# Environmental Product Declaration

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

## Thermal insulation material

from

## TENAPORS

| | |
|---|---|
| Program: | The International EPD® System, www.environdec.com |
| Program operator: | EPD International AB |
| EPD registration number: | S-P-07794 |
| Publication date: | 2022-12-07 |
| Valid until: | 2027-12-06 |

*An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com*

EPD®

ECO PLATFORM
EPD VERIFIED

SUSTAINABLE      RECYCLABLE      ENERGY EFFICIENT      THERMAL INSULATION

# General information

## Program information

| | |
|---|---|
| **Program:** | The International EPD® System |
| **Address:** | EPD International AB<br>Box 210 60<br>SE-100 31 Stockholm<br>Sweden |
| **Website:** | www.environdec.com |
| **E-mail:** | info@environdec.com |

| **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 (PCR): *PCR2019-14 Construction products v1.2.4* and as complementary c-PCR the *c-PCR-005 Thermal insulation products (EN 16783)* |
| PCR review was conducted by: *The Technical Committee of the International EPD® System. A full list of members is available on* www.environdec.com. *The review panel may be contacted via* info@environdec.com. |
| **Life Cycle Assessment (LCA)** |
| LCA accountability: *Bureau Veritas Latvia* |
| **Third-party verification** |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:<br><br>☒   EPD verification by individual verifier<br><br>Third-party verifier: *Elisabet Amat, eamat@greenize.es*<br><br>Approved by: The International EPD® System |
| Procedure for follow-up of data during EPD validity involves third party verifier:<br><br>☐   Yes          ☒   No |

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

EPDs within the same product category but registered in different EPD programs or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison.

## Company information

Owner of the EPD: TENAPORS

Contact: Iveta Audzevica, email: Iveta.Audzevica@tenaxgrupa.lv

Description of the organization: Tenapors is an insulation, construction, and packaging solutions manufacturer. Our commitment to sustainability is integrated throughout the value chain, from the production of end products to the recycling of end-of-life products. It is driven by our vision to protect people and goods for a better everyday life.

Product-related or management system-related certifications: EN ISO 14001:2015, EN ISO 50001, ISO 9001:2015, and ISO 45001.

Name and location of production site(s): TENAPORS, Spodrības iela 1, Dobele, LV- 3701 (Latvia).

## Product information

Product name: Thermal insulation material

Product description: This EPD describes Expanded Polystyrene foam (EPS). The closed cell structure is filled with air (98% air: only 2% polystyrene) and results in a lightweight, tough, strong, and rigid thermoplastic insulation foam. The products are used for the thermal insulation of buildings. The foam is available in various dimensions and shapes. Boards can be supplied with different edges: straight edges, half-lap joints, and vertical groves-small air gaps that allow for moisture drainage while the opposite side is flat. This EPD applies to homogeneous EPS products without material combinations or facings. The most important properties are thermal conductivity and compressive strength.

UN CPC code: 54650

Geographical scope: Europe

Multiple products: This EPD is representative of an average thermal insulation material produced by TENAPORS. The following table shows all the products that fit under this EPD. The rules for the multiple products EPD are taken from the PCR2019-14 Construction products v1.2.4.

