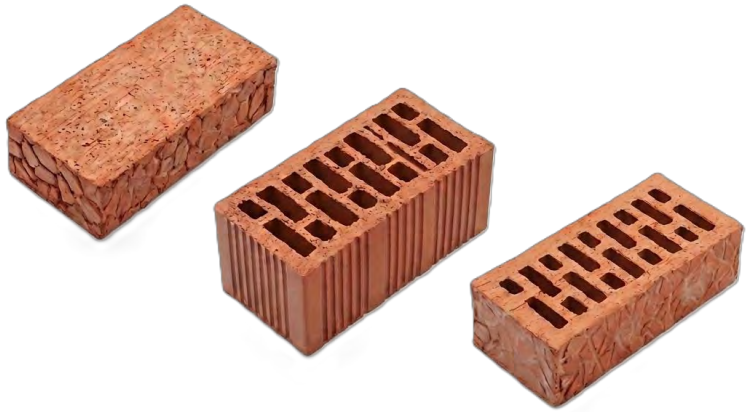



ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

LEIERTHERM FIRED CLAY BRICKS PLANT IASI C1
LEIER ROM SRL



EPD HUB, HUB-6923
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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.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Leier Rom SRL
Address	14 Cibinului Street, 400615, Cluj-Napoca, Cluj County, Romania
Contact details	info@leier.ro
Website	www.leier.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
Sector	Construction product
Category of EPD	Third party verified 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
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Haiha Nguyen as an authorized verifier for EPD Hub

This EPD is intended for business-to-business and/or business-to-consumer 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	LEIERTHERM FIRED CLAY BRICKS PLANT IASI C1
Additional labels	-
Product reference	-
Place(s) of raw material origin	Romania
Place of production	Romania, Iasi, Plant C1
Place(s) of installation and use	Romania, MD
Period for data	calendar year 2025
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3 (%)	- 0.5%
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	88,8

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tone
Declared unit mass	1000 kg
Mass of packaging	9,43 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	191
GWP-total, A1-A3 ($kgCO_2e$)	177
Secondary material, inputs (%)	0,06
Total energy use, A1-A3 (kWh)	574
Net freshwater use, A1-A3 (m^3)	0,52

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Company Overview

Founded in 1965, the Leier Group possesses over 60 years of experience and history in operating at full capacity within the construction materials industry across Europe. Present on the Romanian market since 2005 through LEIER ROM S.R.L., the group has established itself as a manufacturer of primary importance nationwide. Following a continuous strategy of reinvesting profits into plant modernization, technological upgrades, and production capacity expansion, Leier supports regional economic and social progress by driving private investment and creating numerous stable jobs.

Production Facilities and Strategic Presence

To ensure efficient distribution and to meet nationwide demand, Leier operates advanced, highly performing industrial facilities in strategic locations throughout Romania. The company's production footprint includes major manufacturing plants in Unirea (Alba County), Iași, Câțcău (Cluj County), Sighisoara (Mures County), and Feldioara (Brașov County). These modern units utilize advanced technologies and high-capacity machinery to deliver a comprehensive and diverse portfolio of construction materials that strictly comply with applicable European quality standards.

LEIER GROUP Eastern Europe plant network

PRODUCT DESCRIPTION

This Environmental Product Declaration covers the ceramic masonry blocks product ranges manufactured by LEIER ROM S.R.L. exclusively within plant C1 of its designated production plant in Iași. The Leier ceramic masonry line consists of various ceramic blocks and bricks designed for both structural and non-structural masonry applications. As the raw clay mix, manufacturing methodology, and essential raw materials are standardized across the designated production line—the environmental impact results are presented for 1 ton (1,000 kg) of finished product.
Additionally, the Annex to this EPD presents the specific GWP (Global Warming Potential) values obtained individually for each of the manufacturing configurations.

Product type: fired clay masonry units
Reference standard: EN 771-1+A1:2015

Construction and Materials
Leier fired clay bricks are engineered using specialized, optimized clay mixtures and burning processes to establish a highly durable, 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.

