on documented engineering estimates, pending validation once commercial production of the PLUS range begins.
- Quality Control and Sorting: final inspection, dimensional verification, structural verification, and sorting of the fired and rectified units prior to final packaging and storage.
- Packaging: Includes the use of wood pallets and protective plastic (stretch) films, alongside paper labels, to ensure safe delivery, stable stacking, and weather-protected handling.

Direct process emissions: Firing generates direct process CO2 emissions from both clay decarbonation and the combustion of coal and ash within the clay body.

Energy modelling: The facility's energy mix combines natural gas for the drying and firing processes, with grid electricity and self-generated solar power for auxiliary production processes, the rectification line, and office needs, alongside diesel for internal forklift handling. 100% of the self-generated solar power is consumed entirely within the production facility for operational processes, with zero electricity being injected back into the national grid. This internal balancing ensures an accurate and representative footprint for the manufacturing phase impacts.

Waste Management: Manufacturing waste, including raw material losses re-routed directly back into production where possible, ceramic grinding dust/swarf generated during rectification, and packaging discards, is recorded and handled in accordance with internal environmental procedures. Wood pallets are largely recovered and reused, while plastic films are sent for recycling. Residual raw material losses not reused internally (e.g., seed husks) are handed over to authorized local waste collectors. All waste transport uses standard road transport.

System boundary and cut-off criteria

For modules A1–A3, the system boundary includes all processes under Cemacon S.A.'s control at the Biharia plant up to the factory gate (Cradle-to-

Gate), including the post-firing rectification (grinding) operation specific to the PLUS range. Processes excluded include the manufacture of capital goods (machinery, buildings), infrastructure maintenance, and indirect company management overheads. Cut-off criteria ensure that all major raw materials and energy flows are included, confirming that no neglected individual process exceeds 1% of total mass or energy, and the total neglected input flows do not exceed 5% of each inventory module.

Data quality and representativeness
As this is a Design EPD prepared ahead of commercial production, the underlying raw material, energy, and packaging data are derived from the actual, site-specific manufacturing records of the equivalent standard Evoceramic range at the Biharia plant for the calendar year 2025, since the shared production line and firing recipe are unchanged by the rectification step. The incremental data specific to the rectification process (grinding equipment electricity consumption and grinding waste generation) are based on documented engineering estimates and equipment specifications, pending validation against actual operational data once commercial production begins. Background data are derived from recognized LCA databases, specifically Ecoinvent 3.12 and One Click LCA. All assumptions regarding the rectification process and regional transport volumes and allocation are thoroughly documented.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

A4 – Transport to Building Site
This stage includes the transportation of the finished Cemacon Evoceramic PLUS fired clay masonry units from the Biharia manufacturing facility to the construction site. As no independent sales history exists yet for the PLUS range, the transport scenario is modeled on the same logistics infrastructure and customer distribution pattern as the standard Evoceramic range produced at the same plant. Based on this, this involves:
Loading and securing: finished ceramic blocks are palleted and secured at the factory gate using the wood pallets and plastic stretch films documented in module A3, to prevent structural displacement or breakage during transit.
Logistics and volume: transport modeling is based on the bulk volume and density of each masonry unit configuration. For the declared unit of 1 tonne, the product-specific physical density (varying by configuration, see Annex) is used to determine the transported volume relative to vehicle payload limits.
Transport distances: pending the establishment of an independent sales record for the PLUS range, the average transport distance is assumed equal to the sales-volume-weighted average already established for the standard Evoceramic range manufactured at the Biharia plant, resulting in a representative distance of approximately 148 km.
Delivery: the transport stage ends when the products reach the construction site. All packaging materials associated with the product are included up to this stage.

A5 – Installation into the Building / Infrastructure
This stage covers the on-site installation of Cemacon Evoceramic PLUS fired clay masonry units. The installation scenario is defined as follows:
- On-site handling: the installation process is predominantly manual, involving the unpacking, lifting, and precise positioning of the ceramic units by masonry workers to form walls.
- Energy consumption: installation energy use is minimal, limited to a small diesel input for on-site building machinery (e.g., mortar mixing/handling equipment); the manual placement of the blocks themselves requires no additional power tools.
- Auxiliary materials: reflecting the thin-layer (thin-bed) mortar system enabled by the precision rectification of the bed faces, the scenario incorporates auxiliary material inputs per declared unit of 22.3 kg of thin-

layer masonry mortar and 7 kg of tap water — substantially lower than the conventional mortar consumption of the standard (non-rectified) Evoceramic range manufactured at the same plant.

