PRECAST CONCRETE INSULATED SANDWICH WALL ELEMENTS

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

MALMÖ SPORTS PRIMARY SCHOOL
Kv. Sportshallen 1, Malmö, Sweden

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	JSC "Malagris Prefab"
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Contact details	Gediminas Binekas +370 611 23549 info@malagrisprefab.lt
Website	www.malagrisprefab.lt

PRODUCT IDENTIFICATION

Product name	Precast concrete insulated sandwich wall elements
Additional labels	CE, BBC, BVB, ISO
Place(s) of production	Lithuania, Klaipėda

EPD INFORMATION

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.

EPD program operator	The Building Information Foundation RTS sr / Building Information Ltd Malminkatu 16 A,
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804+A2 serves as the core PCR. In addition, the RTS PCR (English version, 26.8.2020) is used.
EPD author	Anni Oviir and Mari Kirss Rangi Maja OÜ Tondi 22-4, Tallinn Estonia www.lcasupport.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
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PRODUCT INFORMATION

PRODUCT DESCRIPTION

Precast concrete insulated sandwich wall elements consist of one layer of concrete cover by a layer of insulation or two layers of concrete separated by one layer of insulation. This EPD covers precast insulation wall elements with three kinds of insulation – polyisocyanurate (PIR), expanded polystyrene (EPS), and mineral wool (MW).

PRODUCT APPLICATION

Precast concrete insulated sandwich wall elements are used in building construction.
Insulated wall elements can be used in residential as well as non-residential buildings. The increased building speed and minimised health and safety risks at the building site are just a few of the benefits of using precast concrete products when compared to in-situ construction methods.

TECHNICAL SPECIFICATIONS

Concrete with various strength classes can be used, but the minimum concrete strength class is C30/37.
The diameter of steel reinforcement used normally varies between 8 and 30 mm. However, it is not limited to these sizes as for certain projects the required adjustments can be made.

The insulation layer is typically made of PIR, EPS or MW and can be up to 200 mm thick. Depending on the project, the insulation material and thickness can be adjusted.
The calculations in this EPD were based on averaged products.

PRODUCT STANDARDS

Product is produced in accordance with EN 206, EN 13369, EN 14992 standards. The quality of the products is ensured by taking regular quality control measures including, but not limited to the testing of raw materials, inspection of the manufacturing equipment and thorough inspection of the final product.

PHYSICAL PROPERTIES OF THE PRODUCT

Physical properties of the product are dependent on the exact project requirements. The product is available in various sizes and thicknesses of the concrete layers as well as with varying thickness of the insulation layer.

ADDITIONAL TECHNICAL INFORMATION

Further information can be found at www.malagrisprefab.lt

PRODUCT RAW MATERIAL COMPOSITION

Material	Quantity, mass %			Usability			Origin of the raw materials
	PIR	EPS	MW	Re-newable	Non-renewable	Recycled	
Reinforcement	5	5	4		x	x	non-EEA
PIR	>1	-	-		x		EEA
EPS	-	>1	-		x		EEA
MW	-	-	3		x		EEA
Cement 42,5R	13	13	13		x		EEA
Gravel	34	34	33		x		EEA
Sand	35	35	34		x		EEA
Concrete admixtures	>1	>1	>1		x		EEA
Granite	6	6	5		x		EEA
Water	6	6	6		x		EEA
Total	100	100	100				

PRODUCT RAW MATERIAL COMPOSITION

Material	Amount, mass %	Material origin
Metals	4	non-EEA
Minerals	90	EEA
Fossil materials	0	-
Bio-based materials	0	-
Water	6	EEA

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

MANUFACTURING AND PACKAGING (A1-A3)

The production of the precast concrete insulated sandwich wall elements begins with the preparation of the casting mould, which includes assembling the mould according to the element dimensions, cleaning the casting platform, and applying form oil. Then the reinforcement is put into place according to the technical drawings. When the reinforcement is in place it is tensioned, after which wet concrete is poured into the mould. After casting, the slab is covered and left to cure. Eventually, the elements are moved out and transported to the construction site.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final product's delivery to construction site cover direct exhaust emissions of fuel, environmental impacts of fuel production, as well as related infrastructure emissions. The transportation distance is defined according to RTS PCR. Average distance of transportation from production plant to building site is assumed as 548 km and the transportation method is assumed to be ferry and lorry. Transportation does not cause losses as product are packaged properly.
Optional A5 module is not declared.