Manufacturing and Sustainability
The production process takes place specifically within Plant C1 at Leier's specialized ceramic manufacturing plant in Iași (Iași 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.
Microclimate & Health Safety: Burned at extreme temperatures 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: Manufactured to strict dimensional tolerances, these masonry units allow for rapid interlocking alignments, significantly reduced mortar mix consumption, short on-site construction times, and cleaner structural jobsites.

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

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	0	-
Minerals	96,2 – 94.3	Romania
Fossil materials	0	-
Bio-based materials	3,8 – 5.7	Romania

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	3,63

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tone
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	50 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 Leier fired clay masonry units. The formulation is based on a natural composition consisting primarily of clay as the structural mineral base, alongside ecological pore-forming agents. To optimize the internal porosity and thermal performance of the ceramic blocks, the mixture incorporates biogenic secondary materials and organic manufacturing residues, specifically sawdust and seed husks. 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 (1000 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 Leier Rom SRL manufacturing plant. It includes inbound logistics for primary clay, biogenic pore-forming additives, and facility operational components. The raw materials with the highest volume share are sourced locally from domestic suppliers within Romania to ensure optimal supply chain efficiency. Transport distances are derived directly from the company's internal logistics records, while vehicle types, load factors, and fuel consumption 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 fired clay masonry units. Key processes at the Leier manufacturing facility include:
- Preparation and Mixing: crushing, grinding, and precise dosing of clay, water, and pore-forming biogenic 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 bricks undergo controlled drying to remove moisture, followed by high-temperature firing in industrial kilns where structural sintering and ceramic bonding occur.
- Quality Control and Sorting: final inspection, structural verification, and sorting of the fired clay units prior to final packaging and storage.

Electricity modeling: The facility's electricity mix model incorporates specific operational grid inputs alongside local onsite renewable generation. 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.
Packaging: Includes the use of wood pallets, protective plastic films, and straps to ensure safe delivery, stable stacking, and weather-protected handling.
Waste Management: Manufacturing waste, including unfired scrap re-routed directly back into production, internal breakage, and packaging discards, is recorded and handled in accordance with internal environmental procedures. Waste streams consist primarily of ancillary materials and packaging waste. These materials are collected and transported to authorized local treatment facilities for recovery and recycling. All transport distances for waste do not exceed 50 km from the facility, utilizing standard road transport.

System boundary and cut-off criteria
For modules A1–A3, the system boundary includes all processes under Leier Rom SRL's control up to the factory gate (Cradle-to-Gate). 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
The data used reflect the actual production period of Leier Rom SRL's operations, specifically covering the calendar year 2025. Foreground data, including specific raw material consumption and specific packaging allocations, are collected directly from site-specific internal monitoring and operational records. Background data are derived from recognized LCA databases, specifically Ecoinvent v3.10.1/3.11/3.12 and One Click LCA. The representativeness of the data is verified, and all assumptions regarding 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 Leier fired clay masonry units from the manufacturing facility to the construction site. For Leier Rom SRL, based on operational data, this involves:
- Loading and securing: finished ceramic blocks are palleted and secured at the factory gate using wooden pallets, plastic films, and strapping to prevent structural displacement or breakage during transit.
- Logistics and volume: transport modeling is based on the bulk volume and high density of the masonry products. For the declared unit of 1 tonne, a representative specific volume is utilized to account for the internal hollow geometry and vehicle payload limits.
- Transport distances: the average transport distance is defined as 300 km, derived from internal logistics records and reflecting localized regional delivery routes.
- 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 Leier fired clay masonry units. The installation scenario is defined as follows:
- On-site handling: the installation process is entirely manual, involving the unpacking, lifting, and precise positioning of the ceramic units by masonry workers to form walls.
- Energy consumption: energy use during installation is completely manual. Since no mechanical machinery or power tools are required for placing the blocks, energy consumption is considered negligible and excluded.
- Auxiliary materials: to structurally bind the masonry units, the scenario incorporates specific auxiliary material inputs per declared unit, consisting of mortar and use of water.
- Installation losses: based on representative construction site assumptions, a product material loss rate of 3% is factored into this module, accounting for scrap generation during the manual laying phase.
Waste Management of Packaging: accounts for the collection and processing of all packaging materials removed during installation (wood pallets and plastic films). The end-of-life treatment for these materials is modeled using a split scenario to reflect 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.