| Product name | Density (kg/m3) | Sizes (mm) | Thermal conductivity coefficient (W/m*K) | Compression tension (kPa) | Tensile strength (kPa) | Long-term water absorption (%) |
|---|---|---|---|---|---|---|
| TENAPORS EPS 60 | 13.5 | 1000x500 | ≤0.040 | Not for load-bearing structures | - | ≤5 |
| TENAPORS EPS 70 | 14 | 1000x500 | ≤0.039 | Not for load-bearing structures | ≥70 | ≤5 |
| TENAPORS EPS 80 | 16.5 | 1000x500 | ≤0.037 | ≥21.8 | ≥80 | ≤5 |
| TENAPORS EPS 100 | 18.7 | 1000x500 | ≤0.036 | ≥27.3 | ≥100 | ≤5 |
| TENAPORS EPS 150 | 25 | 1000x500 | ≤0.036 | ≥32.7 | - | ≤5 |
| TENAPORS EPS 200 | 31 | 1000x500 | ≤0.034 | ≥54.5 | ≥200 | ≤5 |
| TENAPORS NEO EPS 60 | 14 | 1000x500 | ≤0.040 | ≥21.8 | ≥21.8 | ≤3.5 |
| TENAPORS NEO EPS 70 | 15 | 1000x500 | ≤0.032 | Not for load-bearing structures | ≥70 | ≤3.5 |
| TENAPORS NEO EPS 80 | 17.5 | 1000x500 | ≤0.031 | ≥21.8 | ≥80 | ≤3.5 |
| TENAPORS NEO EPS 100 | 19.2 | 1000x500 | ≤0.031 | ≥27.3 | ≥100 | ≤3.5 |
| TENAPORS NEO EPS 150 | 27 | 1000x500 | ≤0.031 | ≥40.9 | ≥150 | ≤3.5 |
| TENAPORS EXTRA | 25 | 1200x600 | ≤0.034 | ≥40.9 | ≥150 | ≤3.5 |
| TENAPORS PRIMA | 19 | 1200x600 | ≤0.036 | ≥27.3 | ≥100 | ≤3.5 |
| TENAPORS SUPRA | 21 | 1200x600 | ≤0.036 | ≥32.7 | - | ≤3.5 |
| TENAPORS L | 28 | on request | ≤0.034 | ≥47.7 | ≥175 | ≤5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TENAPORS L PLUS | 28 | on request | ≤0.040 | ≥47.7 | ≥175 | ≤5 |
| TENAPORS T | 18.7 | diameter 10-1000, length 1200 | ≤0.036 | ≥27.3 | ≥100 | ≤5 |
| TENAPORS TERMO | 25 | 1200x600 | ≤0.034 | ≥40.9 | ≥150 | ≤5 |
| TENAPORS TERMO COMPACT | 27 | 1100x800 | ≤0.034 | ≥40.9 | ≥150 | ≤5 |

## LCA information

Functional unit / declared unit: 1 kg of the insulation material

The technical parameters of the average product considered as a declared unit are:

- Density: 21.25 kg/m3
- Thermal conductivity coefficient: ≤ 0.035 W/m*K
- Compression tension: ≥ 30 kPa
- Tensile strength: ≥ 100 kPa
- Long-term water adsorption: ≤ 4 %

Reference service life: Properly installed EPS boards are durable with respect to their insulation, mechanic properties, and structural and dimensional properties. They are water resistant, EPS resistant against microorganisms, and against most chemical substances. EPS, however, should not be brought into contact with organic solvents. If correctly applied the lifetime of EPS insulation is equal to the building lifetime, usually without requiring any maintenance. Durability studies on applied EPS show no loss of technical properties after 50 years.

Time representativeness: The production data are from 2021, and the database data are from 2013 – 2021, i.e., no data is older than ten years

Database(s) and LCA software used: The databases used are Ecoinvent 3.7.1 and Carbon Minds Database. The LCA software used for the analysis is SimaPro 9.4.

Description of system boundaries:

LCA is made in the "Cradle-to-gate with options, modules C1 – C4, module D, and with optional modules A4 and A5" form. All primary materials, production energy, use, and waste are included for product stages A1, A2, A3, A4, A5, C1, C2, C3, C4, and D. All life cycle impacts are included; see the flowchart below. The following information describes the scenarios in the different modules of the EPD. It must be noted that all significant raw materials and all the essential energy are included. The marginal production processes for raw materials and energy flow with a cut-off of 1% are not included. This cut-off rule does not apply to hazardous materials and substances.

- **Raw material supply (A1)**

The materials needed to produce the thermal insulation material are polystyrene pellets, color, and isopropyl alcohol. In addition, the materials for the packaging are considered, and they are polyethylene, paper, and adhesive tape.

- **Transport (A2)**

The transport of raw materials is organized as follows.

| Materials | Vehicle | Distance (km) | Fuel/energy consumption (l/tkm) | Value (l/t) |
|---|---|---|---|---|
| Polystyrene pellet (location 1) | Lorry, 16-32t, EURO5 | 1070 | 0.0449 | 48.04 |
| Polystyrene pellet (location 2) | Lorry, 16-32t, EURO5 | 1210 | 0.0449 | 54.33 |
| Colour | Lorry, 3.5-7.5t, EURO5 | 1300 | 0.128 | 166.4 |
| Isopropyl alcohol | Lorry, 3.5-7.5t, EURO5 | 100 | 0.128 | 12.8 |
| Paper | Lorry, 3.5-7.5t, EURO5 | 100 | 0.128 | 12.8 |
| PE | Lorry, 3.5-7.5t, EURO5 | 100 | 0.128 | 12.8 |
| Adhesive tape | Lorry, 3.5-7.5t, EURO5 | 100 | 0.128 | 12.8 |