- Installation losses: a product material loss rate of 5% (50 kg per tonne of declared unit) is factored into this module, accounting for scrap generation during the manual laying phase. This installation waste is treated as inert construction debris, with 70% directed to recycling and 30% to sanitary landfill.

Waste Management of Packaging: accounts for the collection and processing of all packaging materials removed during installation (wood pallets and plastic films), amounting to approximately 3.96 kg of wood packaging and 0.52 kg of plastic packaging per declared unit, consistent with the standard Evoceramic range packaging practice at the same plant. The end-of-life treatment for these materials is modeled using a EU-level split scenario (source: EUROSTAT, via One Click LCA), reflecting regional waste practices:

- Wood packaging: 32% is recycled, 30% is directed to energy recovery (incineration), and 38% is landfilled;
- Plastic packaging: 40% is recycled, 37% is directed to energy recovery (incineration), and 23% is landfilled.

All packaging waste and installation material losses are assumed to be transported over a representative distance of 50 km from the site to authorized regional waste management facilities.

PRODUCT END OF LIFE (C1-C4, D)

C1 – Deconstruction / Disassembly

At the end of its service life, the Cemacon Evoceramic PLUS clay masonry wall structure is dismantled during building deconstruction primarily through mechanical and manual demolition operations. As no independent demolition history exists for the PLUS range, the scenario is modeled consistently with the standard Evoceramic range at the same plant, adjusted for the lower mortar content characteristic of the thin-layer mortar system. The specific scenario accounts for the deconstruction of 1,022.3 kg of total mass per declared unit, comprising 1,000 kg of fired clay brick and 22.3 kg of thin-layer mortar. Disassembly relies on a modest diesel input for on-site demolition machinery, while the sorting and separation of the masonry units otherwise requires no additional energy input. Since the fired ceramic and mortar matrix are chemically inert and fully stable, no hazardous emissions or volatile compounds are released during disassembly.

C2 – Transport to Waste Processing Facilities

Following disassembly, the masonry waste (bricks and mortar) is transported to authorized regional collection points, recycling centers, or treatment facilities. For the LCA model, transport is assumed to occur via standard heavy-duty road vehicles over a representative average distance of 50 km. Fuel consumption and logistics emissions are calculated based on the total mass of the combined materials, utilizing standard transport datasets from Ecoinvent to reflect regional waste logistics infrastructure.

C3 – Waste Processing

This stage involves the physical sorting, crushing, and preparation of the discarded structural masonry units. The fired clay brick fraction and the thin-layer mortar fraction are processed separately: the ceramic brick is directed towards authorized construction and demolition waste processing facilities for mechanical crushing and screening into secondary mineral aggregates, while the mortar fraction is processed according to standard cement/mortar waste treatment routes (source: Eurostat 2022). Both streams require standard operational processing before recycling or final disposal.

C4 – Final Disposal

The disposal scenario is defined according to representative regional construction and demolition waste practices, distinguished per material fraction: the fired clay brick fraction follows a 70% recycling / 30% landfill split, while the thin-layer mortar fraction follows an 80% recycling / 20%