System Boundary and Cut-Off Criteria

For Modules A4–A5, the system boundary includes all processes from the dispatch of finished masonry units at the Leier factory gate until the units are structurally placed into the building wall, including installation material losses and auxiliary inputs. Excluded processes include secondary infrastructure integration and final finishing plasterwork. Cut-off criteria ensure that neglected individual flows do not exceed 1% of total mass or energy, and total neglected flows do not exceed the 5% threshold of each inventory module, according to EN 15804+A2.

Data Quality and Representativeness

The data used reflect the logistics, auxiliary material formulations, and installation conditions recorded for Leier Rom SRL's operations covering the 2025 reference year.

- Foreground data: transport distances, specific installation mass inputs, 3% material loss rates, and manual installation methods are based on internal logistics records and site-specific operational assumptions.
- Background data: emission factors for transport, auxiliary materials, and waste treatment processes are sourced from the Ecoinvent database and One Click LCA, ensuring full compliance with current LCA standards.
- Scenario assumptions: all parameters regarding regional transport and manual installation are documented and verified for geographical and temporal representativeness.

PRODUCT END OF LIFE (C1-C4, D)

C1 – Deconstruction / Disassembly

At the end of its service life, the Leier clay masonry wall structure is dismantled during building deconstruction primarily through mechanical and manual demolition operations. The specific scenario accounts for the deconstruction of 1420 kg of total mass per declared unit, comprising 1000 kg of fired clay brick and 420 kg of mortar. The energy demand for sorting and separating the heavy masonry units on-site is considered minimal, and since the fired ceramic and mortar matrix is 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 inert material, containing both the fired clay blocks and structural mortar, is directed towards authorized construction and demolition waste processing facilities. The material undergoes mechanical crushing and screening to process them into secondary mineral aggregates, requiring 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. The processed inert mineral