- **Manufacturing (A3)**

This stage includes the operation that transforms the polystyrene pellets into compact thermal insulation material and the final packaging of the final product. It provides energy consumption (electricity, natural gas, and diesel), water consumption, the wastewater produced, and the waste treatment of the packaging materials. During this stage, there are emissions of pentane and styrene that are below the national emissions limit threshold in the pollution permit of the company.

- **Distribution of the product (A4)**

Transportation from TENAPORS production sites in Latvia to customers in Latvia, Lithuania, and Estonia.

| Country | Vehicle | Distance (km) | Fuel/energy consumption (l/tkm) | Value (l/t) |
|---------|---------|---------------|---------------------------------|-------------|
| Latvia | Lorry, 3.5-7.5t, EURO6 | 100 | 0.0553 | 5.53 |
| Lithuania | Lorry, 3.5-7.5t, EURO6 | 200 | 0.0553 | 10.6 |
| Estonia | Lorry, 3.5-7.5t, EURO6 | 300 | 0.0553 | 16.59 |

- **Installation (A5) and de-construction demolition (C1)**

The installation and the de-construction processes are specific operations and it is not possible to evaluate average data. This is also in line with the research of Santos et al. 2021. For this reason, in modules, A5 and C1, the energy consumed and other impacts related to the product installation and demolition processes are considered negligible.

- **Transport to waste processing (C2)**

It is assumed an average transport of 50 km by EURO5 truck.

- **Waste processing (C3)**

It includes procedures and the consumption of a plastic sorting plant for the packaging material.
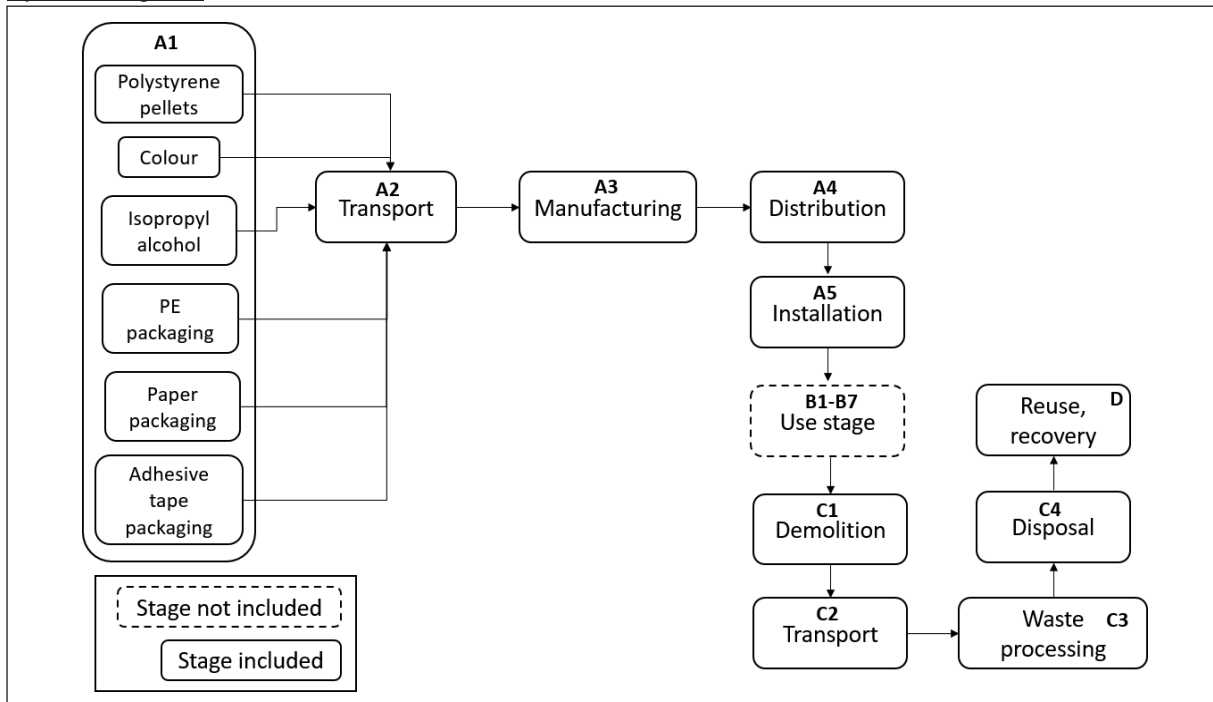
- **Disposal (C4)**

All the thermal insulation material is disposed of at a sanitary landfill. The packaging material's percentages that are not recycled are also disposed of at sanitary landfill.

