ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

PRECAST CONCRETE ELEMENTS FOR SEWERAGE SYSTEMS
LEIER ROM SRL

EPD HUB, HUB-6707
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 elements for sewerage systems
Additional labels	-
Product reference	-
Place(s) of raw material origin	Romania
Place of production	Unirea Village, Alba County, Romania
Place(s) of installation and use	Romania, Hungary
Period for data	calendar year 2025
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 (%)	89,7

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tonne
Declared unit mass	1000 kg
Mass of packaging	0,8 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	110
GWP-total, A1-A3 ($kgCO_2e$)	109
Secondary material, inputs (%)	0,31
Total energy use, A1-A3 (kWh)	284
Net freshwater use, A1-A3 (m^3)	2,06

LEIER ROM – concrete pipe for sewerage systems

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 (Iasi County), 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 plants network in Eastern Europe

PRODUCT DESCRIPTION

This Environmental Product Declaration covers the precast concrete elements for sewerage systems product ranges manufactured by LEIER ROM S.R.L. exclusively within its designated production plant situated in Dumbrava Village, Unirea Commune, Alba county.
The scope of this EPD encompasses the following specific product lines manufactured at the indicated facility:
- precast concrete pipes with tongue-and-groove joints (including circular pipes with sleeve configurations, pipes with integrated rubber seals, and configurations with integrated foot and sleeve) ,
- monolithic manhole base units (with or without concrete flow channels) ,
- intermediate straight manhole shafts , cone reducers (with and without access steps),
- concrete and reinforced concrete cover slabs ,

These concrete elements are engineered for specialized infrastructure and underground wastewater management configurations, operating as permanent elements of subterranean gravitational sewer networks under open surface water-flow conditions. They are structurally optimized for the collection, retention, and transport of domestic sewage, industrial wastewater and surface stormwater runoff , safely spanning heavy-load configurations under public roads or railways subject to high earth pressure and dynamic traffic stress.
The Leier sewerage product line is defined by a high-density, low-porosity engineered concrete matrix. As the core concrete mix, manufacturing methodology, and essential raw materials are identical across the production matrix for all covered pipes, manholes, and structural elements—regardless of the specific nominal diameter (ranging from DN 300 up to DN 1000 for standard circular units) , structural depths, or custom connection angles —the environmental impact results are presented for 1 tonne (1,000 kg) of finished product. This declared unit provides a precise and scalable environmental assessment for any infrastructural layout or pipeline layout within the covered sewerage range.

Product Reference Standard

Product	Reference Standard
Concrete pipes	EN 1916:2003 EN 1916:2003/AC:2008
Manholes & chambers	EN 1917:2003 EN 1917:2003/AC:2008

Construction and Materials
Leier precast concrete sewerage elements are engineered using specialized, optimized concrete recipes to establish a highly durable, high-performance structural configuration:
- the structural elements are manufactured from high-performance cements and dense natural aggregates. Depending on the specific configuration and product type within the range, some elements (such as manholes) include integrated components like high-durability steps (composed of a steel core encased in a plastic protective layer) and structural synthetic macro-fibres (Concrix) for dispersed reinforcement, ensuring high mechanical strength and active mineral protection against aggressive biogenic chemical environments.
- High-performance elastomeric sealing system: designed with integrated or factory-fitted rubber gaskets conforming to EN 1610 standards, featuring advanced multi-chamber cross-sections and factory-applied lubrication to secure immediate, long-term hydrostatic joint tightness.

Manufacturing and Sustainability
Waste management at the manufacturing facility follows a closed-loop approach for concrete production waste. Concrete production rejects and off-specification units, representing approximately 3% of production volume, are crushed and reintegrated as recycled aggregate in road subbase applications or as fill material, in compliance with Romanian waste management regulations. This water is collected and transferred to a No concrete production waste is directed to landfill.

Product benefits

- Environmental & subterranean protection: the hydrostatic sealing performance of the joints prevents hazardous wastewater exfiltration, protecting surrounding soils and underground water reserves from ecological or microbiological contamination.
- Treatment plant hydraulic optimization: by preventing clean groundwater infiltration into the utility pipeline network through high-precision elastomeric seals, Leier elements eliminate unnecessary hydraulic surges at municipal wastewater treatment facilities, minimizing public treatment costs and energy consumption.
- Inherent corrosion & abrasion resistance: the dense, mineral-stabilized layout provides high resistance to internal pipeline abrasion caused by suspended crystalline sediment grit
- Precision engineering & instant structural duty: fabricated to controlled factory tolerances with tongue-and-groove alignments, these precast units facilitate quick underground installation, ensuring a uniform grade, perfect hydraulic seal and immediate traffic-bearing structural readiness without on-site concrete curing delays.