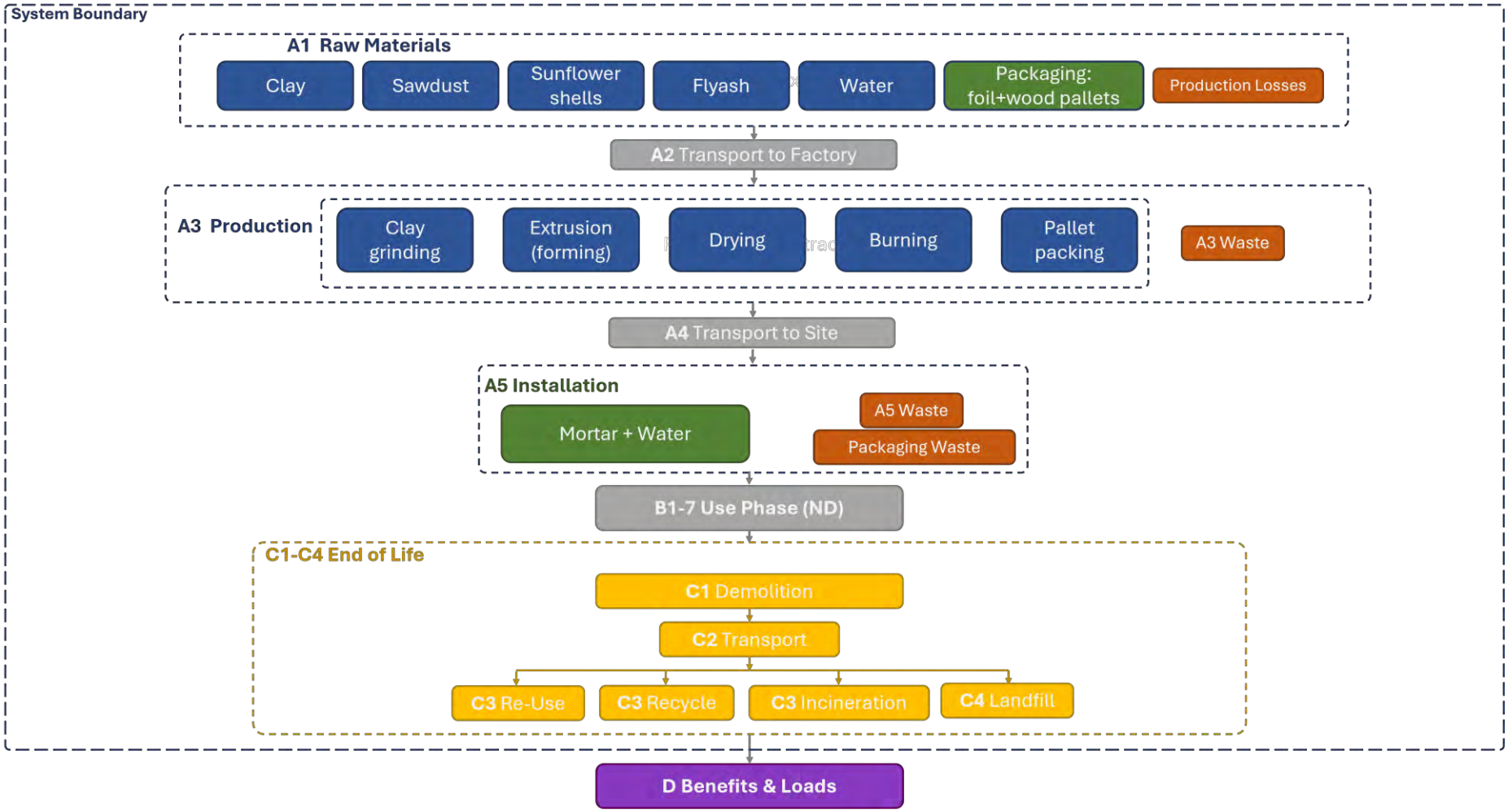
waste is handled through compliant non-hazardous pathways. Fired clay masonry and cured mortar are non-leaching, highly stable materials that do not undergo biochemical degradation; therefore, they do not generate greenhouse gas emissions, leachate, or environmental contamination when directed to compliant landfills or structural inert storage facilities.
The end-of-life treatment for masonry waste is modeled using a split scenario to reflect regional waste practices: 70% is recycled and 30% is landfilled. 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.
Net Flow Calculation: Net flows for recycling and recovery are determined by subtracting any secondary material inputs used in the production stage (A1-A3) from the total waste flows. The calculations in this module account for the multi-material benefits derived from the recycling of 1420 kg of masonry mass (fired clay brick plus mortar), alongside the recovery of packaging waste consisting of plastic packaging and wood packaging.
Mineral Recycling Credits: The mechanical processing of brick and mortar waste yields secondary recycled mineral aggregates. These secondary materials replace the need for extraction and production of virgin primary aggregates (such as natural gravel or crushed stone) in local road infrastructure and construction applications.
Packaging Recovery and Recycling: Benefits are also accounted for the recycling and energy recovery of packaging materials collected during the installation stage (Module A5). Credits are calculated for the avoided production of virgin raw materials, based on the specific recovery and split scenarios: plastic packaging (40% recycling, 37% incineration with energy recovery, 23% landfill) and wood packaging/pallets (32% recycling, 30% incineration with energy recovery, 38% landfill). The thermal treatment fraction replaces primary fossil fuels in regional energy networks, while the recycled fraction replaces virgin polymer and timber production.

Data Quality and Representativeness
The scenarios for Modules C and D reflect representative construction and demolition waste management practices and packaging recovery infrastructures.
Total mass configurations, transport distance for waste processing (50 km), packaging material formulations, and regional recycling split assumptions are derived from operational records 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.