- **Reuse, recovery, recycling, potential (D)**

It is assumed that a percentage of the packaging materials is recycled.

System diagram:



More information:

Heat, electricity, and other energy use and waste in production are calculated as an average weight per produced tons of all products using yearly production data and the rate for 2021. Manufacturing processes and raw materials consider the specific country's mix of heat and electricity. Secondary data on materials' flow information has been gathered from the Ecoinvent 3.7.1 database. In addition, the allocation is made following the provisions of EN 15804:2012+A2:2019. With waste production in-house, incoming energy and water are allocated equally among all products through mass allocation. The recycling process and transportation of the material are earmarked for this analysis. The polluter payer and modularity principles have been followed. Moreover, the methods excluded are environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process and personnel-related impacts, such as transportation to and from work.

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 | X | X | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | EU | EU | EU | EU | EU | ND | ND | ND | ND | ND | ND | ND | EU | EU | EU | EU | EU |
| Specific data used | >90% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | The results for GWP-GHG indicator for modules A1-A3 of all the TENAPORS products included in this EPD fall into a range of ±10% from the average product. | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

More information: Note that ND stands for "Not Declared", as reported by EN 15804:2012+A2:2019.

# Content information

| Product components | Weight, kg | Post-consumer material, weight-% | Biogenic material, weight-% and kg C/kg |
|---|---|---|---|
| Polystyrene | 0.999832 | 0 | 0 |
| Color | 3.31E-05 | 0 | 0 |
| Isopropyl alcohol | 0.000134 | 0 | 0 |
| TOTAL | 1 | 0 | 0 |
| **Packaging materials** | **Weight, kg** | **Weight-% (versus the product)** | **Weight biogenic carbon, kg C/kg** |
| Polyethylene | 0.008119 | 0.81 | 0 |
| Paper | 0.001922 | 0.19 | 2.76E-04 |
| Adhesive tape | 0.000305 | 0.03 | 0 |
| TOTAL | 0.0103 | 1.03 | 2.76E-04 |

*Note: 1 kg of biogenic carbon is equivalent to 44/12 kg CO2.*

The product does not contain any REACH SVHC substances.