By providing certified data calculated per tonne for the products manufactured at the Unirea plant, Leier enables utility engineers, public developers, and green infrastructure assessors to accurately compute the environmental footprint of customized civil engineering layouts to fulfill LEED, BREEAM, or other international sustainability certification requirements.

Finished pipeline and manhole components are securely loaded and dispatched directly from the Unirea regional manufacturing matrix using specialized heavy transport configurations, ensuring safe on-site mechanical unloading and structural integrity at infrastructure project delivery zones

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

LEIER ROM Unirea (County Alba) plant

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	0,19	HU
Minerals	99,24	RO
Fossil materials	0,57	RO, HU
Bio-based materials	0	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0,063
Biogenic carbon content in packaging, kg C	0,273

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tonne
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	100 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 used in the manufacture of Leier Rom SRL precast concrete elements for sewerage systems. The product formulation is engineered for heavy structural and underground utility performance, relying on a mineral-intensive composition to establish a highly durable, clean ecological profile. The primary raw material inputs consist of cement, natural aggregates and clean process water, supplemented by advanced concrete admixtures and, where applicable, structural reinforcing elements. In addition, high-performance elastomeric sealing components (EPDM/SBR rubber gaskets and/or foam) are integrated to guarantee immediate and long-term joint tightness.
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 designated Leier Rom SRL manufacturing plant located in Unirea village (Alba County), Romania. The primary raw materials originate mainly from domestic sources within 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/EURO 6, 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 sewerage components. Key processes include:
- Batching and mixing: precise dosing and automated mixing of cement, calibrated aggregates, and specialized admixtures to form a dense, low-porosity engineered concrete matrix.
- Forming and compacting: the concrete mixture is cast into high-precision industrial molds using advanced compaction techniques to ensure high structural strength and absolute density.
- Curing and Assembly: elements undergo controlled on-site curing to achieve high mechanical strength and chemical durability. Integrated or factory-fitted rubber gaskets are assembled onto the components in compliance with EN 1610 standards.
- Quality control: finished elements are verified against applicable technical European standards (SR EN 1916 / EN 1916 for concrete pipes and SR EN 1917 / EN 1917 for manholes and inspection chambers), ensuring compliance for hydrostatic tightness, water absorption (maximum 6%), and chemical exposure resistance (class XA1).

Electricity modeling: The environmental impact of electricity consumption during the manufacturing stage (A3) is modeled using a specific hybrid configuration reflecting the Unirea plant's infrastructure. Power demands are satisfied through a combination of on-site renewable energy generated via an integrated solar photovoltaic (PV) and supplementary electricity drawn from the national grid, which is mapped using a market-based approach to the national residual mix.
Packaging: finished pipeline and manhole components are prepared for dispatch directly from the factory yard. Due to their large scale and structural mass, they are securely handled and loaded onto specialized heavy transport configurations using minimized packaging materials (such as protective bands or temporary stabilization elements).
Waste Management: materials lost during the manufacturing process,

internal production scrap and ancillary streams are strictly recorded. Any concrete production scrap is diverted, crushed, and recovered for secondary infrastructure or road construction applications.

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, weights, transport logistics, and site-specific energy profiles, were collected directly from the manufacturing plant in Unirea village (Alba County). 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 specific plant data have been fully examined, ensuring high geographical, technological, and time-specific representativeness for the Romanian and wider EU infrastructure 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 elements for sewerage systems from the manufacturing facility in Unirea to the construction or installation site. For Leier Rom SRL, based on 2025 operational data, this involves:
- Loading and securing: finished pipeline and manhole components are loaded onto heavy transport vehicles at the factory yard. Given the heavy structural nature of the concrete units, products are stabilized using specific safety constraints or minimal protective bands to prevent movement during transit.
- Logistics and volume: transport is modeled based on the bulk volume of the products. For the declared unit of 1 tonne, a representative specific volume (1.15 m3/tonne) is used to account for the product geometry.
- Transport distances: the average transport distance is defined as 120 km. This value is calculated from Leier Rom SRL's internal logistics records for 2025, reflecting the distribution matrix from the Unirea facility to municipal engineering and civil infrastructure sites across Romania.
- Delivery: the transport stage ends when the products reach the site. All packaging materials associated with the product (such as wooden stabilization elements or plastic wraps) are included in this stage.