LEIER ROM Plant Iasi

MANUFACTURING PROCESS AND SYSTEM BOUNDARY



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.
- 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.
- C1 Deconstruction energy: The mechanical energy and fuel consumption associated with dismantling equipment during building demolition, as the structural masonry fraction's share is negligible and falls below the cut-off thresholds.
- 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) were applied:
- Installation Scenario (Module A5): The installation process of the Leier fired clay bricks into the building matrix is assumed to be entirely manual, requiring no mechanical energy inputs. Materials used for jointing are modeled based on standard construction practices.

- Deconstruction Scenario (Module C1): The building disassembly and demolition process is assumed to be primarily mechanical in nature (utilizing standard heavy machinery). However, the specific energy and fuel share allocated to the structural clay masonry fraction per declared unit is considered negligible and falls below the cut-off criteria thresholds, resulting in no direct fuel inputs modeled for this stage.
- 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 1000 kg of fired clay bricks, an additional 420 kg of structural masonry mortar is assumed to be bound to the product, totaling 1420 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 of inert masonry waste (brick plus mortar) is modeled based on a specific split: 70% of the mass is assumed to be directed to recycling facilities for crushing and sorting into secondary mineral aggregates (generating environmental benefits in Module D), while the remaining 30% is allocated to compliant inert landfills for final disposal (Module C4).
- 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.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products
Grouping method	Based on a representative product
Variation in GWP-fossil for A1-A3, %	- 0.5%

This Environmental Product Declaration (EPD) represents a product-specific weighted group average covering the entire portfolio of fired clay masonry units manufactured at a single production facility: Leier Rom SRL – Iași, Plant C1. The LCA results represent the weighted average impact calculated based on the total annual production volume of the participating products.

The technical characteristics within this product group cover a bulk density range from approximately 600 kg/m³ to 1600 kg/m³, resulting in different geometries depending on the specific block layout. The maximum variation in the climate impact (GWP-fossil) between the individual products within the group is approximately -0.5% and is present due to slight differences in the recipe's organic material content (sawdust) used across the product range. While the main environmental indicators are declared per 1 metric ton of average product to ensure consistency, an explicit breakdown of the Global Warming Potential (GWP-fossil) for each individual product configuration, based on its specific density (kg/m3), is provided in Annex 1 of this document to ensure maximum transparency and eliminate any ambiguity regarding product variation.