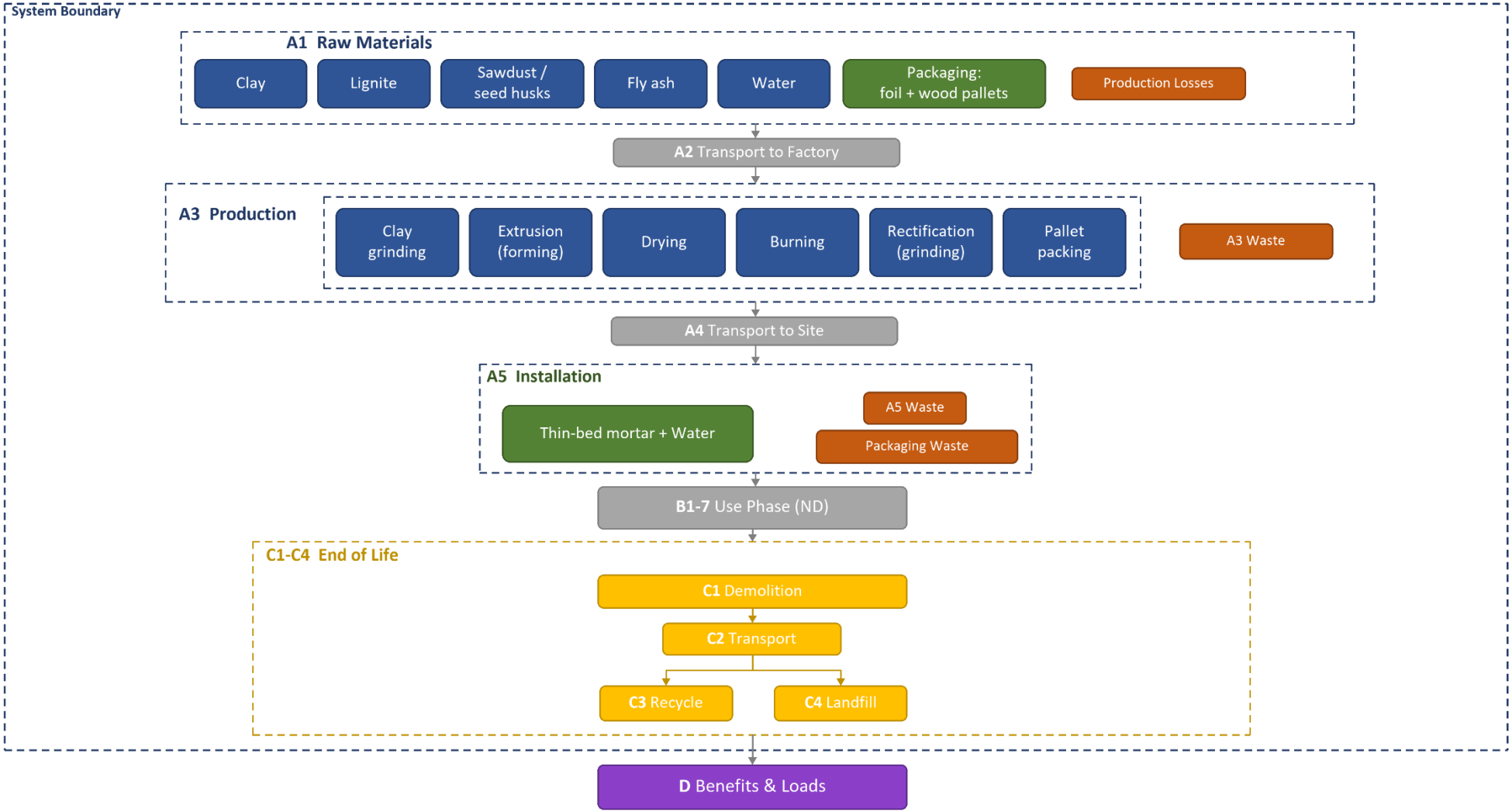
landfill split (Eurostat 2022 treatment data). Fired clay masonry and cured mortar are non-leaching, highly stable materials that do not undergo biochemical degradation; therefore, they do not generate greenhouse gas emissions, leachate, or environmental contamination when directed to compliant landfills or structural inert storage facilities. All waste is assumed to be transported over a representative distance of 50 km from the site to authorized regional waste management facilities.

Module D – Benefits and Loads Beyond the System Boundary
The recovery of materials and energy at the end-of-life provides net benefits beyond the system boundary, reported as negative environmental impacts in Module D. The net-flow modelling accounts separately for each recovered material stream (fired clay brick, thin-layer mortar, wood packaging, plastic packaging), combining the environmental loads of processing/recycling with the benefits of avoided virgin material and energy production.
Net Flow Calculation: For each material stream, net flows for recycling and energy recovery are determined based on the specific recovery and disposal split defined in Modules A5 and C3-C4. This includes: for wood and plastic packaging, the transfer of the renewable/non-renewable energy content embodied in the material (PERM/PENRM) and, for wood packaging specifically, the release of the biogenic carbon content stored in the material; for the incinerated fraction of each packaging stream, credits for the exported electricity and heat replacing the regional energy mix; and for the recycled fraction of each stream, credits (net of any processing loads) reflecting the substitution of virgin material production.