A5 – Installation into the Building / Infrastructure
This stage covers the on-site installation of Leier precast concrete sewerage products. The installation scenario is defined as follows:
- On-site handling: the process involves unloading and positioning the elements into the prepared trenches. Due to the high structural mass, the handling relies on mechanized lifting equipment (e.g., excavators or cranes)

to ensure alignment and precise tongue-and-groove joint configuration.
Energy consumption: the operational energy required for mechanical handling and installation is modeled with a specific energy consumption equivalent to 36 MJ of primary fuel energy per declared unit of 1 ton.
Installation losses: it is assumed that there are no product losses or breakages during the installation process; therefore, no material waste from the concrete sewerage elements themselves is recorded.
Waste Management of Packaging: accounts for the collection and processing of all packaging materials removed during installation (wood pallets/elements and plastic packaging). The end-of-life treatment for these materials is modeled using a split scenario to reflect regional waste management practices and infrastructure:
- 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 is assumed to be transported over a representative distance of 50 km from the installation site to the authorized waste management, sorting, or disposal facilities, utilizing standard heavy-duty vehicles (Lorry >32t, EURO 5/EURO 6).

System Boundary and Cut-Off Criteria
For Modules A4–A5, the system boundary includes all processes from the dispatch of finished products at the Leier Unirea factory until the unit is fully installed within the infrastructure network. Excluded processes include trench excavation, sand or aggregate bedding preparation, backfilling or secondary civil engineering integration (building-level assessment). Cut-off criteria ensure that neglected flows do not exceed the 5% threshold of each inventory module, according to EN 15804+A2.

PRODUCT END OF LIFE (C1-C4, D)

C1 – Deconstruction / Demolition
At the end of its reference service life (RSL of 100 years for underground infrastructure, according to 16757:2023), the precast concrete sewerage elements (including pipes, manholes, and chambers) are removed from the subterranean installation network. The deconstruction process is fully mechanical, relying on heavy hydraulic excavators and specialized lifting machinery suitable for public utility civil engineering projects. The environmental impacts associated with this stage directly account for the combustion of diesel fuel and the operational burdens of heavy-duty construction machinery, modeled using representative regional datasets from the Ecoinvent database. As the dense concrete matrix is fully cured and chemically inert, no volatile organic compounds or hazardous chemical emissions are released into the soil or atmosphere during the physical extraction process.

C2 – Transport to Waste Processing Facilities
Following deconstruction and excavation, the discarded concrete sewerage 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 mechanical sorting, crushing, and physical preparation of the excavated and discarded concrete sewerage elements destined for material recovery. Per the life-cycle inventory data and the applied end-of-life scenario, 70% of the structural product mass is directed