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 Leier Rom S.R.L. for the calendar year 2025 (internal bills of materials, energy logs, transport, and waste records for the Iași manufacturing plant).
5. Ecoinvent 3.10 or newer 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	-1,19E+02	3,75E+00	2,93E+02	1,77E+02	3,22E+01	8,44E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	1,19E+01	9,94E+00	4,87E+00	-1,55E+01
GWP – fossil	kg CO_2e	1,56E+01	3,75E+00	1,71E+02	1,91E+02	3,22E+01	7,02E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	1,19E+01	9,94E+00	4,87E+00	-1,19E+01
GWP – biogenic	kg CO_2e	-1,35E+02	6,97E-04	1,21E+02	-1,33E+01	7,28E-03	1,42E+01	ND	ND	ND	ND	ND	ND	ND	6,90E-04	2,43E-03	-8,58E-03	-5,40E-03	-3,54E+00
GWP – LULUC	kg CO_2e	2,38E-02	1,54E-03	2,11E-02	4,65E-02	1,44E-02	2,71E-02	ND	ND	ND	ND	ND	ND	ND	3,71E-04	4,43E-03	1,52E-02	4,77E-03	-1,18E-02
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	1,46E-06	6,55E-08	1,24E-05	1,40E-05	4,75E-07	4,17E-06	ND	ND	ND	ND	ND	ND	ND	5,38E-08	2,26E-07	1,57E-07	1,31E-07	-1,26E-07
Acidification potential	mol H^+e	1,35E-01	1,27E-02	4,99E-01	6,47E-01	1,10E-01	3,45E-01	ND	ND	ND	ND	ND	ND	ND	3,24E-02	3,79E-02	7,28E-02	4,46E-02	-7,29E-02
EP-freshwater[2)]	kg Pe	2,97E-03	3,56E-04	6,96E-03	1,03E-02	2,50E-03	1,43E-03	ND	ND	ND	ND	ND	ND	ND	1,17E-04	8,17E-04	2,40E-03	5,17E-03	-4,41E-03
EP-marine	kg Ne	3,82E-02	4,29E-03	1,98E-01	2,41E-01	3,60E-02	8,75E-02	ND	ND	ND	ND	ND	ND	ND	1,51E-02	1,27E-02	2,88E-02	1,29E-02	-1,66E-02
EP-terrestrial	mol Ne	4,62E-01	4,65E-02	2,15E+00	2,66E+00	3,92E-01	9,76E-01	ND	ND	ND	ND	ND	ND	ND	1,65E-01	1,38E-01	3,13E-01	1,39E-01	-1,97E-01
POCP ("smog")[3)]	kg NMVOCe	1,26E-01	1,94E-02	7,24E-01	8,69E-01	1,62E-01	2,69E-01	ND	ND	ND	ND	ND	ND	ND	4,94E-02	5,88E-02	9,76E-02	4,93E-02	-5,73E-02
ADP-minerals & metals[4)]	kg Sbe	5,18E-04	1,08E-05	1,36E-04	6,65E-04	8,97E-05	3,58E-03	ND	ND	ND	ND	ND	ND	ND	1,30E-06	3,79E-05	2,00E-05	1,00E-05	-6,46E-05
ADP-fossil resources	MJ	3,37E+02	5,39E+01	1,85E+03	2,24E+03	4,67E+02	6,05E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,69E+02	1,42E+02	1,01E+02	-1,66E+02
Water use[5)]	m^3e depr.	4,65E+00	3,13E-01	3,51E+01	4,01E+01	2,31E+00	1,41E+01	ND	ND	ND	ND	ND	ND	ND	1,21E-01	8,29E-01	7,27E-01	5,42E-01	-1,62E+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	2,85E-06	3,71E-07	2,63E-06	5,85E-06	3,22E-06	4,00E-06	ND	ND	ND	ND	ND	ND	ND	9,25E-07	9,86E-07	9,42E-06	1,40E-06	-1,06E-06
Ionizing radiation[6)]	kBq U235e	1,25E+00	4,98E-02	1,57E+01	1,70E+01	4,06E-01	2,98E+00	ND	ND	ND	ND	ND	ND	ND	2,01E-02	2,02E-01	1,83E-01	1,16E-01	-1,36E+00
Ecotoxicity (freshwater)	CTUe	5,99E+02	9,75E+00	4,89E+02	1,10E+03	6,60E+01	1,14E+03	ND	ND	ND	ND	ND	ND	ND	2,69E+01	2,25E+01	4,63E+01	5,34E+01	-3,30E+02
Human toxicity, cancer	CTUh	3,22E-08	5,90E-10	2,42E-08	5,70E-08	5,31E-09	1,79E-08	ND	ND	ND	ND	ND	ND	ND	3,69E-10	2,02E-09	2,01E-09	1,67E-09	-3,04E-09
Human tox. non-cancer	CTUh	5,09E-07	3,35E-08	2,44E-07	7,86E-07	3,02E-07	5,56E-07	ND	ND	ND	ND	ND	ND	ND	5,80E-09	1,07E-07	7,98E-08	9,61E-08	-9,31E-08
SQP[7)]	-	1,32E+03	5,40E+01	1,21E+03	2,59E+03	4,70E+02	1,16E+03	ND	ND	ND	ND	ND	ND	ND	3,12E+00	1,14E+02	1,01E+02	2,08E+02	-1,24E+02