Mineral Recycling Credits: The recycled fraction of the ceramic brick waste is modelled as an avoided production of virgin crushed gravel/aggregate, used to offset primary aggregate extraction for local road infrastructure and construction applications; the associated crushing/processing burden of the recycled brick fraction is accounted for within the same net flow, avoiding double counting. The thin-layer mortar fraction follows an analogous recycling credit, based on its own Eurostat-sourced recovery split, though its overall contribution is comparatively smaller than for the standard (non-rectified) range, reflecting the significantly reduced mortar mass.
Packaging Recovery and Recycling: Benefits are also accounted for the recovery of packaging materials collected during the installation stage (Module A5):
- Wood packaging: the biogenic carbon and embodied renewable/non-renewable energy content of the material are transferred out of the system; the incinerated share (30%) is credited with avoided grid electricity and district heat production; the recycled share (32%) is credited with avoided production of wood chips/mulch for agricultural and landscaping applications, net of the energy required for processing.
- Plastic packaging: the embodied non-renewable energy content of the material is transferred out of the system; the incinerated share (37%) is credited with avoided grid electricity and district heat production; the recycled share (40%) is credited with avoided production of virgin high-density polyethylene granulate.

Data Quality and Representativeness
The scenarios for Modules C and D reflect representative construction and demolition waste management practices and packaging recovery infrastructures, extrapolated from the standard Evoceramic range at the Biharia plant given the absence of independent production and demolition history for the PLUS range.
Total mass configurations (1,000 kg brick and 22.3 kg thin-layer mortar), transport distance for waste processing (50 km), packaging material formulations, and regional recycling split assumptions are derived from operational records of the standard Evoceramic range and site-specific project configurations.
Impact factors for mineral aggregate crushing, material recycling substitution, packaging incineration, and landfilling are sourced from the Ecoinvent database and One Click LCA, ensuring technological, geographical, and temporal relevance for the European market.

LIFE CYCLE FLOW DIAGRAM



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

In accordance with the PCR and EN 15804+A2 cut-off criteria, the following processes and infrastructure components have been excluded from the system boundaries of this study:
Capital goods and infrastructure: The manufacturing, maintenance, and disposal of production machinery, industrial buildings, kilns, and other capital equipment, including the rectification/grinding line itself.
Corporate overheads: Administrative activities, corporate office energy consumption, business travel, and R&D activities that are not directly tied to the shop-floor manufacturing line.
Minor auxiliary inputs: Minor material or energy flows that contribute less than 1% to the total input mass or energy, and whose cumulative exclusion does not exceed 5% of any given inventory module.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	Physical Properties
Packaging material	Physical Properties
Ancillary materials	Physical Properties
Manufacturing energy and waste	Physical Properties

Where primary operational data was unavailable, conservative engineering estimates and standard scenarios based on the Product Category Rules (PCR) and the One Click LCA platform were applied:
Design EPD Basis (Modules A1–A3): As the Evoceramic PLUS range has not yet entered commercial production, the foreground raw material, energy, and packaging data are derived from the actual, site-specific manufacturing records of the equivalent standard (non-rectified) Evoceramic range at the Biharia plant for the calendar year 2025. The green body composition and firing recipe are unchanged by the downstream rectification process; the incremental electricity consumption and grinding waste generation specific