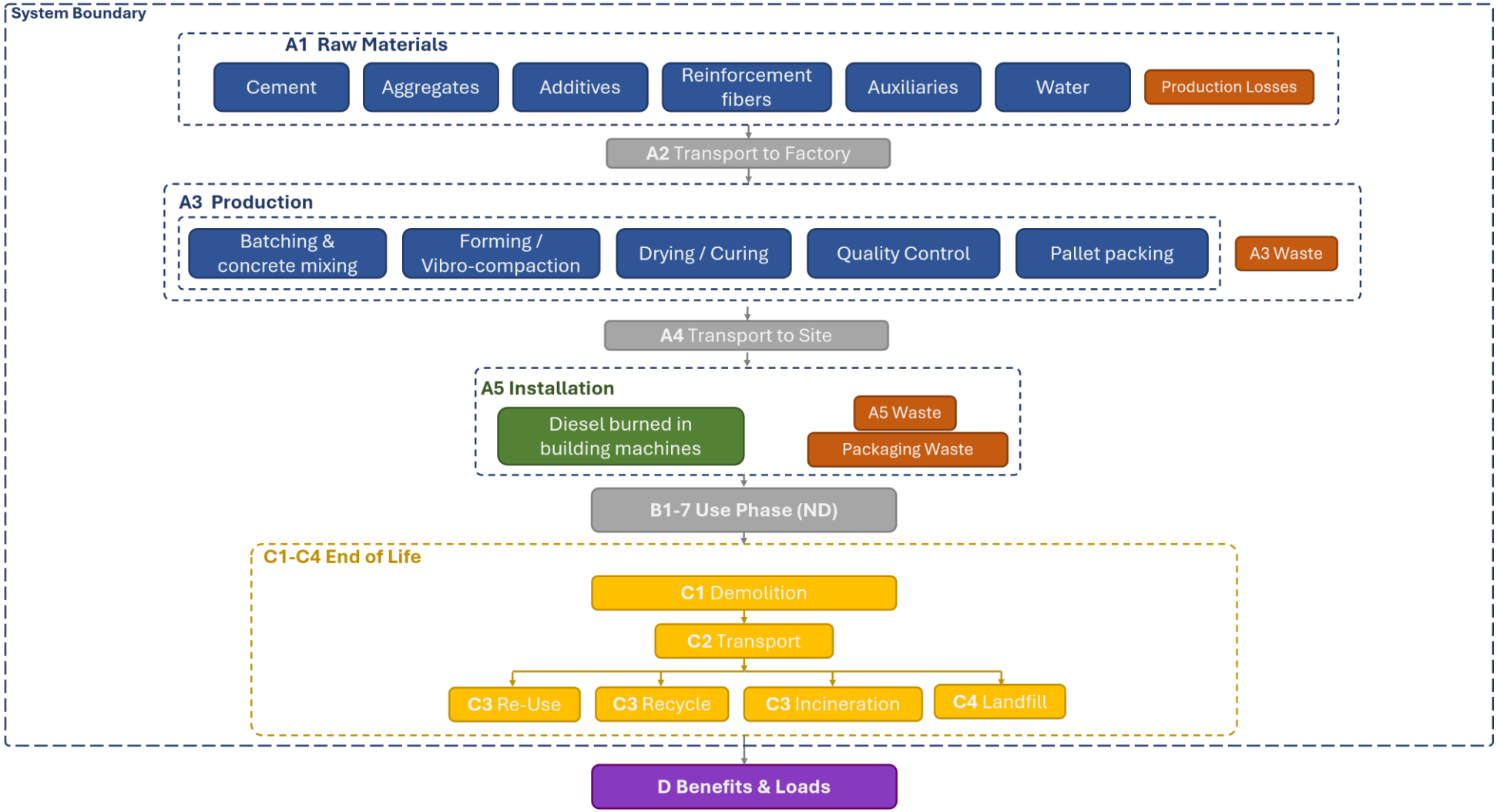
toward recycling pathways. The heavy concrete elements are crushed down into recycled concrete aggregates (RCA) to be prepared for secondary applications in civil engineering, road substructures, or new concrete structural formulations, supporting a low-waste circular economy model.

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 infrastructure 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 into the surrounding soil or groundwater during final disposal.

Module D – Benefits and Loads Beyond the System Boundary
The recycling of concrete sewerage 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 subtracting any secondary material inputs utilized during the raw material supply stage (A1-A3), recorded at an input rate of 0.00% (as the production utilizes entirely primary natural mineral resources), from the total end-of-life waste recovery flows.
Material Recycling Credits: the structural recovery of concrete aggregates (originating from the 70% recycled product fraction) replaces the market demand for virgin, primary mineral aggregates in the regional construction market, significantly reducing the abiotic depletion of natural mineral resources and environmental impacts associated with quarrying.
Packaging Recovery Benefits: Module D also incorporates the net benefits generated by the recycling and energy recovery of packaging materials (wooden dunnage/pallets and plastic strapping) collected during the installation stage (Module A5). This includes credits from exported energy generated during controlled thermal processing, substituting the need for primary grid electricity 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 and utility markets:
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 the cut-off criteria outlined in EN 15804+A2 and EPD Hub PCR guidelines, no primary production processes, core raw materials, or manufacturing energy flows have been excluded from this study.
The following minor background flows have been excluded based on the standard framework limitations:
- Production, manufacture, and maintenance of factory capital equipment, heavy machinery, buildings, and associated infrastructure.
- Environmental burdens associated with personnel activities, such as employee commuting, office administrative operations, and corporate travel.
- Extremely low-mass ancillary materials or components that fall well below the 1% cut-off threshold by mass (and under 5% cumulatively for the entire system), such as minor printer ink for packaging labels or administrative office waste.