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	-3,66E+02	7,81E-01	2,26E+02	-1,39E+02	6,40E+00	-9,43E+01	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,80E+00	3,09E+00	1,83E+00	1,17E+01
Renew. PER as material	MJ	5,80E+02	0,00E+00	-4,47E+02	1,33E+02	0,00E+00	-1,33E+02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,52E+01
Total use of renew. PER	MJ	2,14E+02	7,81E-01	-2,22E+02	-6,81E+00	6,40E+00	-2,27E+02	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,80E+00	3,09E+00	1,83E+00	4,69E+01
Non-re. PER as energy	MJ	3,37E+02	5,39E+01	1,81E+03	2,20E+03	4,67E+02	5,77E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,69E+02	1,42E+02	1,01E+02	-1,66E+02
Non-re. PER as material	MJ	0,00E+00	0,00E+00	3,75E+01	3,75E+01	0,00E+00	-3,75E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,37E+01
Total use of non-re. PER	MJ	3,37E+02	5,39E+01	1,85E+03	2,24E+03	4,67E+02	5,39E+02	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,69E+02	1,42E+02	1,01E+02	-1,53E+02
Secondary materials	kg	5,70E-01	2,27E-02	5,81E-01	1,17E+00	1,99E-01	5,50E-02	ND	ND	ND	ND	ND	ND	ND	1,95E-02	7,62E-02	5,73E-02	3,47E-02	1,40E-01
Renew. secondary fuels	MJ	2,37E-03	2,97E-04	4,49E+00	4,50E+00	2,52E-03	1,35E-01	ND	ND	ND	ND	ND	ND	ND	5,12E-05	9,63E-04	4,99E-04	5,72E-04	-1,04E-03
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	5,94E-02	7,51E-03	4,54E-01	5,21E-01	6,90E-02	2,20E+00	ND	ND	ND	ND	ND	ND	ND	3,02E-03	2,31E-02	-3,18E-01	-8,28E-01	-3,75E-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	3,76E+00	3,30E-01	1,93E+00	6,03E+00	7,91E-01	2,06E+00	ND	ND	ND	ND	ND	ND	ND	5,29E-02	2,50E-01	2,89E-01	1,63E-01	-1,11E+00
Non-hazardous waste	kg	1,70E+02	6,63E+00	1,15E+02	2,92E+02	1,46E+01	1,12E+02	ND	ND	ND	ND	ND	ND	ND	7,71E-01	5,14E+00	4,55E+02	1,07E+03	-2,89E+01
Radioactive waste	kg	7,84E-04	1,20E-05	5,56E-03	6,35E-03	9,95E-05	2,27E-03	ND	ND	ND	ND	ND	ND	ND	4,93E-06	5,00E-05	4,45E-05	2,83E-05	-3,34E-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	3,07E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	1,04E+03	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	1,79E+01	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	7,55E+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	1,04E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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	1,56E+01	3,75E+00	1,71E+02	1,91E+02	3,22E+01	7,03E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	1,19E+01	9,95E+00	4,88E+00	-1,20E+01

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, Ecoinvent, 0.10 kgCO2e/MJ

Transport scenario documentation - A4 (Transport resources)

1. Market for transport, freight, lorry >32 metric ton, EURO5, 296.0 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	85
Bulk density of transported products	878
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: 0.02 m3
Ancillary materials: type and mass (kg)	cement mortar: 420 kg
Waste materials: type and mass (kg)	30 kg ceramic bricks 8.76 kg wood pallets 0.67 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)	1420 kg
Collection process: Mixed waste (kg)	-
Recovery: re-use (kg)	0
Recovery: recycling (kg)	1040
Recovery: energy recovery (kg)	0
Disposal (kg)	380
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.

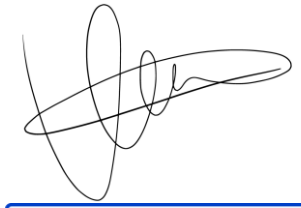
The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

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

Haiha Nguyen as an authorized verifier for EPD Hub Limited 17.07.2026



ANNEX 1 – GWP VARIATION ACROSS PRODUCTS

Name	Mass (kg/m3)	GWP total KgCO2e/m3	GWP Fossil KgCO2e/m3
Leier CE	920	163	175
Leier CF	1085	192	207
Leier CF1	1085	192	207
Leier CP	1530	271	292
Leier CP1	1530	271	292
Leier CP Plus	1280	227	244
Leier CV D170/238	590	105	113
Leier CV D210	550	98	105