# Environmental Information

## Potential environmental impact – mandatory indicators according to EN 15804

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Results per declared unit** | | | | | | | | | | |
| Indicator | Unit | A1 | A2 | A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-total | kg $CO_2$ eq. | 3.92 E+00 | 2.41 E-01 | 3.99 E-01 | 3.24 E-02 | 0.00 E+00 | 0.00 E+00 | 8.41 E-03 | 1.79 E-03 | 1.56 E-01 | -9.81 E-04 |
| GWP-fossil | kg $CO_2$ eq. | 3.89 E+00 | 2.41 E-01 | 3.84 E-01 | 3.23 E-02 | 0.00 E+00 | 0.00 E+00 | 8.40 E-03 | -1.05 E-03 | 1.54 E-01 | -3.73 E-03 |
| GWP-biogenic | kg $CO_2$ eq. | 2.90 E-02 | 2.17 E-04 | 1.46 E-02 | 3.12 E-05 | 0.00 E+00 | 0.00 E+00 | 7.55 E-06 | 2.84 E-03 | 1.59 E-03 | 2.75 E-03 |
| GWP-luluc | kg $CO_2$ eq. | 4.48 E-05 | 9.46 E-05 | 2.33 E-04 | 1.53 E-05 | 0.00 E+00 | 0.00 E+00 | 3.30 E-06 | -2.92 E-08 | 2.57 E-06 | -2.98 E-06 |
| ODP | kg CFC 11 eq. | 3.95 E-09 | 5.57 E-08 | 3.55 E-07 | 7.29 E-09 | 0.00 E+00 | 0.00 E+00 | 1.94 E-09 | 2.54 E-10 | 3.14 E-09 | -1.51 E-10 |
| AP | mol $H^+$ eq. | 1.37 E-02 | 9.77 E-04 | 3.11 E-03 | 1.37 E-02 | 0.00 E+00 | 0.00 E+00 | 3.41 E-05 | -3.20 E-07 | 7.43 E-05 | -1.61 E-05 |
| EP-freshwater | kg $PO_4^{3-}$ eq. | 7.06 E-04 | 9.71 E-05 | 1.51 E-04 | 5.90 E-06 | 0.00 E+00 | 0.00 E+00 | 3.39 E-06 | -2.66 E-07 | 2.31 E-04 | -1.13 E-06 |
| EP-freshwater | kg P eq. | 5.06 E-05 | 1.55 E-05 | 3.93 E-05 | 2.44 E-06 | 0.00 E+00 | 0.00 E+00 | 5.41 E-07 | -2.68 E-07 | 6.91 E-07 | -6.66 E-07 |
| EP-marine | kg N eq. | 2.14 E-03 | 2.94 E-04 | 4.58 E-04 | 1.79 E-05 | 0.00 E+00 | 0.00 E+00 | 1.03 E-05 | -8.06 E-07 | 7.01 E-04 | -3.44 E-06 |
| EP-terrestrial | mol N eq. | 2.31 E-02 | 3.21 E-03 | 4.85 E-03 | 1.95 E-04 | 0.00 E+00 | 0.00 E+00 | 1.12 E-04 | -7.66 E-06 | 3.03 E-04 | -3.62 E-05 |
| POCP | kg NMVOC eq. | 9.73 E-03 | 9.85 E-04 | 5.62 E-02 | 7.47 E-05 | 0.00 E+00 | 0.00 E+00 | 3.44 E-05 | -6.08 E-06 | 1.20 E-04 | -1.48 E-05 |
| ADP-minerals&metals* | kg Sb eq. | 5.67 E-07 | 8.39 E-07 | 5.18 E-07 | 1.48 E-07 | 0.00 E+00 | 0.00 E+00 | 2.92 E-08 | -2.22 E-08 | 2.86 E-08 | -2.68 E-08 |
| ADP-fossil* | MJ | 8.21 E+01 | 3.64 E+00 | 2.57 E+01 | 4.84 E-01 | 0.00 E+00 | 0.00 E+00 | 1.27 E-01 | -8.25 E-02 | 2.26 E-01 | -1.23 E-01 |
| WDP | $m^3$ | 2.27 E+00 | 1.09 E-02 | 1.87 E-01 | 1.61 E-03 | 0.00 E+00 | 0.00 E+00 | 3.80 E-04 | -4.95 E-03 | 1.13 E-03 | -5.26 E-03 |
| 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 | | | | | | | | | | |

*Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

## Potential environmental impact – additional mandatory and voluntary indicators

| | | Results per declared unit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| GWP-GHG[1] | kg $CO_2$ eq. | 3.89 E+00 | 2.41 E-01 | 3.84 E-01 | 3.23 E-02 | 0.00 E+00 | 0.00 E+00 | 8.40 E-03 | -1.05 E-03 | 1.54 E-01 | -3.74 E-03 |
| PM | Disease Inc. | 1.44 E-07 | 2.08 E-08 | 1.90 E-08 | 2.21 E-09 | 0.00 E+00 | 0.00 E+00 | 7.25 E-10 | -1.07 E-10 | 1.63 E-09 | -2.46 E-10 |
| IRP | kBq U-235 eq. | 3.48 E-03 | 1.87 E-02 | 9.55 E-02 | 2.57 E-03 | 0.00 E+00 | 0.00 E+00 | 6.53 E-04 | 3.00 E-05 | 1.42 E-03 | -3.01 E-04 |
| ETP - fw | CTUe | 3.60 E+00 | 2.84 E+00 | 1.06 E+01 | 3.95 E-01 | 0.00 E+00 | 0.00 E+00 | 9.91 E-02 | -6.52 E-03 | 2.78 E-01 | -3.18 E-02 |
| HTP - c | CTUh | 8.82 E-09 | 2.98 E-09 | 3.15 E-09 | 3.82 E-10 | 0.00 E+00 | 0.00 E+00 | 1.04 E-10 | -1.51 E-11 | 1.38 E-10 | -3.00 E-11 |
| HTP - nc | CTUh | 5.37 E-10 | 9.21 E-11 | 9.47 E-10 | 1.43 E-11 | 0.00 E+00 | 0.00 E+00 | 3.21 E-12 | 6.13 E-13 | 6.53 E-12 | -1.60 E-12 |
| SQP | Pt | 5.47 E-01 | 2.50 E+00 | 2.42 E+00 | 2.86 E-01 | 0.00 E+00 | 0.00 E+00 | 8.72 E-02 | -3.19 E-01 | 5.88 E-01 | -3.37 E-01 |
| Acronyms | PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw= Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential Soil quality index | | | | | | | | | | |

