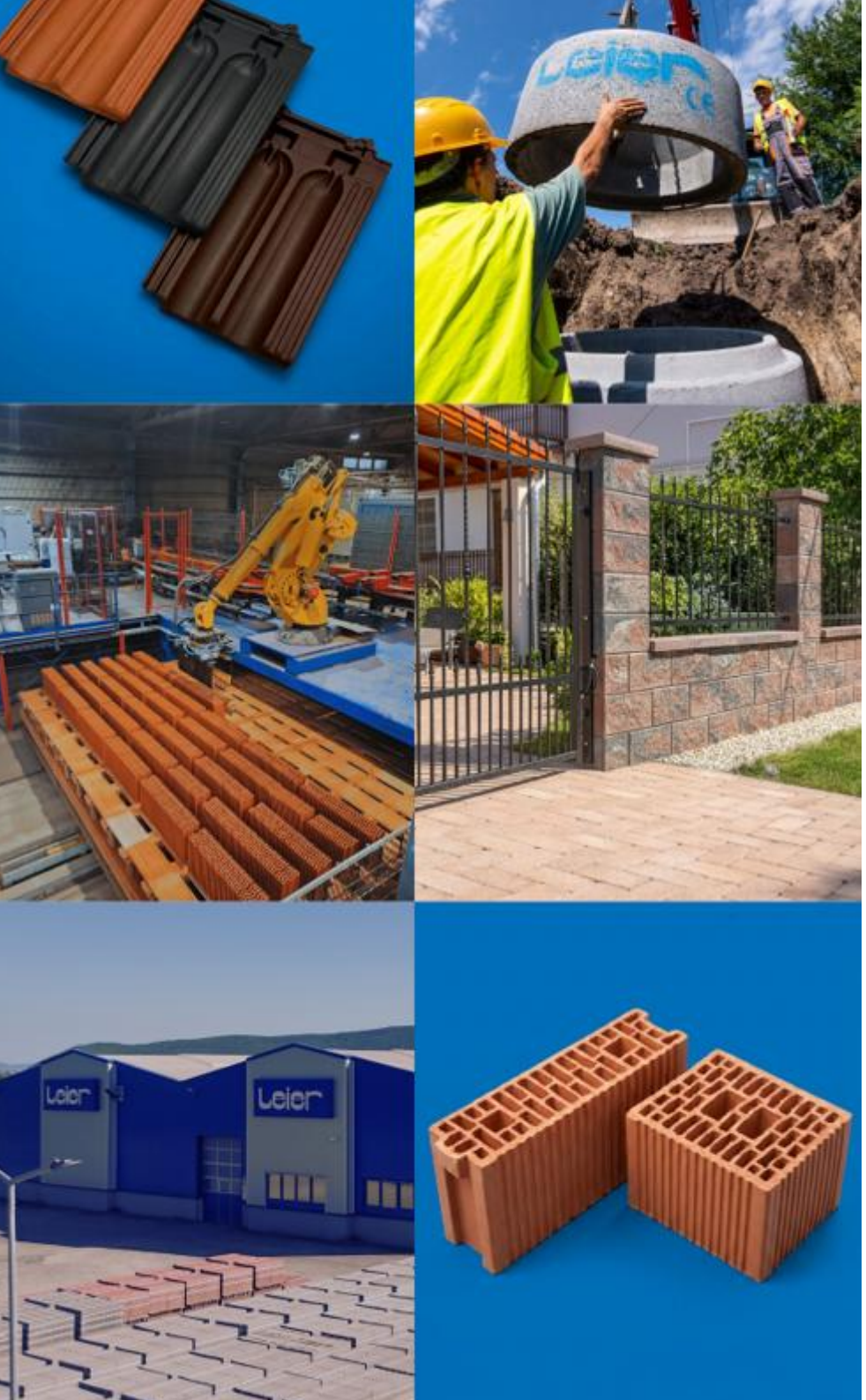


ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

PRECAST CONCRETE SHALLOW GUTTERS
LEIER ROM SRL

EPD HUB, HUB-6718
Published on 19.06.2026, last updated on 19.06.2026, valid until 18.06.2031

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 EN 16757 Product Category Rules for concrete and concrete elements
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	Afzal khan Peerukhan 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	Precast concrete shallow gutters
Additional labels	-
Product reference	-
Place(s) of raw material origin	Romania, Hungary, Austria
Place of production	Romania: Catcau village, Cluj county; Iasi, Iasi county,
Place(s) of installation and use	Romania, EU
Period for data	calendar year 2025
Averaging in EPD	Multiple factories
Variation in GWP-fossil for A1-A3 (%)	-2.9%; +3.0%
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	87,5