to the rectification step are based on documented engineering estimates for the dedicated grinding equipment, pending validation against actual operational data once commercial production begins.
Installation Scenario (Module A5): The installation process of the Cemacon Evoceramic PLUS fired clay blocks into the building matrix is predominantly manual, with a minor diesel input modeled for on-site building machinery. Auxiliary materials used for jointing are modeled based on a thin-layer (thin-bed) mortar system enabled by the precision rectification of the bed faces (22.3 kg mortar and 7 kg water per declared unit), substantially lower than the conventional mortar consumption of the standard range. Installation losses and packaging waste generation are assumed consistent with the standard Evoceramic range manufactured at the same plant, pending independent site data once the PLUS range enters commercial distribution.
Deconstruction Scenario (Module C1): The building disassembly and demolition process is assumed to be primarily mechanical in nature (utilizing standard heavy machinery), with a minor diesel input modeled for the structural clay masonry fraction's share per declared unit.
Mortar Inclusion at End-of-Life (Modules C and D): For the end-of-life deconstruction, transport, and processing scenarios, it is assumed that the structural wall generates a combined waste flow. For every 1,000 kg of fired clay brick, an additional 22.3 kg of thin-layer structural masonry mortar is assumed to be bound to the product, totaling 1,022.3 kg of mineral waste processed per declared unit.
End-of-Life Destination (Modules C3, C4, and D): In accordance with representative regional infrastructure practices, the end-of-life scenario for the inert masonry waste is modeled per material fraction: the fired clay brick fraction (1,000 kg) follows a 70% recycling / 30% landfill split (EN 17160), directed to recycling facilities for crushing and sorting into secondary mineral aggregates (generating environmental benefits in Module D), while the thin-layer mortar fraction (22.3 kg) follows an 80% recycling / 20% landfill split (Eurostat 2022 treatment data).
Transportation Parameters: For all standard logistics scenarios where specific vehicle profiles were not logistically restricted, transportation was modeled using generic Euro 5 or Euro 6 heavy-duty road freight datasets from Ecoinvent to maintain a representative and conservative carbon accounting approach. Pending an independent sales record for the PLUS range, the delivery distance is assumed equal to the sales-volume-weighted average already established for the standard Evoceramic range manufactured at the Biharia plant (~148 km).

PRODUCT & MANUFACTURING SITES GROUPING

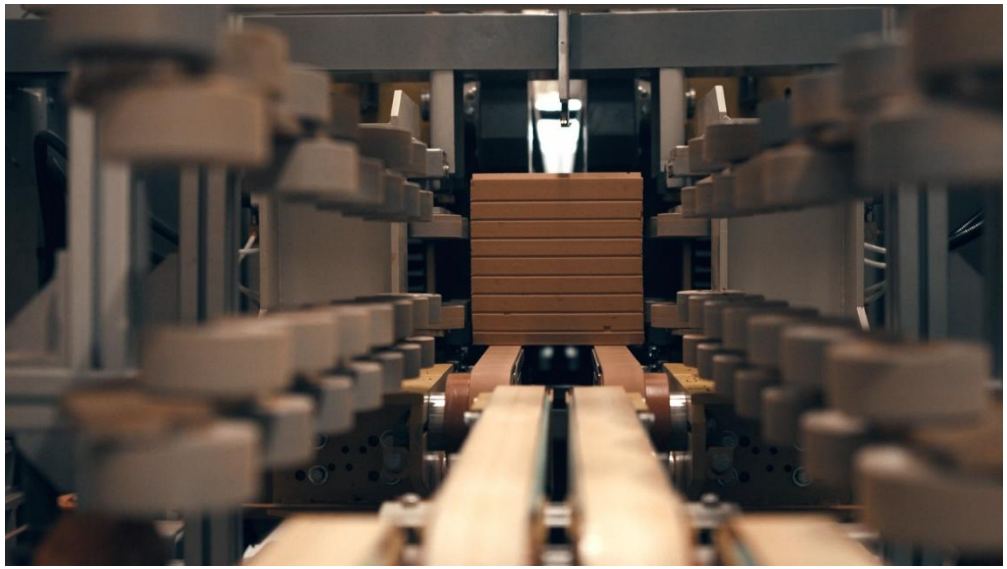
Type of grouping	Multiple products
Grouping method	Based on average results of product group - by total mass
Variation in GWP-fossil for A1-A3, %	0

This Environmental Product Declaration (EPD) is a Design EPD, representing a product-specific group average covering the rectified Evoceramic PLUS portfolio of fired clay masonry units to be manufactured at a single production facility: Cemacon S.A. – Biharia plant, Bihor County, Romania. This group excludes the standard (non-rectified) Evoceramic range manufactured at the same plant, which is covered by a separate EPD.
The technical characteristics within this product group cover a bulk density range from approximately 750 kg/m³ to 800 kg/m³, resulting in different hollow geometries, wall thicknesses, and thermal performance depending on the specific block layout.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.5. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

