Environmental Product Declaration

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

Graphite MgO SIP panel

from

Költözzma Ltd.

Programme:	The International EPD® System, www.environdec.com
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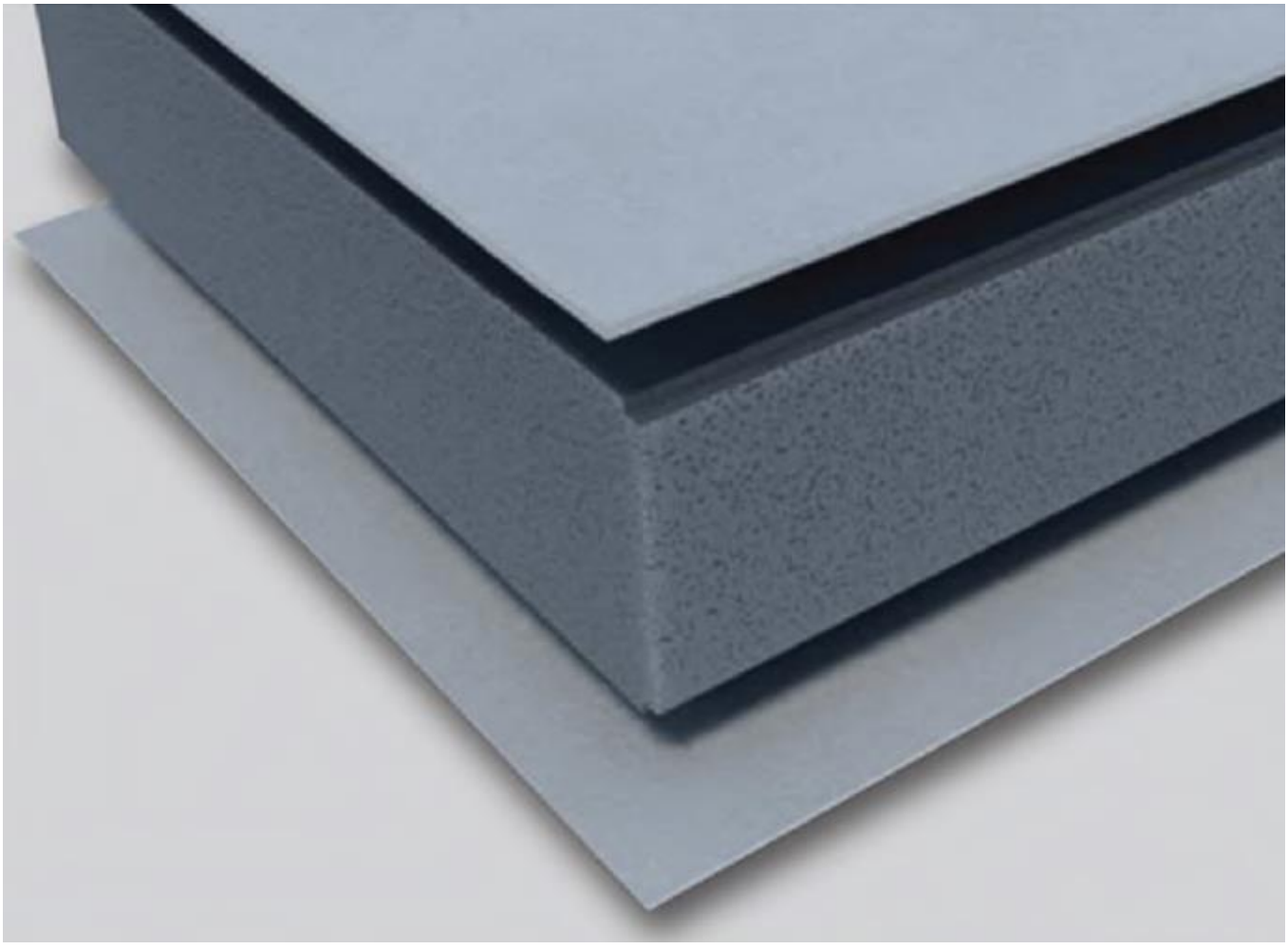