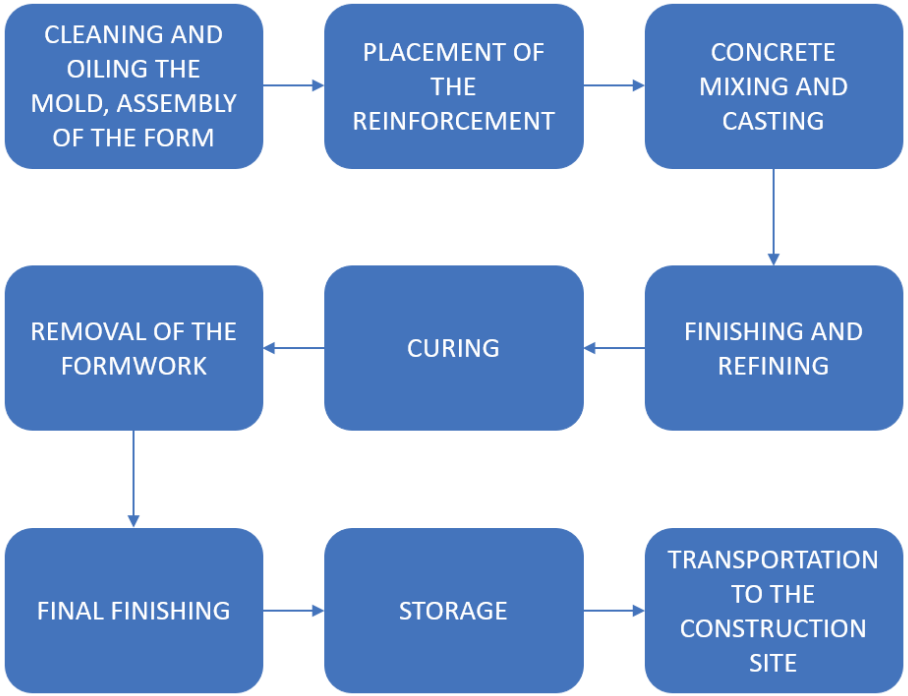
PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase. Air, soil and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste. The demolition process consumes energy in the form of diesel fuel used by building machines (C1).
All of the end-of-life product is assumed to be sent to the closest facilities (C2), which are assumed to be located within 15 km of the demolition site.
At the waste treatment plant, waste that can be reused, recycled or recovered for energy is separated and diverted for further use (C3).
Unusable materials are disposed of in a landfill (C4).
Due to the recycling potential of reinforcement steel and concrete, they can be used as secondary raw material. This avoids the use of virgin raw materials (D)

Manufacturing process:



LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2020

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 tonne
Mass per declared unit	1000 kg

The values can be converted to m^2 using the following factors:

- Two-layer elements: 358 kg/m^2, average thickness 350 mm
- Three-layer elements: 623 kg/m^2, average thickness 420 mm

BIOGENIC CARBON CONTENT

The products do not contain any biogenic carbon. However, wooden beams and pallets are used for transport.

Biogenic carbon content in product, kg C	-
Biogenic carbon content in packaging, kg C	1.49 kg

SYSTEM BOUNDARY

The scope of the EPD is "cradle to gate with modules C1-C4 and D". The modules A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport) as well as C1 (Deconstruction/ demolition), C2 (Transport at end-of-life), C3 (Waste processing), C4 (Disposal) and D (benefits and loads beyond the system boundary) are included in the study.

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	D	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