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

The Reference Service Life (RSL) of 100 years has been defined in strict accordance with the provisions and standard scenarios outlined in EN 16757:2023 for precast concrete infrastructure elements.
Minor installation components (gaskets, mortar) represent <1% of the total mass and fall below the cut-off criteria. Downstream scenarios for installation waste and end-of-life logistics (C1-C4) are based on conservative regional industry averages.

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 EPD represents a multiple-product grouping from a single manufacturer and a single production site. It covers the entire range of precast concrete elements for sewerage systems (including pipes, manhole bases, chambers, shafts, and adjustment rings) produced by Leier Rom SRL at the Unirea manufacturing plant (Alba County, Romania).
All covered products share an identical, uniform concrete matrix with a standard density of approximately 2200–2400 kg/m³. Since the environmental profile is reported per 1 declared ton of finished product and the raw material recipe is constant, the mass-based average is 100% representative of all physical configurations regardless of their individual shape, diameter, or structural geometry.
The geographical coverage is specific to Romania for the production phase (A1–A3) and models regional European infrastructure deployment scenarios for the downstream phases (A4–A5, C1–C4, D).

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‘.

ISO 14025:2010 – Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
ISO 14040:2006 / ISO 14044:2006 – Environmental management — Life cycle assessment — Principles, framework, requirements and guidelines.
EN 15804:2012+A2:2019/AC:2021 – Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products.
EN 16757:2023 – Sustainability of construction works — Environmental product declarations — Product Category Rules for concrete and concrete elements. (Used as the core methodological reference for defining the 100-year Reference Service Life and specific precast concrete scenarios).
Specific manufacturer data (Leier Rom SRL) – Internal factory production recipes, utility bills, raw material transport distances, and annual waste registers for the Unirea manufacturing plant (Reference year 2025).