General information

Programme information

Programme:	The International EPD® System
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules – Construction Products (PCR 2019:14, version 1.3.1)
PCR review was conducted by: *International EPD system*
Life Cycle Assessment (LCA)
LCA accountability: *Renáta Bodnárné Sándor, Bay Zoltán Nonprofit Ltd. for Applied Research*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by accredited certification body Third-party verification: *prof Ing. Vladimir Kocí* *Šárecká 1962/5, 160 00 Praha 6* is an approved individual verifier for the third-party verification the International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

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

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN15804. For further information about comparability, see EN15804 and ISO14025.

Company information

Owner of the EPD:
Költözzma Ltd.
H-6772 Deszk, Alkotmány street 61., Hungary

Contact: Csaba Nádasdi; iroda@koltozzma.hu

Description of the organisation:
Költözzma Ltd. was established in 2019 in Csongrád-Csanád county of Hungary with the specific aim of introducing a new technology of lightweight house construction in the county. The new technology was the Modern SIP (Structural Insulated Panel) panel, a graphite insulation pressed between two OSB boards. In addition to timber frame construction and the manufacture of lightweight structural elements, we undertake the complete construction of the house. The company is SMEs with two managers supported by two office administrators, and more than 20 registered full-time manual workers, including skilled and semi-skilled workers and subcontractors.

The product range includes:

- Modern SIP panel
- **MgO SIP panel**
- nail plate truss roofing.

Due to the technical development, they replaced the OSB boards in the Modern SIP panel with MgO boards (current product.) In the last half year, they produced the MgO SIP panels and the frames of three new buildings (houses) with their technology.
Their aim is to maintain the results achieved, to make the technology to be more known and acclaimed and also to launch the new MgO SIP panel on the market successfully. Their vision is that users will discover the benefits of this new product the values of their environment.

Product-related or management system-related certifications: The company is certified by ISO 9001 and ISO 14001 as part of the ISO 14000 family of standards for environmental management systems.

Name and location of production site:
Költözzma Ltd. (H-6772 Deszk, Alkotmány street 61., Hungary)

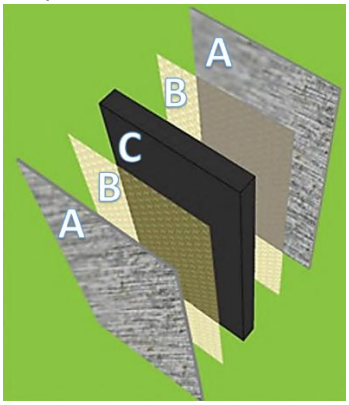
Product information

Product name: graphite MgO SIP panel
Product description:
New house building panel, made by environmentally friendly and energy-saving construction technology. Special prefabricated elements are used to construct buildings using this method. These are made of two 12 mm MgO sheets with 140 graphite powder insulation EPS material sandwiched between them. The prefabricated elements are easy to work with on the construction site due to their low weight.
The houses built by lightweight, graphite MgO (magnesium oxide) structural Insulated Panels (SIP) have many advantages in the long term, as:

Board performance:

- Excellent fire resistance
- Water and moisture resistance
- Lightweight and earthquake proof
- Environmentally friendly and healthy
- Thermal insulation and energy saving
- Sound insulation
- Insect and mould proof.