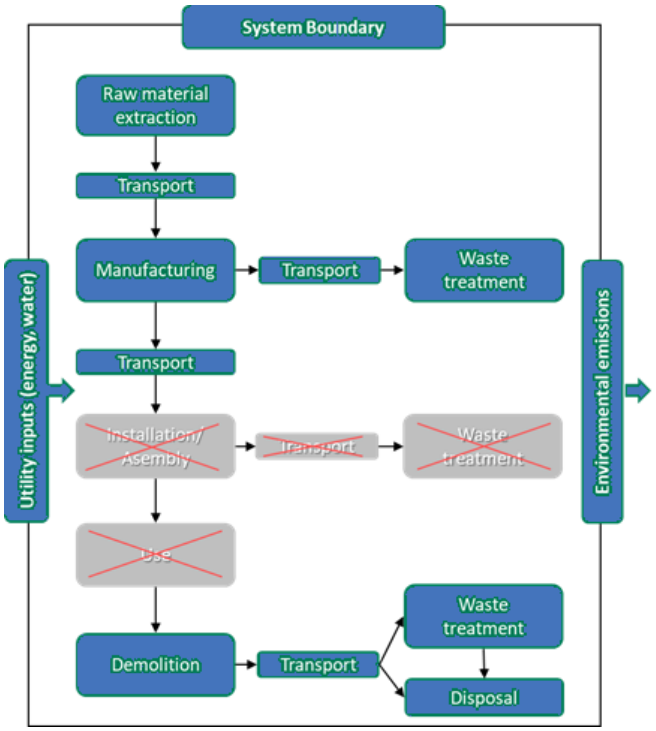


Figure a. Life cycle stages diagram

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the *EN 15804:2012+A2:2019* and *RTS 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 which data are available for are included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total neglected input and output flows do also not exceed 5% of energy usage or mass. The life cycle analysis includes all industrial processes from raw material acquisition to production, distribution, and end-of-life stages.

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.

ALLOCATION

As it is impossible to collect raw material and energy consumption data separately for each product produced the in the plant, data is allocated. Allocation is based on annual production rate and made with high accuracy and precision.

The values for 1000 kg of the product which is used within this study is calculated by considering the total product weight per annual production. In the factory, several kinds of concrete elements are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to the ratio of the annual production of the declared product to the total annual production at

the factory, the annual total raw materials, energy consumption, packaging materials and the generated waste per the declared product are allocated. Subsequently, the product output fixed to 1000 kg and the corresponding amount of product is used in the calculations.

ESTIMATES AND ASSUMPTIONS

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. All estimations and assumptions are given below:

• Module A4: The transportation distance is defined according to RTS PCR. It was assumed that typical installation place is situated in Stockholm, Sweden. Average distance of transportation from production plant to building site is equal to 548 km. Transportation method is assumed to be ferry and lorry. The transportation doesn't cause losses as products are packaged properly. Also, volume capacity utilisation factor is assumed to be 1 for the nested packaged products.

• Module C1: Energy consumption of demolition process is on the average 10 kWh/m2 (Bozdağ, Ö & Seçer, M. 2007). Basing on Level(s) project, an average mass of concrete building is about 1000 kg/m2. Therefore, energy consumption demolition is 10 kWh/ 1000 kg=0,01 kWh/kg.

• Module C2: It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed that it has the same weight with the declared product. All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 15 km and the transportation method is assumed as lorry which is the most common.

• Module A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by transportation company to serve needs of other clients.

• Module C3: It is assumed that 71-72% of the waste is recycled. This assumption was based on information from industry associations. App. 70% of concrete and 100% of steel is recycled. The process losses of the waste treatment plant are assumed to be negligible

• Module C4: The remaining 30% of concrete is assumed to be send to landfill.

• Module D: The recycled end-of-life product is assumed to be converted into a raw material after recycling.

ENVIRONMENTAL IMPACT DATA

NOTE: ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930 ARE PRESENTED IN ANNEX.
CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEP

1) 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 experienced with the indicator. 2) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e.