1. EN 15804:2012+A2:2019/AC:2021 – Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
2. ISO 14025:2006 – Environmental labels and declarations - Type III environmental declarations - Principles and procedures.
3. EN 771-1:2011+A1:2015 – Specification for masonry units - Part 1: Fired clay masonry units.
4. Primary operational data from Cemacon S.A. for the calendar year 2025 (internal bills of materials, energy logs, transport, and waste records for the standard Evoceramic range at the Biharia manufacturing plant, Bihor County), used as the foreground data basis for this Design EPD.
5. Internal engineering specifications and estimates for the rectification (grinding) process line at the Biharia plant, used to model the incremental electricity consumption and waste generation specific to the Evoceramic PLUS range, pending validation against actual operational data once commercial production begins.
6. Ecoinvent 3.12 database and One Click LCA platform – Background datasets used for upstream raw materials, energy grids, transport logistics, and end-of-life scenarios.



ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	-3,44E-01	1,97E+00	1,37E+02	1,39E+02	1,57E+01	2,01E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,80E+00	3,43E+00	3,10E+00	-9,66E+00
GWP – fossil	kg CO_2e	1,44E+01	1,97E+00	1,29E+02	1,45E+02	1,57E+01	1,40E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,79E+00	3,43E+00	3,10E+00	-8,05E+00
GWP – biogenic	kg CO_2e	-1,48E+01	4,12E-04	8,70E+00	-6,08E+00	8,13E-03	6,07E+00	ND	ND	ND	ND	ND	ND	ND	6,90E-04	1,94E-03	-7,52E-04	-4,98E-03	-1,60E+00
GWP – LULUC	kg CO_2e	1,66E-02	8,72E-04	1,29E-02	3,04E-02	5,51E-03	3,65E-03	ND	ND	ND	ND	ND	ND	ND	3,71E-04	3,47E-03	1,11E-03	1,04E-03	-7,78E-03
Ozone depletion pot.	kg $CFC\text{-}_{11}e$	1,44E-06	2,91E-08	8,13E-06	9,60E-06	3,57E-07	7,30E-07	ND	ND	ND	ND	ND	ND	ND	5,38E-08	1,94E-07	5,28E-08	9,60E-08	-8,61E-08
Acidification potential	mol H^+e	1,25E-01	6,84E-03	6,48E-01	7,80E-01	5,08E-02	7,55E-02	ND	ND	ND	ND	ND	ND	ND	3,24E-02	3,06E-02	3,00E-02	3,37E-02	-4,89E-02
EP-freshwater[2)]	kg Pe	1,21E-01	2,11E-04	7,48E-03	1,29E-01	1,12E-03	6,92E-03	ND	ND	ND	ND	ND	ND	ND	1,17E-04	6,51E-04	2,11E-04	5,05E-03	-2,90E-03
EP-marine	kg Ne	5,87E-02	2,26E-03	2,03E-01	2,64E-01	1,79E-02	2,61E-02	ND	ND	ND	ND	ND	ND	ND	1,51E-02	1,03E-02	1,37E-02	8,50E-03	-1,12E-02
EP-terrestrial	mol Ne	4,22E-01	2,45E-02	2,21E+00	2,65E+00	1,94E-01	2,69E-01	ND	ND	ND	ND	ND	ND	ND	1,65E-01	1,12E-01	1,50E-01	9,14E-02	-1,34E-01
POCP ("smog")[3)]	kg NMVOCe	1,10E-01	1,01E-02	5,94E-01	7,14E-01	8,38E-02	7,72E-02	ND	ND	ND	ND	ND	ND	ND	4,94E-02	4,80E-02	4,48E-02	3,34E-02	-3,91E-02
ADP-minerals & metals[4)]	kg Sbe	5,19E-04	5,64E-06	1,00E-04	6,25E-04	4,55E-05	2,24E-04	ND	ND	ND	ND	ND	ND	ND	1,30E-06	3,20E-05	2,11E-06	6,11E-06	-4,45E-05
ADP-fossil resources	MJ	8,15E+02	2,81E+01	1,43E+03	2,27E+03	2,28E+02	1,82E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,38E+02	4,55E+01	7,15E+01	-1,13E+02
Water use[5)]	m^3e depr.	5,21E+00	1,64E-01	3,53E+01	4,06E+01	1,32E+00	3,08E+00	ND	ND	ND	ND	ND	ND	ND	1,21E-01	6,76E-01	1,33E-01	4,29E-01	-1,12E+01