The sandwich panel consists of 3 different types of layers:



A: magnesium oxide board
B: polyurethane adhesive (solvent and odourless)
C: EPS insulation material with graphite powder (EPS80)
B: polyurethane adhesive
A: magnesium oxide board

Product components and characteristics

Characteristics	Value
MgO SIP panel	
thermal conductivity	0,032W/mk
Magnesium-oxide board	
density	>900kg/m^3
thermal conductivity	0,182W/(mK)
resistance to condensation diffusion	44,9
chloride ion content	<0,4m/m%
EPS	
density	15kg/m^3
Thermal conductivity resistance	4,516 R[(m2 K)/W
thermal conductivity	0,031W/(mK)
resistance to condensation diffusion	6-10
density	15kg/m^3
Fire protection class	E
polyurethane adhesive	
density	1,11g/ml
viscosity	6000mPa
substantial	100-200g/m^2
heat-resisting	-35°C- +35°C

- reaction to fire class: IB-s1,d0
- hazardous substance emissions and vapour permeability, noise cancelation, breathability, durability: no performance determined (in the case of structures where MgO SIP panel is installed, a humidity calculation must be carried out for the whole structure with the additional layers, taking into account the humidity diffusion factors.)

Thermal conductivity resistance: 4,65 (m^2K)W

UN CPC code: 3633 - Plates, sheets, film, foil, and strip of plastics, not self-adhesive, non-cellular, and not reinforced, laminated, supported, or similarly combined with other materials
Geographical scope: Global - The magnesium-oxide layers are produced in China, but the other components: ESP and glue, are made in Hungary (A1). This SIP panel production site (A3) is located in the south part of Hungary, in Deszk. The houses are built from these panels in Hungary (A5). The final houses were built in Hungary by the use of the SIP panels.

LCA information

Declared unit: **1 m^2 product (MgO SIP panel)** at the factory gate ready for distribution.
The following technical information supports the functional unit definition:

- weight of the product: 22,39kg/m^2
- width: 165mm
- thermal conductivity: 0,032W/mk

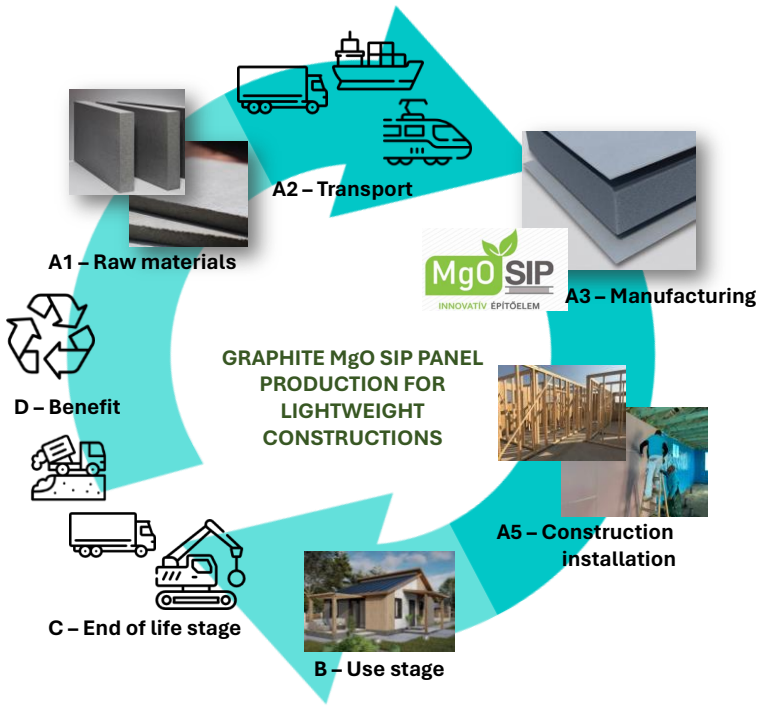
Base materials:

Material	thickness (mm)	weight (kg/m^2) of one layer	% /Final product	Dimension of a panel board (mm)
Magnesium oxide board	12	9,9	88,43	3000x1200
EPS (EPS80) insulation material with graphite powder	140	2,5	11,17	1000x500
Adhesive agent		0,09	0,41	