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Climate change – total	kg CO2e	2.09E2	2.18E2	2.48E2	5.47E1	5.47E1	5.47E1	MND	MND
Climate change – fossil	kg CO2e	1.94E2	2.03E2	2.34E2	5.51E1	5.51E1	5.51E1	MND	MND
Climate change – biogenic	kg CO2e	1.48E1	1.49E1	1.44E1	1.12E−2	1.12E−2	1.12E−2	MND	MND
Climate change – LULUC	kg CO2e	9.48E−2	9.45E−2	1.17E−1	2.61E−2	2.61E−2	2.61E−2	MND	MND
Ozone depletion	kg CFC11e	1.41E−5	1.42E−5	1.67E−5	1.19E−5	1.19E−5	1.19E−5	MND	MND
Acidification	mol H+e	7.96E−1	8.26E−1	1.2E0	1.1E0	1.1E0	1.1E0	MND	MND
Eutrophication, aquatic freshwater[2)]	kg Pe	3.81E−3	3.96E−3	5.41E−3	3.29E−4	3.29E−4	3.29E−4	MND	MND
Eutrophication, aquatic marine	kg Ne	2.14E−1	2.18E−1	2.52E−1	2.79E−1	2.79E−1	2.79E−1	MND	MND
Eutrophication, terrestrial	mol Ne	2.44E0	2.49E0	3.13E0	3.09E0	3.09E0	3.09E0	MND	MND
Photochemical ozone formation	kg NMVOCe	7.29E−1	7.52E−1	9.06E−1	8.21E−1	8.21E−1	8.21E−1	MND	MND
Abiotic depletion, minerals & metals	kg Sbe	1.67E−3	1.67E−3	2.81E−3	6.26E−4	6.26E−4	6.26E−4	MND	MND
Abiotic depletion of fossil resources	MJ	1.47E3	1.66E3	1.95E3	7.73E2	7.73E2	7.73E2	MND	MND
Water use[1)]	m3e depr.	5.95E1	6.59E1	6.99E1	2.18E0	2.18E0	2.18E0	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Climate change – total	kg CO2e	3.3E0	3.3E0	3.3E0	1.36E0	1.36E0	1.36E0	8.29E0	1.28E1	5.11E0	4.01E0	4.01E0	3.89E0	−5.59E0	−5.59E0	−5.43E0
Climate change – fossil	kg CO2e	3.3E0	3.3E0	3.3E0	1.36E0	1.36E0	1.36E0	6.5E0	1.28E1	5.1E0	4.01E0	4.01E0	3.89E0	−5.58E0	−5.58E0	−5.41E0
Climate change – biogenic	kg CO2e	9.17E−4	9.17E−4	9.17E−4	9.9E−4	9.9E−4	9.9E−4	1.79E0	1.62E−3	1.42E−3	4.07E−3	4.07E−3	3.95E−3	−1E−2	−1E−2	−9.74E−3
Climate change – LULUC	kg CO2e	2.79E−4	2.79E−4	2.79E−4	4.1E−4	4.1E−4	4.1E−4	4.71E−4	4.6E−4	4.31E−4	1.1E−3	1.1E−3	1.06E−3	−2.08E−3	−2.08E−3	−2.02E−3
Ozone depletion	kg CFC11e	7.12E−7	7.12E−7	7.12E−7	3.2E−7	3.2E−7	3.2E−7	1.15E−6	1.14E−6	1.1E−6	1.15E−6	1.15E−6	1.12E−6	−1.89E−6	−1.89E−6	−1.84E−6
Acidification	mol H+e	3.45E−2	3.45E−2	3.45E−2	5.73E−3	5.73E−3	5.73E−3	5.58E−2	5.6E−2	5.34E−2	3.68E−2	3.68E−2	3.57E−2	−4.62E−2	−4.62E−2	−4.48E−2
Eutrophication, aquatic freshwater[2)]	kg Pe	1.33E−5	1.33E−5	1.33E−5	1.11E−5	1.11E−5	1.11E−5	2.28E−5	2.21E−5	2.06E−5	3.75E−5	3.75E−5	3.64E−5	−7.26E−5	−7.26E−5	−7.05E−5
Eutrophication, aquatic marine	kg Ne	1.52E−2	1.52E−2	1.52E−2	1.73E−3	1.73E−3	1.73E−3	2.46E−2	2.48E−2	2.36E−2	1.44E−2	1.44E−2	1.4E−2	−1.6E−2	−1.6E−2	−1.56E−2
Eutrophication, terrestrial	mol Ne	1.67E−1	1.67E−1	1.67E−1	1.91E−2	1.91E−2	1.91E−2	2.7E−1	2.71E−1	2.59E−1	1.58E−1	1.58E−1	1.53E−1	−1.77E−1	−1.77E−1	−1.72E−1
Photochemical ozone formation	kg NMVOCe	4.59E−2	4.59E−2	4.59E−2	6.13E−3	6.13E−3	6.13E−3	7.42E−2	7.45E−2	7.11E−2	4.44E−2	4.44E−2	4.31E−2	−5.1E−2	−5.1E−2	−4.94E−2
Abiotic depletion, minerals & metals	kg Sbe	5.03E−6	5.03E−6	5.03E−6	2.33E−5	2.33E−5	2.33E−5	9.54E−6	9.28E−6	7.79E−6	3.63E−5	3.63E−5	3.52E−5	−7.9E−5	−7.9E−5	−7.67E−5
Abiotic depletion of fossil resources	MJ	4.54E1	4.54E1	4.54E1	2.12E1	2.12E1	2.12E1	7.32E1	7.31E1	7.02E1	7.73E1	7.73E1	7.51E1	−1.3E2	−1.3E2	−1.26E2
Water use[1)]	m3e depr.	8.46E−2	8.46E−2	8.46E−2	7.89E−2	7.89E−2	7.89E−2	2.27E−1	1.91E−1	1.31E−1	2.06E0	2.06E0	2E0	−4.7E0	−4.7E0	−4.57E0

USE OF NATURAL RESOURCES

4) PER abbreviation stands for primary energy resources.