[1] The indicator includes all greenhouse gases included in the GWP total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

## Use of resources

| | | Results per declared unit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| PERE | MJ | 1.97 E-01 | 3.85 E-02 | 3.97 E-01 | 6.09 E-03 | 0.00 E+00 | 0.00 E+00 | 1.34 E-03 | 4.12 E-03 | 8.51 E-03 | -1.85 E-03 |
| PERM | MJ | 2.36 E-01 | 1.28 E-02 | 1.05 E-01 | 2.10 E-03 | 0.00 E+00 | 0.00 E+00 | 4.47 E-04 | -5.09 E-02 | 2.02 E-03 | -5.47 E-02 |
| PERT | MJ | 4.33 E-01 | 5.14 E-02 | 5.02 E-01 | 8.19 E-03 | 0.00 E+00 | 0.00 E+00 | 1.79 E-03 | -4.68 E-02 | 1.05 E-02 | -5.65 E-02 |
| PENRE | MJ | 8.21 E+01 | 3.64 E+00 | 2.57 E+01 | 4.84 E-01 | 0.00 E+00 | 0.00 E+00 | 1.27 E-01 | -8.26 E-02 | 2.26 E-01 | -1.23 E-01 |
| PENRM | MJ | 7.91 E-05 | 1.51 E-04 | 9.32 E-05 | 2.23 E-05 | 0.00 E+00 | 0.00 E+00 | 5.26 E-06 | -2.02 E-06 | 3.07 E-06 | -2.48 E-06 |
| PENRT | MJ | 8.21 E+01 | 3.64 E+00 | 2.57 E+01 | 4.84 E-01 | 0.00 E+00 | 0.00 E+00 | 1.27 E-01 | -8.26 E-02 | 2.26 E-01 | -1.23 E-01 |
| SM | kg | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| RSF | MJ | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| NRSF | MJ | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| FW | $m^3$ | 5.29 E-02 | 4.06 E-04 | 4.98 E-03 | 6.13 E-05 | 0.00 E+00 | 0.00 E+00 | 1.41 E-05 | -8.74 E-05 | 2.92 E-04 | -1.02 E-04 |
| 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = use of non-renewable secondary fuels; FW = use of net freshwater | | | | | | | | | | |

## Waste production and output flows

### Waste production

| Indicator | Unit | A1 | A2 | A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **Results per declared unit** | | | | | | | | | | | |
| Hazardous waste disposed | kg | 6.94 E-07 | 9.51 E-06 | 5.46 E-05 | 1.30 E-06 | 0.00 E+00 | 0.00 E+00 | 3.32 E-07 | 1.27E-08 | 2.71 E-07 | -2.60 E-08 |
| Non-hazardous waste disposed | kg | 4.10 E-02 | 1.87 E-01 | 1.99 E-02 | 2.06 E-02 | 0.00 E+00 | 0.00 E+00 | 6.53 E-03 | -1.62E-04 | 1.01 E+00 | -2.71 E-04 |
| Radioactive waste disposed | kg | 1.59 E-06 | 2.46 E-05 | 1.29 E-04 | 3.24 E-06 | 0.00 E+00 | 0.00 E+00 | 8.58 E-07 | 5.92E-08 | 1.47 E-06 | -1.06 E-07 |

### Output flows

| Indicator | Unit | A1 | A2 | A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **Results per declared unit** | | | | | | | | | | | |
| Components for re-use | kg | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| Material for recycling | kg | 0.00 E+00 | 0.00 E+00 | 5.68 E-03 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 3.08 E-03 | 0.00 E+00 | 3.08 E-03 |
| Materials for energy recovery | kg | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| Exported energy, electricity | MJ | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |
| Exported energy, thermal | MJ | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 | 0.00 E+00 |

