

# ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ČSN ISO 14025:2010  
and EN 15804:2021+A2:2019+AC:2021

Organization	<b>GRENA, a.s.</b>
Industry Program Operator	CENIA, Czech Environmental Information Agency, Executive Body of NPEZ Agency
Author	<b>GRENA, a.s.</b>
Declaration No.:	3015-EPD-030065141
Publication Date	2023-12-08
Valid until	2028-12-08 in accordance with EN 15804+A2:2019



# Grenamat



# 1. General Information Declaration

<b>GRENA, a.s.</b>	<b>Grenamat</b>
<b>Programme:</b> „National programme of environmental labelling“- CR <b>Industry operator:</b> CENIA, Czech Environmental Information Agency, Executive body of the NPEZ Agency, Moskevská 1523/63, Praha 10, 101 00, <a href="http://www.cenia.cz">www.cenia.cz</a> ,	<b>Name and address of the manufacturer:</b> <b>GRENA, a.s.</b> Třída Čs. armády 541 391 81 Veselí nad Lužnicí - Veselí nad Lužnicí II, CZ
<b>EPD registration number:</b> <b>3015-EPD-030065141</b>	<b>Declared unit:</b> <b>1 kg of average product – Grenamat</b>
<b>Product category rules:</b> EN 15804+A2:2019 as core PCR <b>Publication Date:</b> 2023-12-08 <b>Valid until:</b> 2028-12-08 dle EN 15804+A2:2019	<b>Product:</b> <b>Grenamat</b>

Grena a.s., Tř. Čs. armády 541, 391 81 Veselí nad Lužnicí, is a Czech company, which was established in 1941.

The main areas of production are fire-resistant, non-combustible, insulating and acoustic vermiculite boards and shaped parts Grenamat. These products are widely used in construction, the shipbuilding industry, in the construction of fireplaces and stoves, in the manufacture of doors and in many other industries. We export these products to more than 30 countries around the world.

Due to the possibility of comparing products within the life cycle assessment of buildings based on their EPD, which is carried out by determining their contribution to the environmental properties of the building, it is necessary that the EPD of the given building products be processed in accordance with the requirements of the standard **EN 15804+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.**

## 1.1. Product data

### 1.1.1. Product

The main areas of production are fire-resistant, non-combustible, insulating and acoustic vermiculite boards and shaped parts Grenamat.

### 1.1.2. Product data sheet

Product	Description
<b>Grenamat A</b>	<ul style="list-style-type: none"> <li>▪ non-combustible board (fire reaction class A1) suitable for general use in the shipbuilding industry (production of furniture, bulkheads and ceilings)</li> <li>▪ <b>MED certificate</b></li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenamat-a/">https://www.grenamat.cz/cz/grenamat-a/</a></li> </ul>
<b>Grenamat AL</b>	<ul style="list-style-type: none"> <li>▪ non-combustible board (fire reaction class A1) suitable for applications such as:</li> </ul>

Product	Description
	<ul style="list-style-type: none"> <li>▪ wall and ceiling cladding (including acoustic applications)</li> <li>▪ protection of steel and other structural constructions.</li> <li>▪ heat and smoke exhaust</li> <li>▪ air ventilation system</li> <li>▪ installation channels and shafts</li> <li>▪ walls fillers for the safes</li> <li>▪ <b>ETA certificate</b></li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenamat-al/">https://www.grenamat.cz/cz/grenamat-al/</a></li> </ul>
<b>Grenamat AS</b>	<ul style="list-style-type: none"> <li>▪ Fire-resistant board made from expanded vermiculite and special inorganic binder, providing high resistance to temperatures up to 1100°C and thermal shocks. The board is harmless to health and does not contain any asbestos, glass or mineral fibers.</li> <li>▪ Resistant to CO and CH<sub>4</sub> in the atmosphere.</li> <li>▪ Fire reaction according to ČSN EN 13501.1, DIN 4102 = A1.</li> <li>▪ Sufficient strength and mechanical stability, high temperature resistance with high electrical resistance and low thermal conductivity.</li> <li>▪ Used for insulating fireplaces and vents, high temperature furnaces, refractories, hot water boilers, etc.</li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenamat-as/">https://www.grenamat.cz/cz/grenamat-as/</a></li> </ul>
<b>Grenamat HTI</b>	<ul style="list-style-type: none"> <li>▪ Fire-resistant insulation board made from exfoliated vermiculite and special inorganic binders. It is intended for use as back-up insulation and/or direct flame contact in various furnaces and high temperature industrial processes. The material does not contain asbestos, glass fibers, or mineral fibers.</li> <li>▪ It is resistant to the effects of CO and CH<sub>4</sub> in the atmosphere and is difficult to wet with liquid aluminum, cryolite, and fluorides.</li> <li>▪ Fire reaction according to ČSN EN 13501.1, DIN 4102 = A1.</li> <li>▪ It has sufficient strength and mechanical stability, high temperature resistance with high electrical resistance and low thermal conductivity.</li> <li>▪ Used for insulating fireplaces and vents, high temperature furnaces, refractories, and hot water boilers., etc.</li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenamat-hti/">https://www.grenamat.cz/cz/grenamat-hti/</a></li> </ul>