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Renewable PER used as energy4[)]	MJ	1.6E2	1.61E2	1.83E2	7.29E0	7.29E0	7.29E0	MND	MND
Renewable PER used as materials	MJ	3.03E1	3.03E1	3.03E1	0E0	0E0	0E0	MND	MND
Total use of renewable PER	MJ	1.91E2	1.91E2	2.13E2	7.29E0	7.29E0	7.29E0	MND	MND
Non-renew. PER used as energy	MJ	1.47E3	1.55E3	1.95E3	7.73E2	7.73E2	7.73E2	MND	MND
Non-renew. PER used as materials	MJ	0E0	1.13E2	0E0	0E0	0E0	0E0	MND	MND
Total use of non-renewable PER	MJ	1.47E3	1.66E3	1.95E3	7.73E2	7.73E2	7.73E2	MND	MND

Use of secondary materials	kg	1.41E0	1.41E0	1.58E0	0E0	0E0	0E0	MND	MND
Use of renewable secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND
Use of non-renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND
Use of net fresh water	m3	3.14E0	3.16E0	3.39E0	1.15E−1	1.15E−1	1.15E−1	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Renewable PER used as energy4)	MJ	2.45E−1	2.45E−1	2.45E−1	2.67E−1	2.67E−1	2.67E−1	4.15E−1	4.07E−1	3.8E−1	7.12E−1	7.12E−1	6.91E−1	−1.62E0	−1.62E0	−1.57E0
Renewable PER used as materials	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Total use of renewable PER	MJ	2.45E−1	2.45E−1	2.45E−1	2.67E−1	2.67E−1	2.67E−1	4.15E−1	4.07E−1	3.8E−1	7.12E−1	7.12E−1	6.91E−1	−1.62E0	−1.62E0	−1.57E0
Non-renew. PER used as energy	MJ	4.54E1	4.54E1	4.54E1	2.12E1	2.12E1	2.12E1	7.32E1	7.31E1	7.02E1	7.73E1	7.73E1	7.51E1	−1.3E2	−1.3E2	−1.26E2
Non-renew. PER used as materials	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Total use of non-renewable PER	MJ	4.54E1	4.54E1	4.54E1	2.12E1	2.12E1	2.12E1	7.32E1	7.31E1	7.02E1	7.73E1	7.73E1	7.51E1	−1.3E2	−1.3E2	−1.26E2
Use of secondary materials	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Use of renewable secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Use of non-renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m3	4.01E−3	4.01E−3	4.01E−3	4.41E−3	4.41E−3	4.41E−3	1.02E−2	9.4E−3	6.2E−3	5.08E−2	5.08E−2	4.93E−2	−1.15E−1	−1.15E−1	−1.11E−1

END OF LIFE – WASTE

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Hazardous waste	Kg	9.1E0	9.21E0	1.17E1	7.94E−1	7.94E−1	7.94E−1	MND	MND
Non-hazardous waste	Kg	2.42E2	2.42E2	3.09E2	4.68E1	4.68E1	4.68E1	MND	MND
Radioactive waste	Kg	7.54E−3	7.56E−3	8.24E−3	5.37E−3	5.37E−3	5.37E−3	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Hazardous waste	Kg	4.88E−2	4.88E−2	4.88E−2	2.06E−2	2.06E−2	2.06E−2	0E0	0E0	0E0	8.74E−2	8.74E−2	8.48E−2	−1.41E−1	−1.41E−1	−1.37E−1
Non-hazardous waste	Kg	5.22E−1	5.22E−1	5.22E−1	2.28E0	2.28E0	2.28E0	0E0	0E0	0E0	2.86E2	2.86E2	2.77E2	−6.69E2	−6.69E2	−6.49E2
Radioactive waste	Kg	3.18E−4	3.18E−4	3.18E−4	1.46E−4	1.46E−4	1.46E−4	0E0	0E0	0E0	5.17E−4	5.17E−4	5.02E−4	−8.61E−4	−8.61E−4	−8.36E−4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Components for reuse	Kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND
Materials for recycling	Kg	1.87E1	1.87E1	1.87E1	0E0	0E0	0E0	MND	MND
Materials for energy recovery	Kg	1.08E1	1.08E1	1.08E1	0E0	0E0	0E0	MND	MND
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Components for reuse	Kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Materials for recycling	Kg	0E0	0E0	0E0	0E0	0E0	0E0	7.12E2	7.12E2	6.91E2	0E0	0E0	0E0	0E0	0E0	0E0
Materials for energy recovery	Kg	0E0	0E0	0E0	0E0	0E0	0E0	2.38E0	2.38E0	3.19E1	0E0	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0

KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Climate change – total	kg CO2e	2.09E−1	2.18E−1	2.48E−1	5.51E−2	5.51E−2	5.51E−2	MND	MND
Abiotic depletion, minerals & metals	kg Sbe	1.67E−6	1.67E−6	2.81E−6	6.26E−7	6.26E−7	6.26E−7	MND	MND
Abiotic depletion of fossil resources	MJ	1.47E0	1.66E0	1.95E0	7.73E−1	7.73E−1	7.73E−1	MND	MND
Water use	m3e depr.	5.95E−2	6.59E−2	6.99E−2	2.18E−3	2.18E−3	2.18E−3	MND	MND
Use of secondary materials	kg	1.41E−3	1.41E−3	1.58E−3	0E0	0E0	0E0	MND	MND
Biogenic carbon content in product	kg C	N/A	N/A	N/A	N/A	N/A	N/A	MND	MND
Biogenic carbon content in packaging	kg C	1.49	1.49	1.49	N/A	N/A	N/A	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Climate change – total	kg CO2e	3.3E−3	3.3E−3	3.3E−3	1.36E−3	1.36E−3	1.36E−3	8.29E−3	1.28E−2	5.11E−3	4.01E−3	4.01E−3	3.89E−3	−5.59E−3	−5.59E−3	−5.43E−3
Abiotic depletion, minerals & metals	kg Sbe	5.03E−9	5.03E−9	5.03E−9	2.33E−8	2.33E−8	2.33E−8	9.54E−9	9.28E−9	7.79E−9	3.63E−8	3.63E−8	3.52E−8	−7.9E−8	−7.9E−8	−7.67E−8
Abiotic depletion of fossil resources	MJ	4.54E−2	4.54E−2	4.54E−2	2.12E−2	2.12E−2	2.12E−2	7.32E−2	7.31E−2	7.02E−2	7.73E−2	7.73E−2	7.51E−2	−1.3E−1	−1.3E−1	−1.26E−1
Water use	m3e	8.46E−5	8.46E−5	8.46E−5	7.89E−5	7.89E−5	7.89E−5	2.27E−4	1.91E−4	1.31E−4	2.06E−3	2.06E−3	2E−3	−4.7E−3	−4.7E−3	−4.57E−3
Use of secondary materials	kg	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0	0E0
Biogenic carbon content in product	kg C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Biogenic carbon content in packaging	kg C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity, high voltage, production mix (Reference product: market for electricity, high voltage), Lithuania, Ecoinvent 3,6, year: 2019
Electricity CO2e / kWh	0,34 kg CO_2e / kWh
District heating data source and quality	Heat and power co-generation, wood chips (Reference product: heat, district or industrial, other than natural gas), Lithuania, Ecoinvent 3,6, year: 2019
District heating CO2e / kWh	0,11 kg CO_2e / kWh

Transport scenario documentation

Scenario parameter	Value
A4 specific transport CO2e emissions, kg CO2e / tkm, lorry	0.090
A4 specific transport CO2e emissions, kg CO2e / tkm, ferry	0.011
A4 average transport distance, lorry, km	273
A4 average transport distance, ferry, km	275
Transport capacity utilization, %	75
Bulk density of transported products, kg/m^3	1424
Volume capacity utilisation factor for nested packaged products	1

End of life scenario documentation

Scenario parameter	Value for PIR and EPS	Value for MW
Collection process – kg collected separately	1000	1000
Collection process – kg collected with mixed waste	0	0
Recovery process – kg for re-use	0	0
Recovery process – kg for recycling	712	691
Recovery process – kg for energy recovery	2	32
Disposal (total) – kg for final deposition	286	277
Scenario assumptions for transportation		End-of-life product is transported 15 km with an average lorry.