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	9,79E+01	6,18E+00	4,71E+00	1,09E+02	1,27E+01	4,83E+00	ND	ND	ND	ND	ND	ND	ND	7,05E+00	7,07E+00	1,80E-01	1,88E+00	-1,02E+01
GWP – fossil	kg CO_2e	9,81E+01	6,16E+00	5,69E+00	1,10E+02	1,27E+01	3,83E+00	ND	ND	ND	ND	ND	ND	ND	7,04E+00	6,69E+00	1,74E-01	1,88E+00	-9,91E+00
GWP – biogenic	kg CO_2e	-3,95E-01	6,63E-03	-9,93E-01	-1,38E+00	6,56E-03	1,00E+00	ND	ND	ND	ND	ND	ND	ND	1,34E-03	1,23E-01	5,57E-03	8,42E-04	-2,66E-01
GWP – LULUC	kg CO_2e	1,74E-01	1,28E-02	1,39E-02	2,00E-01	4,45E-03	4,12E-04	ND	ND	ND	ND	ND	ND	ND	7,21E-04	2,61E-01	4,97E-04	1,08E-03	-9,44E-03
Ozone depletion pot.	kg CFC-$_{11}$e	1,47E-06	1,07E-07	1,74E-07	1,75E-06	2,88E-07	5,42E-08	ND	ND	ND	ND	ND	ND	ND	1,05E-07	2,60E-07	2,82E-09	5,23E-08	-8,41E-08
Acidification potential	mol H^+e	2,43E-01	2,10E-02	2,79E-02	2,92E-01	4,10E-02	3,26E-02	ND	ND	ND	ND	ND	ND	ND	6,30E-02	2,16E-02	8,59E-04	1,31E-02	-6,16E-02
EP-freshwater[2)]	kg Pe	2,23E-03	6,10E-04	9,64E-04	3,80E-03	9,03E-04	1,24E-04	ND	ND	ND	ND	ND	ND	ND	2,27E-04	5,49E-04	1,55E-04	1,64E-04	-3,43E-03
EP-marine	kg Ne	7,59E-02	7,14E-03	9,23E-03	9,23E-02	1,44E-02	1,52E-02	ND	ND	ND	ND	ND	ND	ND	2,93E-02	9,61E-03	1,54E-04	5,05E-03	-1,46E-02
EP-terrestrial	mol Ne	8,28E-01	7,64E-02	9,81E-02	1,00E+00	1,57E-01	1,66E-01	ND	ND	ND	ND	ND	ND	ND	3,21E-01	8,10E-02	1,34E-03	5,51E-02	-1,76E-01
POCP ("smog")[3)]	kg NMVOCe	2,38E-01	3,16E-02	3,70E-02	3,07E-01	6,77E-02	4,96E-02	ND	ND	ND	ND	ND	ND	ND	9,60E-02	3,11E-02	4,39E-04	1,99E-02	-4,94E-02
ADP-minerals & metals[4)]	kg Sbe	2,82E-04	1,80E-05	3,16E-05	3,32E-04	3,68E-05	1,41E-06	ND	ND	ND	ND	ND	ND	ND	2,53E-06	2,61E-05	4,19E-07	2,80E-06	-5,88E-05
ADP-fossil resources	MJ	5,82E+02	8,83E+01	1,08E+02	7,78E+02	1,84E+02	4,76E+01	ND	ND	ND	ND	ND	ND	ND	9,17E+01	9,65E+01	3,97E+00	4,60E+01	-1,26E+02
Water use[5)]	m^3e depr.	1,58E+02	5,18E-01	5,71E+00	1,64E+02	1,06E+00	1,38E-01	ND	ND	ND	ND	ND	ND	ND	2,36E-01	7,12E-01	1,04E-01	2,02E+00	-1,52E+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	1,68E-06	6,06E-07	4,92E-07	2,78E-06	1,28E-06	9,29E-07	ND	ND	ND	ND	ND	ND	ND	1,80E-06	6,42E-07	3,91E-09	3,02E-07	-9,60E-07
Ionizing radiation[6)]	kBq U235e	9,86E-01	7,88E-02	1,39E+00	2,46E+00	1,99E-01	2,10E-02	ND	ND	ND	ND	ND	ND	ND	3,90E-02	8,43E-02	1,09E-01	2,75E-02	-8,87E-01
Ecotoxicity (freshwater)	CTUe	3,43E+02	1,76E+01	2,57E+01	3,86E+02	2,49E+01	2,83E+01	ND	ND	ND	ND	ND	ND	ND	5,24E+01	1,17E+02	4,41E+00	3,07E+01	-2,88E+02
Human toxicity, cancer	CTUh	1,13E-08	9,85E-10	2,03E-09	1,43E-08	2,00E-09	4,00E-10	ND	ND	ND	ND	ND	ND	ND	7,18E-10	1,54E-09	5,70E-11	3,40E-10	-2,69E-09
Human tox. non-cancer	CTUh	1,97E-07	5,54E-08	3,96E-08	2,92E-07	1,15E-07	6,77E-09	ND	ND	ND	ND	ND	ND	ND	1,13E-08	7,42E-08	2,75E-09	7,65E-09	-7,96E-08
SQP[7)]	-	7,53E+02	8,84E+01	1,15E+02	9,56E+02	1,86E+02	3,51E+00	ND	ND	ND	ND	ND	ND	ND	6,06E+00	1,02E+02	5,76E-01	9,03E+01	-1,13E+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	9,08E+01	1,29E+00	2,91E+01	1,21E+02	2,87E+00	-9,36E+00	ND	ND	ND	ND	ND	ND	ND	5,76E-01	2,09E+00	8,75E-01	4,30E-01	-9,48E+00
Renew. PER as material	MJ	2,27E+00	0,00E+00	9,94E+00	1,22E+01	0,00E+00	-9,94E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	-1,59E+00	-6,82E-01	2,64E+00
Total use of renew. PER	MJ	9,31E+01	1,29E+00	3,90E+01	1,33E+02	2,87E+00	-1,93E+01	ND	ND	ND	ND	ND	ND	ND	5,76E-01	2,09E+00	-7,17E-01	-2,53E-01	-6,84E+00
Non-re. PER as energy	MJ	5,89E+02	8,84E+01	9,61E+01	7,73E+02	1,84E+02	4,16E+01	ND	ND	ND	ND	ND	ND	ND	9,17E+01	9,84E+01	3,97E+00	4,60E+01	-1,26E+02