Product	Description
<b>Grenatherm</b>	<ul style="list-style-type: none"> <li>▪ Grenatherm radiant construction boards made from expanded vermiculite and a special inorganic binder that ensures high resistance to thermal shocks, thermal capacity and radiant ability. These boards are used for cladding fireplace enclosures and similar applications, etc.</li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenatherm/">https://www.grenamat.cz/cz/grenatherm/</a></li> </ul>
<b>Grenaisol</b>	<ul style="list-style-type: none"> <li>▪ Insulation boards made from expanded vermiculite and special inorganic binders, which ensures high resistance to thermal shocks and high insulating capacity.</li> <li>▪ The boards are harmless to health and does not contain any asbestos, glass or mineral fibers. Have sufficient strength and mechanical stability.</li> <li>▪ Grenaisol boards are very stable, there are no fumes even during firing.</li> <li>▪ Used for constructing fireplace enclosures, insulating stove chambers, and achieving insulation and structural support in one step.</li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenaisol/">https://www.grenamat.cz/cz/grenaisol/</a></li> </ul>
<b>Grenamat C</b>	<ul style="list-style-type: none"> <li>▪ Grenamat C are boards made from expanded vermiculite, wood matter and organic binders. Used to protect all types of building constructions from fire, for the construction of fireproof and prewall walls, fireproof door panels, acoustic panels, flame retardant furniture and floor panels.</li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenamat-b-c/">https://www.grenamat.cz/cz/grenamat-b-c/</a></li> </ul>
<b>Grenaboard</b>	<ul style="list-style-type: none"> <li>▪ Grenaboards are very light and strong fire-resistant boards made from expanded vermiculite and special inorganic binder. The boards are covered with paper on both sides and pressed on all four edges for easy joint filling of a sealant. It is certified for increase the fire resistance of various types of ceiling structures with resistance up to 180 minutes.</li> <li>▪ <b>ETA certificate</b></li> <li>▪ <b>ISO 9001-2015 certificate</b></li> <li>▪ <b>CE mark</b></li> <li>▪ <a href="https://www.grenamat.cz/cz/grenaboard-92622/">https://www.grenamat.cz/cz/grenaboard-92622/</a></li> </ul>

These standards apply to the products.

#### **Grenamat A Non-combustible material**

Marine Equipment Directive 2014/90/EU  
item No. MED/3.13. SOLAS 74 as amended, Regulation II-2/3 II-2/5, II-2/9 & X/3,  
2000 HSC Code 7 and IMO 2010 FTP Code

## Grenamat AL

EN 13501-X *Požární klasifikace stavebních výrobků a konstrukcí staveb - Část 1-4 (Fire classification of construction products and building elements - Part 1-4)*

ČSN 73 0863 *Požárně technické vlastnosti hmot. Stanovení šíření plamene po povrchu stavebních hmot (Fire technical properties of materials. Determination of flame propagation along the surface of building materials)*

## Grenamat AS, Grenamat HTI, Grenatherm, Grenaisol,

EN 15501:2015 *Tepelněizolační výrobky pro zařízení budov a průmyslové instalace - Průmyslově vyráběné výrobky z expandovaného perlitu (EP) a exfoliovaného vermikulitu (EV) – Specifikace (Thermal insulation products for building equipment and industrial installations - Factory made expanded perlite (EP) and exfoliated vermiculite (EV) products – Specification).*

You can find a detailed description of all products at <https://www.grenamat.cz/>.

### Product packaging:

Grenamat boards are stored in a horizontal position on spatially rigid and custom-made wooden pallets.

The edges are protected with paper corners, the whole is protected with stretch film and reinforced with PP tape.

### 1.1.3. Rules for use

#### Use of products:

Grena a.s. manufactures non-combustible boards suitable for securing internal spaces against fire, such as wall coverings, steel beams, carbon fiber slats, air channels and shafts (Grenamat AL, Grenaboard), fire resistant doors (Grenamat C), ship structures (Grenamat A), fireplaces, fireplace insulation (Grenamat AS, Grenaisol, Grenatherm), hot water boilers, refractors, blast furnaces (Grenatherm HTI), etc.





## Environment and health during use

Under normal conditions of use, the products do not create any adverse effects on health or release volatile organic substances into indoor air.