# Additional environmental information

Since the electricity in module A3 accounts for more than 30% of the total energy in stages A1 to A3, the energy sources behind the electricity grid in module A3 present on Ecoinvent 3.7.1 (*Electricity, medium voltage {LV}| market for | Cut-off, U*) are shown:
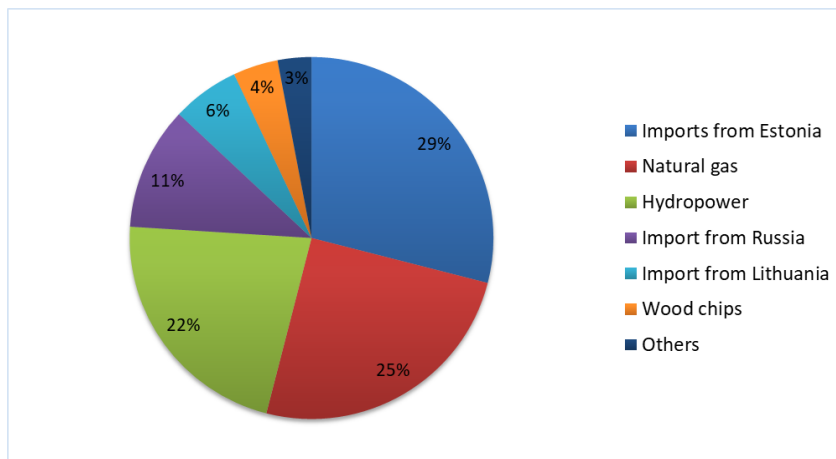


The climate impact of 1 kWh of electricity is 0.546 kg $CO_2$ eq.

# Rules for the extrapolation

A scaling factor is applied to all the capacities of the same product range to obtain a valid EPD for a range of thermal insulating materials; see the table in the "product information" section. This extrapolation is possible because the product conforms to the rules of the PCR2019-14 Construction products v.1.2.4.

| SCALING FACTOR PER $1M^2$ OF DIFFERENT THERMAL INSULATION MATERIAL | | |
|---|---|---|
| Product name | Thickness (mm) | Scaling factor |
| TENAPORS EPS 60 | 37 | 0.500 |
| TENAPORS EPS 70 | 37 | 0.518 |
| TENAPORS EPS 80 | 37 | 0.611 |
| TENAPORS EPS 100 | 37 | 0.692 |
| TENAPORS EPS 150 | 37 | 0.925 |
| TENAPORS EPS 200 | 37 | 1.147 |
| TENAPORS NEO EPS 60 | 37 | 0.518 |
| TENAPORS NEO EPS 70 | 37 | 0.555 |
| TENAPORS NEO EPS 80 | 37 | 0.648 |
| TENAPORS NEO EPS 100 | 37 | 0.710 |
| TENAPORS NEO EPS 150 | 37 | 0.999 |
| TENAPORS EXTRA | 34 | 0.850 |
| TENAPORS PRIMA | 36 | 0.600 |
| TENAPORS SUPRA | 36 | 0.756 |
| TENAPORS L | 100 | 2.8 |
| TENAPORS L PLUS | 100 | 2.8 |
| TENAPORS T | 36 | 0.673 |
| TENAPORS TERMO | 34 | 0.85 |
| TENAPORS TERMO COMPACT | 34 | 0.918 |

*Note: Environmental impacts per 1 $m^2$ of all of these thermal insulation products with different thicknesses can be calculated by multiplying the environmental impact results by the scaling factors up- shown.*

# References

General Program Instructions of the International EPD® System. Version 4.0.

PCR 2019:14. Construction products. V1.2.4

c-PCR-005 Thermal insulation products (EN16783)

ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006. Environmental management – Life cycle assessment – Requirements and Guidelines

LCA software SimaPro 9.4.

EN ISO 9001: Quality management systems — Requirements.

EN ISO 14001:2015: Environmental management systems — Requirements with guidance for use.

ISO 14021:2016: Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)

ISO 50001:2018: Energy management systems — Requirements with guidance for use

ISO 45001:2018: Occupational health and safety management systems - Requirements with guidance for use

Santos P., Correira J. R., Godinho L., et al. (2021). Life cycle analysis of cross-insulated timber panels. *Structure*, 31 (2021) 1311-1324.