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tonne
Declared unit mass	1000 kg
Mass of packaging	4,398 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	104
GWP-total, A1-A3 ($kgCO_2e$)	98,1
Secondary material, inputs (%)	0,49
Total energy use, A1-A3 (kWh)	284
Net freshwater use, A1-A3 (m^3)	1,63

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 leading 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), 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 plants network in Eastern Europe

PRODUCT DESCRIPTION

This Environmental Product Declaration covers the precast concrete shallow gutters product ranges manufactured by LEIER ROM S.R.L. exclusively within its designated production plants. The Leier concrete drainage line is defined by a dual-layer structure. As the concrete mix, manufacturing methodology, and essential raw materials are simmillar across the production plants—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 plants.

Technical Characteristic	Value / Property	Reference Standard
Precast Concrete Gutters	-	EN 1433:2003 EN 1433:2003/A1:2006
Water Tightness	No leakage	EN 1433:2003 EN 1433:2003/A1:2006
Weather Resistance (Water Absorption)	Class 2 W (Maximum 6%)	EN 1433:2003 EN 1433:2003/A1:2006
Resistance to Freeze-Thaw with De-icing Salts	Class 3 D (≤ 1.0 kg/m²)	EN 1433:2003 EN 1433:2003/A1:2006

Construction and Materials
Leier precast concrete shallow gutters are engineered using specialized, optimized concrete recipes to establish a highly durable and stable configuration:
- concrete load-bearing core: formulated from optimized high-strength concrete to ensure high structural stability and resistance against loads, mechanical stress and dynamic vehicular traffic forces.
- surface wear layer / finish: formulated utilizing high-purity aggregates and sand to guarantee superior abrasion resistance, optimized water flow kinetics and long-term protection against severe environmental conditions.

Manufacturing and Sustainability
The production process takes place across Leier's indicated concrete manufacturing plants in Romania, situated in Câțcău village (Cluj county) and Iași (Iași county), operating under standardized industrial protocols. The manufacturing process relies on natural raw materials, establishing a clean, mineral-based ecological profile.

Product Benefits
Optimized water management: the structural design of the shallow gutters allows stormwater to be naturally collected and efficiently guided toward the regional discharge networks. This surface water management avoids localized ponding, mitigates erosion or flooding risks on adjacent road surfaces, and preserves the structural integrity of the surrounding infrastructure.
Microclimate & chemical preservation: the shallow drainage elements resist severe freeze-thaw cycles and chemical de-icing agents, maintaining high hydraulic performance without degrading the local soil or groundwater environment.
Longevity & Circular Economy: the inherent structural durability of the concrete layout provides high resistance to mechanical wear, frost, and hydrocarbon actions. In the event of underground infrastructure, utility interventions, or landscape redesigns, the precast gutter units can be easily dismantled and completely reinstalled without damage, avoiding material disposal and eliminating the need for replacement resources.
Precision & Execution Efficiency: the elements are manufactured to precise dimensional tolerances, ensuring quick installation, structural uniformity, seamless surface alignment, and easy coupling with adjacent paving systems at any time.
Environmental Transparency: by providing certified data calculated per tonne for the products manufactured at these locations, Leier enables architects, civil engineers, developers, and green building assessors to

accurately compute the environmental footprint of customized infrastructure layouts to fulfill LEED, BREEAM, or other international certification requirements.
Secure Delivery: finished precast concrete shallow gutters are delivered securely on pallets, optimized for transport efficiency, safe handling, and vehicular loading from the regional production plants.

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

PRODUCT RAW MATERIAL MAIN COMPOSITION

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

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0,03
Biogenic carbon content in packaging, kg C	1,74

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tonne
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		
×	×	×	×	×	ND	ND	ND	ND	ND	ND	ND	×	×	×	×	×		
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 used in the manufacture of Leier Rom SRL precast concrete shallow gutters. The product formulation is based on a mineral-intensive composition, relying on natural raw materials to establish a clean, mineral-based ecological profile. The main raw material inputs consist of aggregates and cement, supplemented by concrete admixtures used in dual-layer engineered structure — a structural load-bearing concrete core and a high-purity aggregates surface wear layer or finish. The environmental burdens of all material inputs are tracked and allocated to the declared unit of 1 tonne of finished product, utilizing the Ecoinvent v3.10.1/3.11/3.12 database to model the upstream impacts of raw material production.