Due to the areas of use of the product, no impacts on the environment and emissions into water, air or soil are expected.

The manufacturer Grena, a.s., Veselí nad Lužnicí declares that the above-mentioned product does not contain substances from the SVHC (Substances of Very High Concern) list of hazardous substances published by the European Chemicals Agency (ECHA) on its website.

The manufacturer Grena, a.s., Veselí nad Lužnicí declares that the above-mentioned product does not contain asbestos, any mineral and glass fibers.

The manufacturer Grena, a.s., Veselí nad Lužnicí further declares that Grenamat boards are objects, which means that they are, according to the valid wording of Regulation of the European Parliament and Council (EC) No. 1907/2006 on the registration, evaluation, authorization and restriction of chemical substances, in the wording of Commission Regulation (EC) No. 987/2008 and Commission Regulation (EU) No. 453/2010 exempted from the obligation to register and thus from the obligation to issue safety data sheets.

## Reference lifetime

The reference service life (RSL) for products is not declared. For Grenamat AS and Grenamat HTI intended for direct contact with fire, the reference service life (RSL) is usually estimated at 5-8 years. The reference service life (RSL) for other products is considered according to the planned service life of the building.

### 1.1.4. Delivery method

In accordance with the Regulation of the European Parliament and the Council (EU) No. 305/2011, establishing harmonized conditions for placing construction products on the market (CPR EU 305/2011), a Declaration was issued for the products Grenamat AS, Grenamat HTI, Grenatherm, Grenaisol on properties, which declares that the properties of the product are in accordance with the relevant harmonized technical specifications.

The quality of the products is ensured by an effective quality management system according to EN ISO 9001 and is in accordance with technical regulations regarding the type of product.

### 1.1.5. Basic raw materials and auxiliary materials

Table 1 Average composition of the product

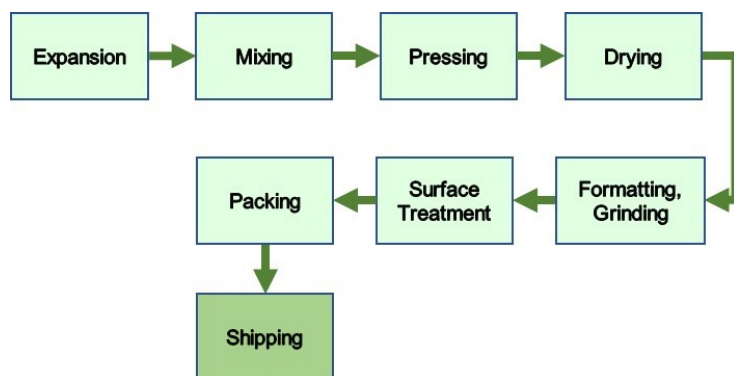
Component	%	Content
Vermiculite	%	60-65
Sawdust	%	10-20
Potassium water glass	%	10-15
Glue	%	<7
Phosphoric acid	%	<3
Burnt shale	%	<1
Other	%	<0,5

### 1.1.6. Production

The basic input material for the production of non-combustible Grenamat boards is expanded vermiculite, which is mixed with an inorganic binder. For the surface treatment of the boards we use veneer, varnishes, laminating foils, edges and related glues.

The production process is schematically shown on the picture 1.

Fig.1: Scheme of the manufacturing process



### 1.1.7. Waste management

Waste generated during the production process is collected according to type and reported according to regulations.

#### Possibility to recycle used products (at the end of their service life)

After the decomposition of the building, it is assumed that the products will be landfilled.

## 1.2. LCA: Calculation rules

### 1.2.1. Declared unit

The declared unit is 1 kg of average manufactured product – Grenamat.

All inputs and outputs of this report were considered as consumption or production related to the production of 1 t of the mentioned product.

Table 1 Declared unit and conversion factors

Identification	Unit	Value
Declared unit	kg	1
Conversion factor from kg	kg	1

## 2. System boundary according to the modular approach

The boundary of the product life cycle system consists of **the information module A1 – A3 "Production phase", "End of life cycle phase" C1-C4 and D** in accordance with EN 15804+A2:2019. The project report includes all relevant processes for the EPD type **"From cradle to gate with modules C1-C4 and module D"** (cradle to gate with modules C1–C4 and module D).

Information on product system boundaries is shown in Table 2.

Table 2: Information about product system boundaries – information modules

Information about product system boundaries – information modules (X = Included, ND = module not declared)																	
Production stage			Construction stage		Usage stage							End-of-life stage				Additional information beyond the life cycle	
Supply of mineral resources	Transport	Production	Transport to the construction site	Construction/installation on process	Usage	Maintenance	Repair	Replacement	Reconstruction	Operational energy consumption	Operating water consumption	Demolition/deconstruction	Transport	Waste treatment	Removal	Benefits and costs beyond the system. Potential for reuse, recovery, and recycling	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X	

**The system boundary** is set to include both those processes that provide material and energy inputs to the system and subsequent production and transport processes up to the factory gate, and the treatment of all waste resulting from these processes.