Reference service life: The sandwich panels are used in lightweight constructions. The reference service life depends on the location, weather conditions, and quality of the coating of panels. The MgO SIP panels exhibit an estimated service life of 40 years. Although not proven by measurement, due to the material components, it is estimated that the lifespan could be longer than 40, up to 50 years.
Time representativeness Reference year is 2023 March-2023 August
"Product recently on the market – LCI data is not yet based on 1 year of production". LCI data are based on data from a shorter time period (2023.03-2023.08 – six months). The data is provided to be representative or conservative for 1-year data, therefore EPD will be updated and re-verified when data from 1 year of production will be available.
Databases and LCA software used:
The LCA model for production was made using the LCA for Experts software (LCA FE) (formerly named GaBi Professional) system for life cycle engineering, developed by Sphera (version 10, 2023).
Applied databases are:

- Managed LCA content (GaBi database, Sphera) database (version 10, 2023).
- Ecoinvent database (version 3.9, 2023)

Description of system boundaries:
"Cradle to gate" (Modules A1 to A3) with module C2-C4 and module D
Life-cycle diagram:



Applicable life cycle stages with the system boundaries and processes are described below.

- Raw materials (A1)
  - magnesium oxide board production: this module contains the Chinese country specific extraction and processing of raw materials.
  - graphite EPS production: the module refers to the Hungarian production of graphite EPS insulating boards.
- Raw material supply (A2)
  - MgO board transport: the module consists of a long transportation route of MgO boards from China to Hungary. All the used transportation methods and distances are included in this module.
  - EPS transport: transportation from the EPS production site to the SIP panel producer
- Manufacturing (A3) of graphite MgO SIP panel production: this module refers to producing an average product with energy utilization and waste management. The final products are delivered to the installation site without packaging.
- End of life stage (C):
  - demolition phase 100%of waste is assumed to be collected as separate construction waste. Based on the recommendation of JRC report, it is considered that the energy needed for the deconstruction of the structure (module C1) in order to be recycled is 0.07 MJ/kg.
  - The default distance is 50km between the location of the demolition and the waste management site (C2),
  - The waste processing (C3 and C4) module includes the data of the Hungarian Statistic Office for the yearly treatment of construction and demolition waste in the following:
    - material recycling 88,85%
    - landfill 11,14%
    - energy recovery 0,01%

- Benefit (D) This module contains mainly the environmental benefit of material recycling, which derived by the raw material content (88,85%). The smaller part of the benefit comes from the energy recovery (0,01%).

More information:

There was no need *allocation* connection with the production.

Cut-off rules were applied according to the EN15804:2012+A2 Standard and Construction Products PCR, namely minimum of 99% of the declared environmental impacts shall be included. In some cases, proxy data were used to achieve full completeness, as this is better than leaving data gaps.

The “Polluter pays” principle has been applied.

Documentation of Electricity

The magnesium oxide board production (A1) was modelled due to the special product process. In this case, the model contains the Chinese national specific electricity grid mix.

In order to ensure the accuracy of the data, national specific EPS production (A1) was and modelled except the average Swiss production process. Specific data were gathered from the sites of the core module (A3) of MgO SIP panel production. The Sphera process represents the average Hungarian electricity mix. The national specific electricity consumption mix is provided by the conversion of the different energy carriers to electricity and imports from neighbouring countries.

Stage	Name of the process	provider, owner	Reference year - valid	CO_2e/kWh
A1 - EPS production A3 – MgO SIP panel production	HU: Electricity grid mix	Sphera	2019-2025	0,341
A1 – MgO board production	CN: Electricity grid mix	Sphera	2019-2025	0,798

Electricity grid factors used in the Study (kg CO_2 eq./ kWh) Source: LCA for Experts - GaBi professional 10. Characterisation factor: EN15804+A2 (based on EF3.1), Climate Change - total

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	x
Geography	CN; HU	GLO	HU	-	-	-	-	-	-	-	-	-	HU	HU	HU	HU	HU
-																	
Specific data used	>90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0 %					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0 %					-	-	-	-	-	-	-	-	-	-	-	-