A2 – Transport to factory
This stage covers the transportation of raw materials from suppliers to the Leier Rom SRL manufacturing plants located in Câțcău village (Cluj County) and Iași (Iași County), Romania. The primary raw materials originate mainly from Romania. Transport distances are derived from actual logistics records, while vehicle types, load factors and fuel consumption are modeled based on operational data. Standard road freight using lorries over 32 metric tons (EURO 5, diesel) is assumed. Assumptions on empty-return trips and load consolidation are specified in the LCA modelling to reflect regional transport infrastructure.

A3 – Manufacturing, Finishing and Packaging
In this stage, raw materials are transformed into finished precast concrete drainage products at Leier's two Romanian manufacturing facilities. Key processes include:
- Batching and mixing: precise dosing and mixing of cement, aggregates,

and admixtures to produce optimized concrete recipes for both the structural load-bearing core and the surface wear layer.
- Pressing and curing: the concrete mixture is formed using high-capacity industrial presses and vibropressing technology, followed by controlled curing to achieve the required mechanical strength and hydraulic surface properties.
- Quality control: the shallow gutters undergo quality control to meet the applicable technical standards, including freeze-thaw resistance with de-icing salts, weather resistance, and required load-bearing capacity.

Electricity modeling: the environmental impact of electricity consumption during the manufacturing stage (A3) is calculated using a market-based approach, as mandated by the EPD Hub PCR. The production facilities utilize a combination of self-generated solar power from the factories' on-site photovoltaic installations (0.0770 kgCO2e/kWh) and purchased electricity mapped to the national grid residual mix (0.33 kgCO2e/kWh).
Packaging: finished items are securely palletized using softwood pallets alongside protective films and securing bands to guarantee safe delivery, structural stability, and efficient vehicle loading.
Waste Management: materials lost during the manufacturing process, internal production losses and ancillary streams are strictly recorded. Manufacturing waste and packaging scraps are collected, sorted and sent to authorized local partners for recycling or proper disposal in compliance with industrial environmental protocols.

System boundary and cut-off criteria
For modules A1–A3, the system boundary is established as Cradle-to-Gate, including all major extraction, transport, and manufacturing processes under the direct control of LEIER ROM S.R.L.. Per the applied PCR and reference standards, the production of capital equipment, construction activities, infrastructure maintenance, and personnel-related operational energy or water flows are explicitly excluded from the inventory. Cut-off criteria ensure that no mandatory unit processes or major raw material and energy flows are omitted. There are no neglected unit processes exceeding 1% of the total mass or energy flows, and the cumulative neglected inputs across the product stage do not exceed 5% of total energy or mass inventory.

Data quality and representativeness
The lifecycle inventory data utilized within this study reflect the actual production operations of LEIER ROM S.R.L. for the specific calendar year 2025. All specific foreground data, including material inputs, packaging weights, transport logistics, and site-specific energy profiles, were collected directly from the manufacturing plants in Câțcău village and Iași. Upstream background processes are modeled using high-quality data from recognized sources, primarily Ecoinvent v3.10.1/3.11/3.12, calculated via the One Click LCA EPD Generator tool. The plausibility and consistency of the combined plant data have been fully examined, ensuring high geographical, technological, and time-specific representativeness for the Romanian and wider EU context.

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 precast concrete shallow gutters from the designated manufacturing facilities to the construction or installation site. The average transport distance to the construction site is ~68 km. This representative value is derived directly from internal operational data, reflecting the distribution matrix from the regional manufacturing facilities to installation sites across Romania.

A5 – Installation into the Building / Infrastructure
This stage covers the on-site layout and structural installation of Leier precast concrete shallow gutters into infrastructure configurations.
Energy consumption: the operational energy required for on-site execution—including the use of unloading equipment, material handling machinery, and specific lifting or positioning infrastructure equipment—is modeled with a specific energy consumption of 14 kWh of primary fuel energy equivalent per declared unit of 1 tonne.
Installation losses: material flows account for a product installation loss rate of 3% to accurately reflect on-site cutting, shaping and fitting waste generated directly during the construction and infrastructure alignment process.
Waste Management of Packaging: accounts for the collection and environmental treatment of all packaging materials removed during the site installation phase. Based on the unified core environmental indicators, the end-of-life treatment for the packaging material mass is modeled through a verified system scenario:
- Softwood Pallets and Related Packaging: the processing matrix covers the management of the:
- 4.2 kg of wood packaging material, where waste handling and specific output routes are tracked under a split recovery approach: 32% recycliing, 30% incineration and 38% landfill.
- 0.2 kg of plastic packaging tracked as: 40% recycling, 37% incineration and 23% landfill.