**The production stage includes the following modules:**

- **A1** – extraction and processing of raw materials and production of packaging from input raw materials
- **A2** - transport of input raw materials from supplier to manufacturer, waste collection
- **A3** - production of products, production of auxiliary materials and semi-finished products, energy consumption, including treatment of waste, up to reaching end-of-waste or after the last material residues have been removed during the production phase.

Data for the period 2022 provided by Grena a.s. is used.

**The end-of-life stage** includes modules:

- **C1**, deconstruction, demolition; of the product from the building, including its dismantling or demolition, including the initial classification of materials at the site of construction
- **C2**, transport to the waste treatment site; transport of the discarded product as part of the waste treatment, e.g., to the recycling site, and transport of the waste, e.g., to the final disposal site.
- **C3**, treatment of waste for re-use, recovery and/or recycling, e.g., collection of waste fractions from deconstruction, treatment of waste from material flows intended for re-use, recycling, and energy recovery.
- **C4**, disposal of waste, including its pre-treatment and management of the disposal site

**The benefits and costs beyond** the product system are set out in Module D.

Module D includes:

- **D**, potential for reuse, recovery and/or recycling, expressed in net impacts or benefits.

The boundaries of the product system are considered in such a way that they **include only production processes, not administrative activities**.

As **scenarios for the end of the life cycle** of the products (C1-C4, D), the data resulting from the expert assessment of the possibility of reprocessing a part of these products after the deconstruction of the building were used. These schemes are::

#### **Module C1**

Decomposition and/or dismantling of paving and cladding are part of the demolition of the entire building. In this case, it is assumed that the impact on the environment is very small and can be neglected.

#### **Module C2**

The transport from the dismantled building is carried out by a truck with a capacity of 7.5 - 16 t (EURO 5) to the inert material dump as a demolition of a mixed building, estimated transport distance according to calculations: 25 km to the dump, transport 1 kg.

#### **Module C3**

A scenario where 100% of the product is disposed of in an inert landfill is assumed.

#### **Modul C4**

100% of the dismantled product is disposed of as mixed construction debris in an inert material landfill, without taking into account the energy use of landfill gas from (minor) organic components.

#### **Potential for reuse, recovery, and recycling (D)**

In the module D scenario, the crushing of wooden parts of the package (module A5) and their energy use is considered.



## 2.1. Preconditions and measures taken

Information modules **A4 to A5**, which are intended to provide additional information beyond the production stage, have not been included in the LCA due to the difficult availability of input data and are therefore not declared.

Information modules from the **usage stage B1 to B7** are also not declared because these types of products do not require maintenance, repair, or replacement during the normal life in the usage stage, provided that they are used correctly. Also, during the usage stage, they do not require consumption of energy or water.

The reference lifetime of the products is also not declared because of unavailability of representative data on the operating conditions in the usage stage of the product.

For the study, all operational data related to the consumption of main and auxiliary materials for the production of the product, energy data, diesel consumption and the distribution of annual waste and emissions according to the plant records were taken. For all inputs and outputs considered, transport costs were considered or differences in transport distances were recognised.

From the point of view of the waste produced, only the waste clearly related to production activities was included in the analysis.

Some input data were converted to units that were needed for selected generic process data in the environmental impact assessment calculation program.

These are:

- Energy data relating to **diesel** expressed in CU – were determined by calculation based on data on diesel consumption in litres and a coefficient of 0,845 kg/l for diesel and an energy value of 42,6 MJ/kg.
- Data on **natural gas** consumption in Kwh – were determined by conversion from the consumed quantity to MJ (1 kWh = 3,6 MJ)
- Data on the production of **waste** were taken from the continuous register of waste for the reference period.

## 2.2. Cut-off criteria

The processes required for the installation of production equipment and the construction of infrastructure were not included in the analysis. Administrative processes are not included either – inputs and outputs are balanced on the production stage.

## 2.3. Sources of environmental data

All inputs and outputs were entered in SI units, namely:

- Material and auxiliary inputs and product outputs in kg, pcs, m<sup>3</sup>
- Sources used as energy input (primary energy), in MWh or MJ and GJ, including renewable energy sources (hydropower, wind energy)
- Water consumption in kg or m<sup>3</sup>
- Inputs related to transport in km (distance), tkm (material transfer) and in kg (diesel consumption)
- Time was stated in practical units depending on the scale of the assessment: minutes, hours, days, years.