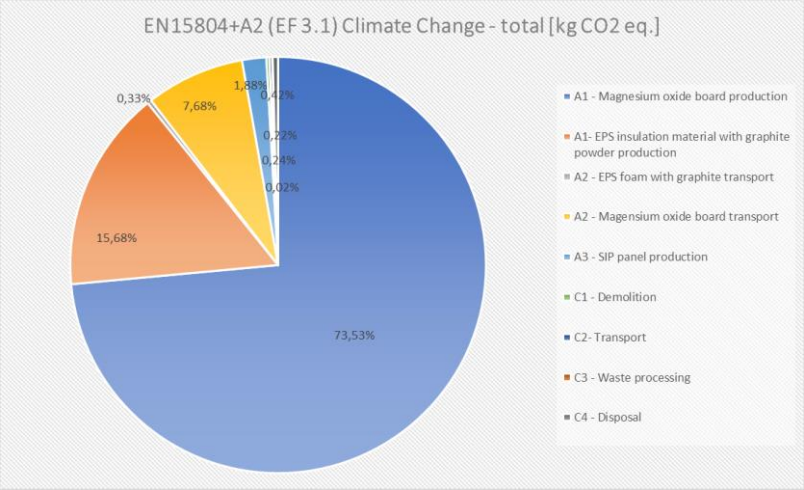
Content information

The post-consumer recycling materials of two base materials – graphite EPS and MgO board - are unknow, and also none of them have biogenic material content.
The final products are not packed; therefore, there is no packaging materials to be considered.
No substance listed under the REACH Regulation is present in this product, neither above the limits for registration with the European Chemicals Agency nor in excess of 0,1 weight-% of the product.

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	6,24E+01				1,48E-01	1,35E-01	1,46E-02	1,55E-01	-5,04E+01
GWP-biogenic	kg CO_2 eq.	-1,59E+00				8,32E-04	-1,98E-03	8,20E-05	1,59E+00	1,41E+00
GWP-luluc	kg CO_2 eq.	3,21E-02				1,44E-05	1,25E-03	1,41E-06	-8,87E-07	-1,54E-02
GWP-total	kg CO_2 eq.	6,08E+01				1,49E-01	1,35E-01	1,46E-02	2,57E-01	-4,90E+01
ODP	kg CFC 11 eq.	3,05E-07				2,26E-12	1,75E-14	2,22E-13	-4,89E-10	-2,53E-07
AP	mol H^+ eq.	2,96E-01				5,69E-04	2,90E-04	5,61E-05	1,88E-05	-2,01E-01
EP-freshwater	kg P eq.	7,67E-03				6,38E-07	4,92E-07	6,29E-08	-6,36E-07	-6,67E-03
EP-marine	kg N eq.	7,13E-02				8,44E-05	1,22E-04	8,32E-06	1,45E-06	-3,76E-02
EP-terrestrial	mol N eq.	7,72E-01				8,52E-04	1,38E-03	8,39E-05	1,07E-04	-4,06E-01
POCP	kg NMVOC eq.	2,26E-01				2,31E-04	2,63E-04	2,28E-05	-6,17E-05	-1,31E-01
ADP-minerals&metals*	kg Sb eq.	3,38E-04				1,61E-08	8,93E-09	1,59E-09	-1,45E-08	-2,90E-04
ADP-fossil*	MJ	7,31E+02				3,93E+00	1,83E+00	3,87E-01	-2,44E-01	-5,79E+02
WDP*	m^3	1,21E+01				7,40E-03	1,63E-03	7,29E-04	2,00E-02	-1,04E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									



Stage A1 accounts for 89.44% of the environmental burden regarding greenhouse gas emissions (GWP-total), while the impact of the supply of raw materials (A2) is 8.03%. The impact of product manufacturing (A3) is 1.89%.