System Boundary and Cut-Off Criteria
Per the reference standards and the applied PCR, any external structural integration, bedding concrete, mortar joints, or infrastructure layers not under the direct control of the product formulation are excluded from the boundaries. No mandatory processes or known hazardous materials are excluded, ensuring that any neglected energy or mass flows do not exceed 1% of total flows for any single unit process and do not exceed 5% of the cumulative inventory for the entire product stage.

Data Quality and Representativeness
The data used reflect the logistics and structural installation profiles recorded for Leier operations during the calendar year 2025:
- Foreground data: logistics indicators, specific packaging mass, on-site utility consumption and transport parameters are based on direct operational parameters. Transport to the building site is modeled using standard heavy-duty vehicles, specifically Euro 5 freight lorries with a gross vehicle weight exceeding 32 metric tons.
- Background data: environmental data sources and upstream database indicators are sourced from recognized sources, primarily Ecoinvent v3.10.1/3.11/3.12, utilizing characterization factors according to EN 15804:2012+A2:2019/AC:2021.
Scenario assumptions: all logistical and construction calculations—including transport distancesand specific machine energy profiles—are verified for strict technological, temporal, and geographical representativeness for the Romanian market contexts.

PRODUCT END OF LIFE (C1-C4, D)

C1 – Deconstruction / Demolition
At the end of its reference service life (RSL of 50 years), the precast concrete shallow gutters are removed from the drainage installation infrastructure. The deconstruction process is primarily mechanical, involving standard demolition or lifting machinery used in civil engineering infrastructure projects. Based on the life-cycle assessment parameters, the environmental impacts and energy inputs during this initial removal stage are accounted for under standard mechanical demolition protocols. As the concrete channel matrix is fully cured and chemically inert, no volatile organic compounds or hazardous emissions are released during deconstruction.
C2 – Transport to Waste Processing Facilities

Following deconstruction, the discarded concrete drainage waste materials are loaded and transported to authorized regional collection points, recycling facilities, or final disposal yards. For the LCA model, the transport distance to waste processing and final treatment facilities is defined as 50 km. The transport module covers the direct exhaust emissions of the transport vehicles, fuel production impacts, and associated infrastructure burdens, modeled using standard heavy-duty transport datasets from the Ecoinvent database to ensure regional technological representativeness.

C3 – Waste Processing

This stage involves the sorting, crushing, and physical preparation of the discarded concrete elements destined for material recovery. Per the life-cycle inventory data and the applied end-of-life scenario, 70% of the product mass is directed toward recycling pathways. The concrete shallow gutters are crushed down into recycled concrete aggregates (RCA) to be prepared for secondary applications in road construction, sub-base layers, or new concrete formulations, supporting a low-waste circular economy model.

C4 – Final Disposal

The final disposal scenario accounts for the remaining fraction that cannot be recovered or recycled through secondary streams. According to the specific end-of-life parameters established for this product family, 30% of the material mass is sent to compliant non-hazardous landfills for inert waste. The concrete matrix is a non-leaching, structurally stable mineral material that does not contain any REACH SVHC substances, ensuring it does not generate dangerous landfill gases or environmental leaching contamination during final disposal.

Module D – Benefits and Loads Beyond the System Boundary

The recycling of concrete elements and the associated recovery of packaging materials at the end-of-life provide significant environmental benefits beyond the system boundary, which are reported as negative environmental impacts (credits) in Module D.

Net Flow Calculation: Net flows for recycling are determined by accounting for the total end-of-life waste recovery flows directed to recycling pathways. As the precast concrete shallow gutters are manufactured utilizing 100% virgin, primary raw materials without any secondary material inputs during the raw material supply stage (A1-A3), the net output flow equals the full amount of crushed concrete aggregates successfully recovered at the end-of-life stage.

Material Recycling Credits: The structural recovery of concrete aggregates (originating from the 70% recycled product fraction) replaces the demand for virgin, primary mineral aggregates in the regional construction market, significantly reducing the abiotic depletion of natural mineral resources.

Packaging Recovery Benefits: Module D also incorporates the net benefits generated by the recycling and energy recovery of packaging materials collected during the installation stage (Module A5). This includes credits from exported energy generated during controlled thermal processing, substituting the need for primary grid energy and fossil fuels.