The time range of the required specific data provided by GRENA a.s., for the purpose of this report was set as a representative period **2022**. For this period, all available data were provided by the organization for their further processing.

The basic source of the necessary data from the area of production, purchasing, maintenance, etc. was the information system, or operational records from maintenance activities. To determine waste production, the annual report on waste production from the ISPOP system and operational records for the given production plant were used. Only those types of waste related to the production phase were included in this report, as waste destined for landfill.

For the following inputs it was proceeded this way (direct data not available):

- Distances on the transport of inputs and outputs (waste) – data from Google maps were used

For the complete analysis of environmental parameters were used:

- computing software SimaPro, version 9.4 SimaPro Analyst (database Ecoinvent version 3.8)

## 2.4. Data quality

The data used to calculate the EPD meet the following principles:

**Time period:** For specific data, manufacturer's data from 2022 have been used. This is due to significant technological changes in the production process. For generic data, the data of the Ecoinvent version database 3.8 have been used. Based on the evaluation in accordance with EN 15804+A2, Annex E, tab. E.1 the generic data used meet the quality level - very good.

**Technological aspect:** Data corresponding to the current production of individual types of sub-products and corresponding to the current state of new technologies in the plant used have been used.

Based on the evaluation in accordance with EN 15804+A2, Annex E, tab. E.1 the generic data used meet the level of quality - very good.

**Completeness and complexness aspect:** Most of the input data is based on consumption balances, which are precisely recorded in the information system. As part of the completeness check, it was checked whether all used inputs/outputs are present in the records. The reliability of the source of specific data is determined by the uniformity of the methodology of the information system collection method.

**Geographical aspect:** The generic data used from the Ecoinvent database are used with validity for the Czech Republic (e.g., energy inputs) and if data are not available for the Czech Republic, data valid for the EU or according to the supplier's location are used. Based on the evaluation according to EN 15804+A2, Annex E, tab. E.1 used generic data meet the level of quality - medium.

**Consistency aspect:** Uniform aspects are used throughout the scope of the report (allocation rules, age of data, technological scope of validity, time scope of validity, geographical scope of validity).

**Credibility aspect:** All important data were checked to ensure cross-comparison of weight balances.

## 2.5. Period considered

As the period of the required specific data, provided by GRENA, a.s., for the purpose of this report, a calendar period **2022** was determined as a representative period.

## 2.6. Allocation

In the balance of inputs, their direct monitoring was used at individual centres, or allocation based on weight was used.

## 2.7. Comparability

Environmental product declarations from different programmes may not be comparable. Comparison or assessment of EPD data is only possible if all compared data reported in accordance with EN 15804+A2:2019 have been determined according to the same rules.

## 2.8. Product variability

The resulting data are given for **1 t of average product – Grenamat**.

## 2.9. LCA: Results

Information on environmental impacts is expressed in the following tables. They are related to the declared unit (DJ) - **1 kg of average product – Grenamat**.

The impact assessment was carried out using the characterisation factors used in the European Life Cycle Reference Database (ELCD) provided by the European Commission – Directorate-General of the Joint Research Centre – Institute for Environment and Sustainability.

## Parameters describing the basic environmental impacts

LCA result – Parameters describing basic environmental impacts (DJ = 1 kg of the product)							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (GWP-total)	kg CO <sub>2</sub> Eq.	1,34E+00	3,30E-03	1,13E-02	7,10E-02	4,26E-03	-1,17E-01
Global warming potential (GWP-fossil)	kg CO <sub>2</sub> eq.	1,88E+00	3,30E-03	1,13E-02	3,97E-02	4,24E-03	-3,84E-03
Global warming potential (GWP-biogenic)	kg CO <sub>2</sub> eq.	-5,42E-01	1,17E-06	5,72E-06	1,11E-01	1,80E-05	-1,13E-01
Global warming potential from land use and land-use change (GWP-luluc)	kg CO <sub>2</sub> eq.	1,15E-03	3,29E-07	5,52E-06	2,16E-05	9,55E-07	-4,88E-06
Stratospheric ozone depletion potential (ODP)	kg CFC 11 eq.	3,32E-07	7,06E-10	2,40E-09	1,64E-09	2,10E-09	-3,41E-10
Acidification potential, Cumulative exceedance (AP)	mol H+ eq.	2,88E-02	3,43E-05	4,59E-05	1,46E-04	4,16E-05	-1,67E-04
Eutrophication potential, proportion of nutrients entering fresh water (freshwater EP)	kg P eq.	3,81E-04	1,02E-07	9,57E-07	1,44E-06	2,42E-07	-2,06E-06
Eutrophication potential, proportion of nutrients entering seawater (seawater EP)	kg N eq.	6,44E-03	1,52E-05	1,31E-05	4,10E-05	1,57E-05	-7,76E-05
Eutrophication potential, Cumulative overshoot (soil EP)	mol N eq.	7,55E-02	1,66E-04	1,42E-04	4,74E-04	1,73E-04	-8,69E-04
Ground-level ozone formation potential (POCP)	kg NMVOC eq.	1,88E-02	4,58E-05	4,35E-05	1,08E-04	4,94E-05	-2,13E-04
Raw material depletion potential for non-fossil sources (ADP-minerals and metals)	kg Sb eq.	1,63E-05	1,70E-09	4,98E-08	3,99E-08	8,28E-09	-2,70E-08
Raw material depletion potential for fossil resources (ADP-fossil fuels)	MJ, calorific value	2,88E+01	4,53E-02	1,63E-01	3,65E-01	1,37E-01	-5,56E-02
Water scarcity potential (for users), water scarcity weighted by water scarcity (WDP)	m <sup>3</sup> eq. scarcity	7,04E-01	7,09E-05	6,19E-04	7,21E-03	4,34E-04	-5,56E-04