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	1,98E-06	1,93E-07	3,31E-06	5,48E-06	1,59E-06	1,26E-06	ND	ND	ND	ND	ND	ND	ND	9,25E-07	7,72E-07	6,17E-06	5,52E-07	-7,21E-07
Ionizing radiation[6)]	kBq U235e	8,21E-01	2,38E-02	1,88E+01	1,96E+01	2,46E-01	1,15E+00	ND	ND	ND	ND	ND	ND	ND	2,01E-02	1,75E-01	2,65E-02	9,44E-02	-8,64E-01
Ecotoxicity (freshwater)	CTUe	8,36E+02	5,77E+00	7,93E+02	1,63E+03	3,08E+01	3,37E+02	ND	ND	ND	ND	ND	ND	ND	2,69E+01	1,81E+01	4,55E+00	4,71E+01	-2,21E+02
Human toxicity, cancer	CTUh	3,26E-08	3,09E-10	1,40E-08	4,69E-08	2,48E-09	3,69E-09	ND	ND	ND	ND	ND	ND	ND	3,69E-10	1,67E-09	4,05E-10	1,31E-09	-2,06E-09
Human tox. non-cancer	CTUh	5,04E-07	1,75E-08	1,97E-07	7,19E-07	1,42E-07	8,37E-08	ND	ND	ND	ND	ND	ND	ND	5,80E-09	8,64E-08	8,96E-09	8,40E-08	-6,29E-08
SQP[7)]	-	2,39E+02	2,81E+01	5,87E+02	8,53E+02	2,31E+02	1,26E+02	ND	ND	ND	ND	ND	ND	ND	3,12E+00	8,26E+01	8,05E+00	1,73E+02	-8,43E+01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	-3,01E+01	3,93E-01	1,78E+02	1,48E+02	3,55E+00	-4,83E+01	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,37E+00	4,05E-01	1,49E+00	2,14E+00
Renew. PER as material	MJ	6,34E+01	0,00E+00	-3,43E+00	5,99E+01	0,00E+00	-5,99E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,59E+01
Total use of renew. PER	MJ	3,33E+01	3,93E-01	1,74E+02	2,08E+02	3,55E+00	-1,08E+02	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,37E+00	4,05E-01	1,49E+00	1,81E+01
Non-re. PER as energy	MJ	3,61E+02	2,81E+01	1,40E+03	1,79E+03	2,28E+02	1,36E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,38E+02	4,55E+01	7,15E+01	-1,13E+02
Non-re. PER as material	MJ	4,54E+02	0,00E+00	-4,21E+02	3,38E+01	0,00E+00	-3,38E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,86E+00
Total use of non-re. PER	MJ	8,15E+02	2,81E+01	9,77E+02	1,82E+03	2,28E+02	1,03E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,38E+02	4,55E+01	7,15E+01	-1,03E+02
Secondary materials	kg	5,65E-01	1,18E-02	3,20E-01	8,97E-01	9,69E-02	6,31E-02	ND	ND	ND	ND	ND	ND	ND	1,95E-02	6,29E-02	1,88E-02	2,38E-02	1,21E-01
Renew. secondary fuels	MJ	2,06E-03	1,54E-04	2,05E+00	2,05E+00	1,28E-03	1,03E-01	ND	ND	ND	ND	ND	ND	ND	5,12E-05	7,95E-04	6,77E-05	4,28E-04	-7,16E-04
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	1,56E-01	4,02E-03	5,01E-01	6,61E-01	3,02E-02	1,13E-01	ND	ND	ND	ND	ND	ND	ND	3,02E-03	1,85E-02	-1,44E-02	-8,43E-01	-2,58E-01