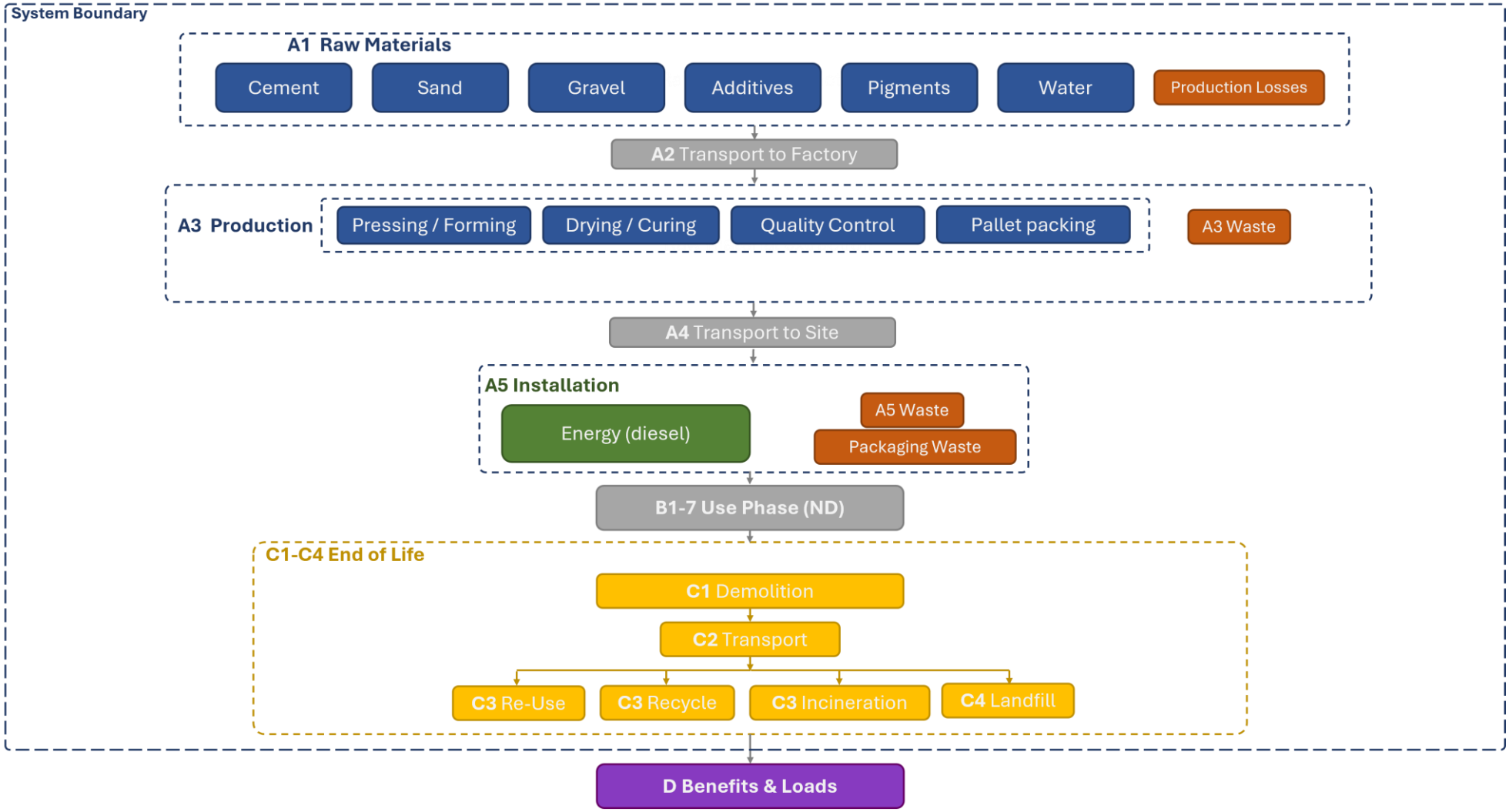
Data Quality and Representativeness

The scenarios modeled for Modules C and D fully reflect verified concrete waste management and circular economy practices within the targeted European infrastructure markets:

Foreground data: specific transport distances (50 km), end-of-life allocation split (70% recycling / 30% landfill), recycling rates, product composition, and packaging variables are sourced directly from time- and site-specific information provided by the manufacturer.

Background data: Environmental impact factors for mechanical processing, material recycling, landfilling, and primary energy substitution are derived from the Ecoinvent v3.10.1/3.11/3.12 databases using the 'Cut-Off, EN 15804+A2' allocation method, calculated via the One Click LCA EPD Generator tool.