## Parameters describing additional environmental impacts

LCA result – Parameters indicating additional environmental impacts (DJ = 1 kg of the product)							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Potential occurrence of disease due to particulate matter emissions (PM)	Occurrence of the disease	8,10E-08	9,19E-10	8,36E-10	1,69E-09	9,22E-10	-2,33E-08
Potential effect of human exposure to the isotope U235 (IRP)	kBq U235 eq.	1,52E-01	2,04E-04	7,44E-04	2,11E-03	6,61E-04	-1,10E-03
Potential comparative toxic unit for ecosystems (ETP-fw)	CTUe	2,91E+02	2,65E-02	1,50E-01	1,71E-01	7,61E-02	-1,28E+00
Potential comparative toxic unit for humans (HTP-c)	CTUh	2,54E-08	1,92E-11	1,38E-10	1,38E-10	3,60E-11	-9,77E-10
Potential comparative toxic unit for humans (HTP-nc)	CTUh	3,39E-09	1,02E-12	4,91E-12	2,61E-10	1,74E-12	-1,50E-11
Potential Soil Quality Index (SQP)	dimensionless	1,44E+01	5,77E-03	9,55E-02	1,99E+00	3,05E-01	-3,00E-02

## Parameters describing resource consumption

LCA result – Parameters describing resource consumption (DJ = 1 kg of the product)							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy, excluding energy sources used as raw materials ( <b>PERE</b> )	MJ	1,60E+00	2,55E-04	2,19E-03	3,72E-01	2,80E-03	-8,30E-03
Consumption of renewable primary energy sources used as raw materials ( <b>PERM</b> )	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total consumption of renewable primary energy sources (primary energy and primary energy sources used as raw materials) ( <b>PERT</b> )	MJ	1,60E+00	2,55E-04	2,19E-03	3,72E-01	2,80E-03	-8,30E-03
Consumption of non-renewable primary energy, excluding energy sources used as raw materials ( <b>PENRE</b> )	MJ	3,11E+01	4,81E-02	1,73E-01	3,93E-01	1,46E-01	-5,85E-02
Consumption of non-renewable primary energy sources used as raw materials ( <b>PENRM</b> )	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total consumption of non-renewable primary energy sources (primary energy and primary energy sources used as raw materials) ( <b>PENRT</b> )	MJ	3,11E+01	4,81E-02	1,73E-01	3,93E-01	1,46E-01	-5,85E-02
Consumption of secondary raw materials ( <b>SM</b> )	kg	2,38E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Consumption of renewable secondary fuels ( <b>RSF</b> )	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Consumption of non-renewable secondary fuels ( <b>NRSF</b> )	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net potable water consumption ( <b>FW</b> )	m <sup>3</sup>	1,85E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

## Other environmental information - waste category description

LCA result — Other environmental information — waste category description (DJ = 1 kg of the product)							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed of ( <b>HWD</b> )	kg	9,61E-06	0	0	0	0	0
Other waste disposed of ( <b>NHWD</b> )	kg	1,94E-01	0	0	0	0	0
Radioactive waste disposed of ( <b>RWD</b> )	kg	0	0	0	0	0	0

## Other environmental information - description of output flows

LCA result - Other environmental information - description of output flows (DJ = 1 kg of the product)							
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Construction units for reuse ( <b>MFR</b> )	kg	0	0	0	0	0	0
Materials for recycling ( <b>MER</b> )	kg	0	0	0	0	0	0
Materials for energy recovery ( <b>EEE</b> )	kg	0	0	0	5,62E-02	0	0
Exported energy ( <b>EET</b> )	MJ per energy carrier	0	0	0	0	0	7,86E-01