Additionally mandatory and voluntary impact category indicators

Results per declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG	kg CO_2 eq.	6,24E+01				1,48E-01	1,37E-01	1,46E-02	1,85E+00	-5,04E+01

There was no need to add additional voluntary indicators.

Resource use indicators

Results per declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	6,72E+01				1,17E+00	1,33E-01	1,15E-01	1,95E-02	-5,59E+01
PERM	MJ	0,00E+00				0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	6,72E+01				1,17E+00	1,33E-01	1,15E-01	1,95E-02	-5,59E+01
PENRE	MJ	7,33E+02				3,93E+00	1,84E+00	3,87E-01	-2,44E-01	-5,79E+02
PENRM	MJ	5,94E-03				2,00E-14	0,00E+00	2,05E-15	-2,60E-06	-4,74E-03
PENRT	MJ	7,33E+02				3,93E+00	1,84E+00	3,87E-01	-2,44E-01	-5,79E+02
SM	kg	0,00E+00				0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,01E+01
RSF	MJ	0,00E+00				0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00				0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	2,88E-01				1,01E-03	1,46E-04	9,92E-05	4,76E-04	-2,44E-01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

Waste indicators

Results per declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	7,92E-08				2,74E-10	5,70E-12	2,70E-11	3,75E-12	-9,28E-11
Non-hazardous waste disposed	kg	3,55E-02				1,86E-03	2,81E-04	1,83E-04	1,05E-02	-1,22E-02
Radioactive waste disposed	kg	4,00E-03				7,86E-04	3,44E-06	7,74E-05	5,57E-06	-2,56E-03

Output flow indicators

Results per declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-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
Material for recycling	kg	0,00E+00				0,00E+00	0,00E+00	1,99E+01	1,99E+01	-1,99E+01
Materials for energy recovery	kg	0,00E+00				0,00E+00	0,00E+00	0,00E+00	2,24E-01	-2,24E-01
Exported energy, electricity	MJ	1,41E+01				0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	3,89E+00				0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Among the declared parameters the A1 module is the most significant life cycle phase. This includes the production of MgO and graphite EPS board and has a very significant contribution to the inventory and impact assessment results (51,61%-97,16%).
The A2 module, the transportation of MgO board by truck, ship, and train is significant in some categories: GWP-luluc (36,42%), AP (22,43%), EP-marine (39,23%), EP-terrestrial (39,73%), EP and POCP (33,64%).
The A3 module is not a significant issue (≥10%), but close to this value in one category ODP (7,25%) only.
The LCA study is complete; there are no relevant life cycle phases or processes excluded.
Consistency of the used data is good: high quality specific data was collected for the A3 module, while the best available generic data was selected for A1 and for all the other life cycle processes.
"Product recently on the market – LCI data is not yet based on 1 year of production". LCI data are based on data from a shorter time period (2023.03-2023.09 – six months). The data are provided to be representative or conservative for 1-year data.
EPD will be updated and re-verified when data from 1 year of production will be available.

Additional environmental information

Költözzma Ltd. makes efforts to achieve continuous quality improvement and environmentally conscious behaviour in the interest of its own effectiveness satisfy the expectations of the owners and customers and maintain employees' quality of life, and keep them healthy.
The company intends to improve environmental parameters, prevent contaminations, keep the premises tidy, organize the selective waste collection, and dispose of their waste correctly. Költözzma Ltd also aims to become an organization that consumes natural resources efficiently and to function in an energy-conscious manner. Their near-term plans include the installation and operation of a solar PV system at the production site.
Költözzma Ltd. maintains ISO9001 and ISO 14001:2015 Environmental Management System.

References

General Programme Instructions of the International EPD® System. Version 4.0.
ISO 14025 – Environmental labels and declarations - Type III environmental declarations - Principles and procedures
PCR Construction Products PCR2019:14; version 1.3.1
EN 15804:2012+A2:2019/AC:2021 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
ISO – 21930:2017 – Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services

Product Category Rules (PCR) – Construction Products PCR2019:14; version 1.3.1

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