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 EN 15804+A2 and the EPD Hub PCR, the following flows and processes have been excluded from the system boundaries of this study as they fall below the 1% mass/energy cut-off threshold or are outside the product system control:
Personnel-related impacts: Employee commuting, business travel, and daily office-administrative activities (e.g., administrative paper waste) within the two manufacturing plants.
Capital goods, maintenance, and infrastructure: The environmental manufacturing impacts associated with production machinery, factory buildings, storage infrastructure, and transport vehicles. This explicitly includes machine spare parts and general equipment maintenance lubricants/greases, as their environmental load is distributed over long operational lifespans and falls outside the product system boundary.
On-site installation auxiliary exceptions: Infrastructure bedding elements, secondary drainage integrations, or external road-laying works that are not under the direct technical formulation control of the Leier concrete gutters themselves (Module A5).
No hazardous materials or known regulated substances under the REACH SVHC candidate list have been deliberately excluded from the inventory.

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	No allocation
Packaging material	Physical Properties
Ancillary materials	Physical Properties
Manufacturing energy and waste	Physical Properties

-

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple factories
Grouping method	Based on average results of product group - by total mass
Variation in GWP-fossil for A1-A3, %	-2.9%; +3.0%

This multi-site EPD represents the production-share-weighted average of concrete gutters products manufactured by LEIER ROM S.R.L. across two distinct production facilities located in Romania: Câțcău (Cluj county) and Iași (Iași county).
Geographical Coverage: 100% of the manufacturing data is sourced from production plants located within Romania, ensuring comprehensive regional representativeness for the Romanian and broader Eastern/Central European infrastructure markets.
Technical and Product Description: The EPD covers a standardized group of precast concrete gutters. The assessed products shares a similar raw material matrix (consisting of cement, natural and crushed mineral aggregates, water, and performance admixtures) with a standard concrete bulk density profile of approximately 2350 kg/m³.
Sampling and Data Quality: No sampling was applied; 100% of the relevant manufacturing sites under the manufacturer's operational control provided primary inventory data. The foreground data collected covers the complete calendar year 2025, ensuring high temporal representativeness.
Impact Variation: The environmental impacts across the different facilities are highly consistent. The specific Global Warming Potential (GWP) variation between the individual production sites and the calculated weighted average is strictly between -2.9% and +3.0%, which is well below the ±10% threshold. To maintain absolute transparency, a factory-specific GWP breakdown table is included in the final section of this EPD document.

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 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
2. EN 16757:2023 - Sustainability of construction works - Environmental product declarations - Product Category Rules for precast concrete products.
3. ISO 14025:2006 - Environmental labels and declarations - Type III environmental declarations - Principles and procedures.
4. EN 1433:2003 - Drainage channels for vehicular and pedestrian areas
5. 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 Câțcău and Iași plants).