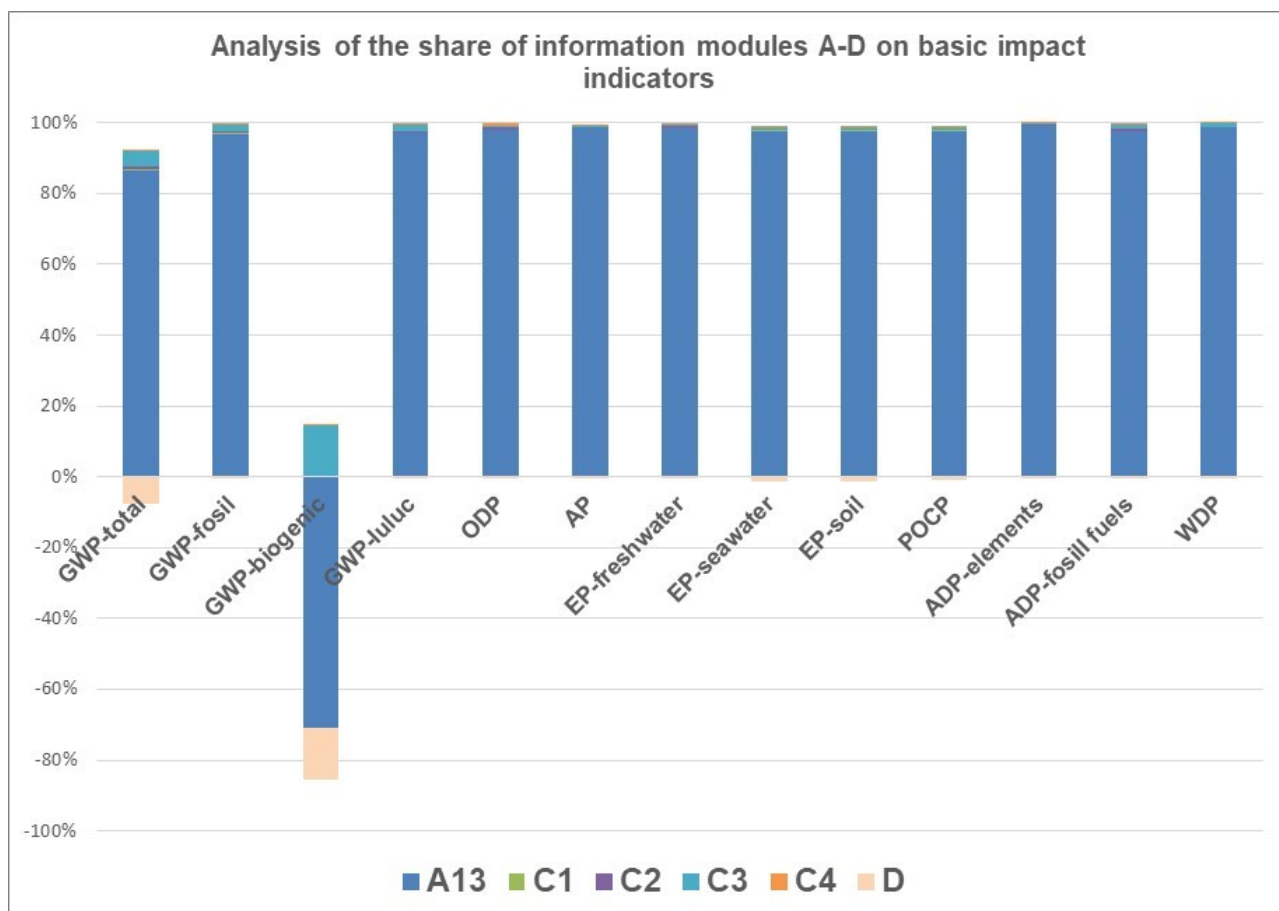
Information describing the **biogenic carbon content** of the plant gate

LCA result – Information describing the biogenic carbon content at the plant gate (DJ = 1 kg of the product)		
Parameter	Unit	At the plant gate
Biogenic carbon content of the product	kg C	1,06E-01
Biogenic carbon content in the appropriate packaging	kg C	7,13E-03

### 2.9.1. LCA: Interpretation

Fig. 2 shows the influence of the share of information modules A1-D on the basic environmental impacts:

Figure 2 Influence of the share of information modules A1-D



The results show that the **transport of input raw materials and the content of chemical components** have a very significant influence on environmental impacts. **Energy consumption** and its energy mix also have a partial influence (CZ). The potential for possible impact reduction is therefore mainly in the transport solution.

### 3. LCA: scenarios and other technical information

Information modules A4, A5 and B1-B7 were not included in the LCA analysis.