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ABOUT THE MANUFACTURER

JSC Malagris Prefab was established in July 2018.

Our main field of activity is manufacturing of reinforced concrete wall elements, balconies, massive slabs, prefabricated stair elements, concrete lego blocks.

Our company can also offer specialized transport services for reinforced concrete elements.

JSC Malagris Prefab uses the most advanced precast management software Alto ERP.

In order to organize the work process of designers and manufacturers, the company implemented production sales and transport modules from the Alto ERP software.

EPD AUTHOR AND CONTRIBUTORS

Manufacturer	JSC Malagris Prefab
EPD author	Anni Oviir and Mari Kirss, Rangi Maja OÜ
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
EPD program	RTS EPD
Background data	This EPD is based on Ecoinvent 3.6 and One Click LCA databases
LCA software	The LCA and EPD have been created using One Click LCA Pre-Verified EPD Generator for Cementitious Products

ANNEX 1 : ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1-A3			A4			A5	B1-B7
		PIR	EPS	MW	PIR	EPS	MW		
Global warming potential	kg CO2e	1.92E2	2E2	2.3E2	5.47E1	5.47E1	5.47E1	MND	MND
Depletion of stratospheric ozone	kg CFC11e	1.18E−5	1.19E−5	1.41E−5	9.46E−6	9.46E−6	9.46E−6	MND	MND
Acidification	kg SO2e	5.58E−1	5.82E−1	8.76E−1	8.42E−1	8.42E−1	8.42E−1	MND	MND
Eutrophication	kg PO4 3e	1.73E−1	1.76E−1	2.36E−1	9.93E−2	9.93E−2	9.93E−2	MND	MND
Photochemical ozone formation	kg C2H4e	4.34E−2	4.29E−2	4.68E−2	2.35E−2	2.35E−2	2.35E−2	MND	MND
Abiotic depletion of non-fossil res.	kg Sbe	1.67E−3	1.67E−3	2.81E−3	6.26E−4	6.26E−4	6.26E−4	MND	MND
Abiotic depletion of fossil resources	MJ	1.47E3	1.66E3	1.95E3	7.73E2	7.73E2	7.73E2	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW	PIR	EPS	MW
Global warming potential	kg CO2e	3.27E0	3.27E0	3.27E0	1.35E0	1.35E0	1.35E0	6.46E0	1.28E1	5.07E0	3.96E0	3.96E0	3.84E0	−5.49E0	−5.49E0	−5.33E0
Depletion of stratospheric ozone	kg	5.63E−7	5.63E−7	5.63E−7	2.55E−7	2.55E−7	2.55E−7	9.08E−7	9.06E−7	8.72E−7	9.13E−7	9.13E−7	8.86E−7	−1.5E−6	−1.5E−6	−1.46E−6
Acidification	kg SO2e	4.87E−3	4.87E−3	4.87E−3	2.77E−3	2.77E−3	2.77E−3	8.29E−3	8.43E−3	7.53E−3	1.23E−2	1.23E−2	1.19E−2	−1.97E−2	−1.97E−2	−1.91E−2
Eutrophication	kg PO4 3e	8.57E−4	8.57E−4	8.57E−4	5.6E−4	5.6E−4	5.6E−4	2.06E−3	1.96E−3	1.33E−3	2.6E−3	2.6E−3	2.52E−3	−4.24E−3	−4.24E−3	−4.11E−3
Photochemical ozone formation	kg C2H4e	5.01E−4	5.01E−4	5.01E−4	1.76E−4	1.76E−4	1.76E−4	8.15E−4	8.12E−4	7.76E−4	8.2E−4	8.2E−4	7.96E−4	−1.34E−3	−1.34E−3	−1.3E−3
Abiotic depletion of non-fossil res.	kg Sbe	5.03E−6	5.03E−6	5.03E−6	2.33E−5	2.33E−5	2.33E−5	9.54E−6	9.28E−6	7.79E−6	3.63E−5	3.63E−5	3.52E−5	−7.9E−5	−7.9E−5	−7.67E−5
Abiotic depletion of fossil	MJ	4.54E1	4.54E1	4.54E1	2.12E1	2.12E1	2.12E1	7.32E1	7.31E1	7.02E1	7.73E1	7.73E1	7.51E1	−1.3E2	−1.3E2	−1.26E2