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	8,62E+01	1,09E+01	9,69E-01	9,81E+01	7,59E+00	1,52E+01	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,97E+00	1,79E-01	1,93E+00	-1,24E+01
GWP – fossil	kg CO_2e	8,60E+01	1,09E+01	7,33E+00	1,04E+02	7,59E+00	8,83E+00	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,96E+00	1,78E-01	1,93E+00	-1,07E+01
GWP – biogenic	kg CO_2e	1,31E-01	2,49E-03	-6,37E+00	-6,24E+00	1,74E-03	6,37E+00	ND	ND	ND	ND	ND	ND	ND	6,90E-04	1,97E-03	3,83E-04	-6,14E-04	-1,69E+00
GWP – LULUC	kg CO_2e	3,24E-02	4,84E-03	7,60E-03	4,48E-02	3,38E-03	2,19E-03	ND	ND	ND	ND	ND	ND	ND	3,71E-04	3,52E-03	5,27E-04	1,10E-03	-1,04E-02
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	4,57E-06	1,58E-07	1,78E-07	4,90E-06	1,10E-07	2,28E-07	ND	ND	ND	ND	ND	ND	ND	5,38E-08	1,98E-07	2,98E-09	5,59E-08	-9,52E-08
Acidification potential	mol H^+e	2,35E-01	3,78E-02	4,16E-02	3,14E-01	2,64E-02	5,64E-02	ND	ND	ND	ND	ND	ND	ND	3,24E-02	3,11E-02	8,97E-04	1,37E-02	-6,66E-02
EP-freshwater[2)]	kg Pe	2,61E-03	1,18E-03	1,46E-03	5,26E-03	8,22E-04	3,88E-04	ND	ND	ND	ND	ND	ND	ND	1,17E-04	6,60E-04	1,53E-04	1,59E-04	-3,84E-03
EP-marine	kg Ne	7,75E-02	1,25E-02	1,37E-02	1,04E-01	8,72E-03	2,53E-02	ND	ND	ND	ND	ND	ND	ND	1,51E-02	1,05E-02	1,58E-04	5,21E-03	-1,56E-02
EP-terrestrial	mol Ne	8,89E-01	1,35E-01	1,48E-01	1,17E+00	9,43E-02	2,73E-01	ND	ND	ND	ND	ND	ND	ND	1,65E-01	1,14E-01	1,39E-03	5,69E-02	-1,87E-01
POCP ("smog")[3)]	kg NMVOCe	2,28E-01	5,54E-02	5,40E-02	3,38E-01	3,87E-02	8,16E-02	ND	ND	ND	ND	ND	ND	ND	4,94E-02	4,88E-02	4,70E-04	2,04E-02	-5,26E-02
ADP-minerals & metals[4)]	kg Sbe	3,55E-04	3,11E-05	3,18E-05	4,18E-04	2,17E-05	1,55E-05	ND	ND	ND	ND	ND	ND	ND	1,30E-06	3,26E-05	4,30E-07	3,06E-06	-6,14E-05
ADP-fossil resources	MJ	4,50E+02	1,55E+02	1,41E+02	7,46E+02	1,08E+02	9,38E+01	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,40E+02	4,08E+00	4,73E+01	-1,40E+02
Water use[5)]	m^3e depr.	1,32E+02	9,06E-01	4,70E+00	1,38E+02	6,32E-01	4,40E+00	ND	ND	ND	ND	ND	ND	ND	1,21E-01	6,87E-01	1,05E-01	1,37E-01	-1,58E+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	2,23E-06	1,07E-06	7,34E-07	4,03E-06	7,43E-07	1,45E-06	ND	ND	ND	ND	ND	ND	ND	9,25E-07	7,83E-07	4,07E-09	3,11E-07	-1,01E-06
Ionizing radiation[6)]	kBq U235e	3,52E+00	1,30E-01	2,35E+00	6,00E+00	9,08E-02	2,16E-01	ND	ND	ND	ND	ND	ND	ND	2,01E-02	1,78E-01	1,11E-01	2,98E-02	-1,07E+00
Ecotoxicity (freshwater)	CTUe	4,46E+02	3,22E+01	7,10E+01	5,49E+02	2,25E+01	5,87E+01	ND	ND	ND	ND	ND	ND	ND	2,69E+01	1,84E+01	4,54E-01	3,97E+00	-3,09E+02
Human toxicity, cancer	CTUh	1,81E-08	1,71E-09	7,76E-09	2,76E-08	1,19E-09	1,48E-09	ND	ND	ND	ND	ND	ND	ND	3,69E-10	1,70E-09	6,53E-11	3,56E-10	-2,86E-09
Human tox. non-cancer	CTUh	7,38E-07	9,64E-08	4,77E-08	8,83E-07	6,73E-08	4,09E-08	ND	ND	ND	ND	ND	ND	ND	5,80E-09	8,78E-08	3,05E-09	8,17E-09	-8,55E-08
SQP[7)]	-	5,95E+02	1,55E+02	5,72E+02	1,32E+03	1,08E+02	4,93E+01	ND	ND	ND	ND	ND	ND	ND	3,12E+00	8,33E+01	7,02E-01	9,32E+01	-1,18E+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	7,15E+01	2,16E+00	6,38E+01	1,37E+02	1,50E+00	-5,69E+01	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,42E+00	9,30E-01	4,57E-01	-1,01E-01
Renew. PER as material	MJ	3,71E-01	0,00E+00	6,33E+01	6,37E+01	0,00E+00	-6,33E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	-2,60E-01	-1,11E-01	1,68E+01
Total use of renew. PER	MJ	7,18E+01	2,16E+00	1,27E+02	2,01E+02	1,50E+00	-1,20E+02	ND	ND	ND	ND	ND	ND	ND	2,96E-01	2,42E+00	6,70E-01	3,46E-01	1,67E+01
Non-re. PER as energy	MJ	4,45E+02	1,55E+02	1,24E+02	7,24E+02	1,08E+02	8,45E+01	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,40E+02	4,08E+00	4,73E+01	-1,40E+02
Non-re. PER as material	MJ	5,12E+00	0,00E+00	1,32E+01	1,83E+01	0,00E+00	-1,32E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	-3,58E+00	-1,54E+00	4,75E+00
Total use of non-re. PER	MJ	4,50E+02	1,55E+02	1,38E+02	7,43E+02	1,08E+02	7,13E+01	ND	ND	ND	ND	ND	ND	ND	4,72E+01	1,40E+02	5,01E-01	4,58E+01	-1,35E+02
Secondary materials	kg	4,87E+00	6,50E-02	2,66E-01	5,20E+00	4,53E-02	1,86E-01	ND	ND	ND	ND	ND	ND	ND	1,95E-02	6,41E-02	2,52E-03	1,19E-02	-4,99E-02
Renew. secondary fuels	MJ	7,17E+01	8,47E-04	2,14E+00	7,38E+01	5,91E-04	2,21E+00	ND	ND	ND	ND	ND	ND	ND	5,12E-05	8,09E-04	2,73E-06	2,46E-04	-1,02E-03
Non-ren. secondary fuels	MJ	8,58E+01	0,00E+00	0,00E+00	8,58E+01	0,00E+00	2,57E+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	1,50E+00	2,23E-02	1,08E-01	1,63E+00	1,55E-02	4,80E-02	ND	ND	ND	ND	ND	ND	ND	3,02E-03	1,88E-02	3,34E-03	4,92E-02	-3,65E-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	6,54E-01	9,93E-01	6,51E-01	2,30E+00	6,92E-01	1,80E-01	ND	ND	ND	ND	ND	ND	ND	5,29E-02	2,01E-01	1,10E-02	5,23E-02	-1,04E+00
Non-hazardous waste	kg	2,32E+01	1,96E+01	3,92E+01	8,20E+01	1,37E+01	9,80E+00	ND	ND	ND	ND	ND	ND	ND	7,71E-01	4,23E+00	7,54E-01	1,20E+00	-2,25E+01
Radioactive waste	kg	2,40E-03	3,11E-05	7,28E-04	3,15E-03	2,17E-05	1,04E-04	ND	ND	ND	ND	ND	ND	ND	4,93E-06	4,43E-05	2,85E-05	7,26E-06	-2,61E-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	5,52E-03	0,00E+00	0,00E+00	5,52E-03	0,00E+00	1,42E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	7,21E+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	7,93E+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	3,34E+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	4,59E+00	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	8,61E+01	1,09E+01	7,34E+00	1,04E+02	7,59E+00	8,83E+00	ND	ND	ND	ND	ND	ND	ND	3,62E+00	9,96E+00	1,79E-01	1,93E+00	-1,07E+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. Heat production, natural gas, at boiler modulating <100kW, europeWithoutSwitzerland, Ecoinvent, 0.0757 kgCO2e/MJ
2. Electricity, medium voltage, residual mix, Romania, Ecoinvent, 0.33 kgCO2e/kWh
3. Market for diesel, burned in building machine, World, Ecoinvent, 0.10 kgCO2e/MJ
4. Electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted, Romania, Ecoinvent, 0.0770 kgCO2e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Market for transport, freight, lorry, >32 metric ton, diesel, EURO 5, 68.0 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	85
Bulk density of transported products	1670
Volume capacity utilization factor	<1