Non-re. PER as material	MJ	5,45E+00	0,00E+00	6,95E+00	1,24E+01	0,00E+00	-6,95E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	-3,81E+00	-1,63E+00	2,70E+00
Total use of non-re. PER	MJ	5,94E+02	8,84E+01	1,03E+02	7,86E+02	1,84E+02	3,46E+01	ND	ND	ND	ND	ND	ND	ND	9,17E+01	9,84E+01	1,58E-01	4,43E+01	-1,24E+02
Secondary materials	kg	3,07E+00	3,72E-02	6,52E-02	3,18E+00	7,83E-02	1,99E-02	ND	ND	ND	ND	ND	ND	ND	3,80E-02	4,55E-02	2,43E-03	1,14E-02	-7,23E-02
Renew. secondary fuels	MJ	5,63E+01	4,85E-04	3,41E-01	5,66E+01	1,03E-03	5,52E-05	ND	ND	ND	ND	ND	ND	ND	9,95E-05	6,03E-04	2,59E-06	2,39E-04	-9,83E-04
Non-ren. secondary fuels	MJ	7,07E+01	0,00E+00	0,00E+00	7,07E+01	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	1,91E+00	1,29E-02	1,34E-01	2,06E+00	2,44E-02	2,11E-03	ND	ND	ND	ND	ND	ND	ND	5,87E-03	2,50E-02	2,41E-03	4,75E-02	-3,50E-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	1,87E+00	5,49E-01	8,73E-01	3,29E+00	1,04E+00	5,69E-02	ND	ND	ND	ND	ND	ND	ND	1,03E-01	2,14E-01	1,03E-02	5,23E-02	-9,80E-01
Non-hazardous waste	kg	2,11E+01	1,08E+01	4,94E+01	8,13E+01	2,17E+01	1,82E+00	ND	ND	ND	ND	ND	ND	ND	1,50E+00	3,21E+00	7,66E-01	1,21E+00	-1,99E+01
Radioactive waste	kg	2,59E-03	1,89E-05	4,30E-04	3,04E-03	4,79E-05	5,17E-06	ND	ND	ND	ND	ND	ND	ND	9,59E-06	2,04E-05	2,80E-05	6,71E-06	-2,14E-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	2,81E-02	0,00E+00	0,00E+00	2,81E-02	0,00E+00	2,69E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	7,00E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	1,82E-05	0,00E+00	0,00E+00	1,82E-05	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	1,83E-02	0,00E+00	0,00E+00	1,83E-02	0,00E+00	1,93E+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	8,12E-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 – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,12E+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	9,82E+01	6,18E+00	5,70E+00	1,10E+02	1,27E+01	3,83E+00	ND	ND	ND	ND	ND	ND	ND	7,05E+00	6,95E+00	1,75E-01	1,88E+00	-9,92E+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. Market for diesel, burned in building machine, Ecoinvent, 0.10 kgCO2e/MJ
2. Heat production, natural gas, Ecoinvent, 0.0757 kgCO2e/MJ
3. Electricity, medium voltage, residual mix, Romania, Ecoinvent, 0.33 kgCO2e/kWh
4. Electricity production, photovoltaic, Romania, Ecoinvent, 0.0888 kgCO2e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Market for transport, freight, lorry, >32 metric ton, diesel, EURO 5, 120.0 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	60
Bulk density of transported products	801
Volume capacity utilization factor	<1

Installation at the building site (A5) - Scenario documentation

Scenario parameter	Value
Energy: type and consumption (MJ or kWh)	36 MJ - crane or excavator
Water use (m^3)	-
Ancillary materials: type and mass (kg)	-
Waste materials: type and mass (kg)	0.66 kg wood packaging 0.15 kg plastic packaging
Waste materials: output routes	wood: 0.21 kg recycling, 0.2 kg incineration, 0.25 kg landfill plastic: 0.06 kg recycling, 0.06 kg incineration, 0.03 kg landfill
Direct emissions (kg)	-

End of life (C1-C4) - Scenario documentation

Scenario information	Value
Collection process: collected separately (kg)	1000 kg
Collection process: Mixed waste (kg)	0
Recovery: re-use (kg)	0
Recovery: recycling (kg)	700
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

VERIFIED ISO 14025