### 4. LCA: Additional information

The EPD does not include additional documentation related to the declaration of supplementary information.

### 5. References

ČSN ISO 14025:2010 Environmentální značky a prohlášení - Environmentální prohlášení typu III - Zásady a postupy (Environmental labels and declarations - Type III environmental declarations - Principles and procedures)

ČSN EN 15804+A2:2020 Udržitelnost staveb - Environmentální prohlášení o produktu - Zásadní pravidla pro produktovou kategorii stavebních výrobků (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products)

ČSN EN ISO 14040:2006 Environmentální management - Posuzování životního cyklu - Zásady a osnova (Environmental management - Life Cycle Assessment - Principles and Framework)

ČSN EN ISO 14044:2006 Environmentální management - Posuzování životního cyklu – Požadavky a směrnice (Environmental management - Life Cycle Assessment – Requirements and guidelines)

ČSN ISO 14063:2007 Environmentální management - Environmentální komunikace - Směrnice a příklady (Environmental management - Environmental communication - Guidelines and examples)

ČSN EN 15643-1:2011 Udržitelnost staveb - Posuzování udržitelnosti budov - Část 1: Obecný rámec (Sustainability of construction works - Sustainability assessment of buildings - Part 1: General framework)

ČSN EN 15643-2:2011 Udržitelnost staveb - Posuzování udržitelnosti budov - Část 2: Rámec pro posuzování environmentálních vlastností (Sustainability of construction works - Assessment of buildings - Part 2: Framework for the assessment of environmental performance)

ČSN EN 15942:2013 Udržitelnost staveb - Environmentální prohlášení o produktu - Formát komunikace mezi podniky (Sustainability of construction works - Environmental product declarations - Communication format business-to-business)

TNI CEN/TR 15941:2012 Udržitelnost staveb - Environmentální prohlášení o produktu - Metodologie výběru a použití generických dat (Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data)

ILCD handbook - JRC EU, 2011

Zákon č. 541/2020 Sb. v platném znění (Zákon o odpadech) / Act. No. 541/2020 Coll., as amended (Waste Act)

Vyhláška č. 8/2021 Sb. Katalog odpadů – Katalog odpadů / Decree No. 8/2021 Coll. Waste catalogue – Waste catalogue

Nařízení Evropského parlamentu č. 1907/2006 o registraci, hodnocení, povolování a omezování chemických látek a o zřízení Evropské agentury pro chemické látky - REACH (registrace, evaluace a autorizace chemických látek) / Regulation (EC) No 1907/2006 of the European Parliament concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing a European Chemicals Agency - REACH (Registration, Evaluation and Authorisation of Chemicals)

Nařízení Evropského parlamentu a Rady (ES) č. 1272/2008 o klasifikaci, označování a balení látek a směsí, o změně a zrušení směrnic 67/548/EHS a 1999/45/ES a o změně nařízení (ES) č. 1907/2006 (nařízení CLP) / Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC and amending Regulation (EC) No 1907/2006 (CLP Regulation)


SimaPro LCA Package, Pré Consultants, the Netherlands, [www.pre-sustainability.com](http://www.pre-sustainability.com)


Ecoinvent Centre, [www.Ecoinvent.org](http://www.Ecoinvent.org)

Explanatory documents are available from the head of Technical Support of GRENA, a.s.



## 6. EPD verification

<b>CEN standard EN 15804+A2 serves as the core PCR</b>	
Independent verification of the declaration and data, according to EN ISO 14025:2010: <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
<b>Third party verifier:</b> Technický a zkušební ústav stavební Praha, s.p. Prosecká 811/76a, Praha 9, 190 00 Czech Republic Certification Body for EPD, accredited by CAI - Czech Accreditation Institute, under No. 95/2023	

	Organizace <b>GRENA, a.s.</b> Třída Čs. armády 541 391 81 Veselí nad Lužnicí	Tel: +420 381 549 111 Fax: -- Email: <a href="mailto:grena@grena.cz">grena@grena.cz</a> Web: <a href="https://www.grenamat.cz/">https://www.grenamat.cz/</a>
	Oborový provozovatel programu: CENIA, Česká informační agentura životního prostředí, výkonná funkce Agentury NPEZ Moskevská 1523/63 100 10 Praha 10	Tel: +420 267 225 226 Fax: - Email: <a href="mailto:info@cenia.cz">info@cenia.cz</a> Web: <a href="http://www.cenia.cz">www.cenia.cz</a>
	TZÚS Praha, s.p. pobočka Plzeň Zahradní 15 326 00 Plzeň	Tel. : +420 734 432 137 +420 602 185 785 <a href="mailto:trinner@tzus.cz">trinner@tzus.cz</a> <a href="mailto:vrbova@tzus.cz">vrbova@tzus.cz</a>