Installation at the building site (A5) - Scenario documentation

Scenario parameter	Value
Energy: type and consumption (MJ or kWh)	14 kWh, diesel burned in construction machines
Water use (m^3)	-
Ancillary materials: type and mass (kg)	-
Waste materials: type and mass (kg)	wood pallets - 4.185 kg plastic foil - 0.1 kg PP strips - 0.11 kg
Waste materials: output routes	wood packaging: 1.34 kg recycled, 1.26 kg incinerated, 1.459 kg landfilled plastic packaging: 0.085 kg recycled, 0.079 kg incinerated, 0.049 kg landfilled concrete waste: 21 kg recycled, 9 kg landfilled
Direct emissions (kg)	-

End of life (C1-C4) - Scenario documentation

Scenario information	Value
Collection process: collected separately (kg)	collected separately: 1030 kg
Collection process: Mixed waste (kg)	mixed waste: 0
Recovery: re-use (kg)	0
Recovery: recycling (kg)	721
Recovery: energy recovery (kg)	0
Disposal (kg)	0
Scenario assumptions e.g. transportation (mode, km) & other	Landfill: 50 km, Recycling: 50 km

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 19.06.2026

ANNEX 1 – GWP VARIATION ACROSS PRODUCTION PLANTS

PLANT	GWP TOTAL (KG CO2E / 1000 KG)	VARIATION
CATCAU, CLUJ COUNTY	95.24	-2.9%
IASI, IASI COUNTY	100.97	+3.0%

Leier ROM plants: Catcau (Cluj), Iasi (Iasi)