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	4,06E+00	1,79E-01	1,97E+00	6,20E+00	1,29E+00	5,24E-01	ND	ND	ND	ND	ND	ND	ND	5,29E-02	1,98E-01	5,76E-02	1,20E-01	-7,49E-01
Non-hazardous waste	kg	6,36E+02	3,55E+00	1,36E+02	7,76E+02	2,68E+01	9,84E+01	ND	ND	ND	ND	ND	ND	ND	7,71E-01	4,17E+00	2,47E+01	1,07E+03	-1,97E+01
Radioactive waste	kg	6,95E-04	5,69E-06	6,30E-03	7,00E-03	5,93E-05	4,69E-04	ND	ND	ND	ND	ND	ND	ND	4,93E-06	4,34E-05	6,49E-06	2,31E-05	-2,12E-04

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,47E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	7,18E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,39E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,95E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,44E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Radioactive waste, high	kg	3,17E-05	1,64E-06	4,25E-03	4,28E-03	1,52E-05	2,22E-04	ND	ND	ND	ND	ND	ND	ND	1,43E-06	1,08E-05	1,91E-06	5,52E-06	-5,51E-05
Radioactive waste, int/low	kg	6,64E-04	4,05E-06	1,52E-03	2,19E-03	4,41E-05	2,20E-04	ND	ND	ND	ND	ND	ND	ND	3,50E-06	3,26E-05	4,58E-06	1,76E-05	-1,57E-04

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	1,44E+01	1,97E+00	1,29E+02	1,45E+02	1,57E+01	1,40E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,79E+00	3,43E+00	3,10E+00	-8,06E+00

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH4 fossil, CH4 biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO2 is set to zero

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation

1. Natural gas, One Click LCA, 0.25 kgCO2e/kWh
2. Electricity, medium voltage, residual mix, Romania, Ecoinvent, 0.28 kgCO2e/kWh
3. Electricity production, photovoltaic, Romania, Ecoinvent, 0.0770 kgCO2e/kWh
4. Market for diesel, burned in building machine, World, Ecoinvent, 0.10 kgCO2e/MJ
5. Electricity, medium voltage, residual mix, Romania, Ecoinvent, 0.28 kgCO2e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Transport, freight, lorry, >32 metric ton, diesel, EURO 5, 148.0 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	85
Bulk density of transported products	755
Volume capacity utilization factor	<1

Installation at the building site (A5) - Scenario documentation

Scenario parameter	Value
Energy: type and consumption (MJ or kWh)	-
Water use (m^3)	tap water: 0.007 m3
Ancillary materials: type and mass (kg)	cement mortar: 23 kg
Waste materials: type and mass (kg)	50 kg ceramic bricks 3.96 kg wood pallets 0.52 kg plastic packaging
Waste materials: output routes	Brick waste: 70% recycled, 30% landfill Wood packaging: 32% recycled, 30% incineration, 38% landfill Plastic packaging: 40% recycled, 37% incineration, 23% landfill
Direct emissions (kg)	-

End of life (C1-C4) - Scenario documentation

Scenario information	Value
Collection process: collected separately (kg)	1022.3 kg
Collection process: Mixed waste (kg)	-
Recovery: re-use (kg)	0
Recovery: recycling (kg)	718
Recovery: energy recovery (kg)	0
Disposal (kg)	304
Scenario assumptions e.g. transportation (mode, km) & other	Landfill: 50km, Recycling: 50km.

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez
Tool verification validity: 27 March 2025 - 26 March 2028

Afzal khan Peerukhan as an authorized verifier for EPD Hub Limited 23.10.2026



ANNEX 1 – GWP VARIATION ACROSS PRODUCTS

Product	Mass (kg/m^3)	GWP total $KgCO2e/m^3$	Width of the wall (cm)	Thermal resistance (m^2K/W)	GWP Total $KgCO2e/m^2$
Evoceramic PLUS 30NF	780	108	30	1.44	32.5
Evoceramic PLUS 25NF	770	107	25	0.88	26.8
Evoceramic PLUS 15NF	800	111	15	0.52	16.7
Evoceramic PLUS 12NF	660	92	12	0.39	11.0
Evoceramic PLUS 10NF	770	107	10	0.42	10.7

