# Environmental Product Declaration

## of Adhesive mortars by THRAKON S.A.

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

**EPD of multiple products, based on the worst-case results of the product group. The product list is presented in page 4**



| | |
|---|---|
| EPD PROGRAM | The international EPD System, https://environdec.com/ |
| PROGRAM OPERATOR | EPD INTERNATIONAL AB |
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| GEOGRAPHICAL SCOPE | Global |

*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*

## *Program related information*

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|---|
| **Program**: The International EPD® System |
| **Address**: EPD International AB Box 210 60 SE-100 31 Stockholm Sweden |
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|---|
| **Accountabilities for PCR, LCA and independent, third-party verification** |
| CEN standard EN 15804:2012+A2:2019 (October 2019) serves as the Core Product Category Rules (PCR) |
| **Product category rules (PCR)**<br>PCR 2019:14 Construction products, version 1.3.4 (2024-04-30) |
| **PCR review was conducted by:** The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact |

**Life Cycle Assessment (LCA)**

| | | |
|---|---|---|
| LCA accountability: | ENVIROMETRICS Climate \| Environment \| Energy | ENVIROMETRICS S.A<br>Kodrou 3 str., 152 32, Chalandri, Greece<br>info@envirometrics.gr<br>www.envirometrics.gr |

**Third-party verification**

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
☒ EPD verification by certification body

Third party verification:

BUSINESS QUALITY VERIFICATION BQV

**Business Quality Verification P.C, Accredited by E.S.Y.D, Accreditation No. 1218**
**5 Konitsis street, Marousi, GR 15125, Greece**
https://bqv.gr/

Business Quality Verification P.C. is an approved certification body accountable for the third-party verification

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 of the EPD.*

*EPDs within the same product category but registered in different EPD programmes 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*

THRAKON is a leading manufacturer of dry mortars, coatings, and construction chemicals in the building industry. With over 25 years of experience, we are committed to delivering high-quality, cost-effective construction solutions with exceptional technical support, customer service, and after-sales assistance. Exceeding 1700 high-performance products, we offer the best construction solutions that add value to our customers. We bring innovation and expertise to the construction world for more than 25 years.

THRAKON offers complete building solutions across a myriad of applications. Our product categories, including External Thermal Insulation Systems (ETICS), Plasters & Renders, Tile Adhesives & Grouts, Waterproofing, Repairing, Microcement, Paints & Varnishes, Solvent Adhesives and Flooring Screeds, ensure that we cater to every construction need.

We offer complete building solutions for all areas of application, rather than individual products. Our certified systems guarantee solutions that meet every customer's needs, providing system-based approaches that increase confidence in selecting the safest and most reliable building solutions for any construction project. We invest substantial resources in research and development, with innovation being the cornerstone of our growth. Our strong R&D department identifies key construction needs and develops products that not only meet industry standards but exceed expectations.

Our six manufacturing plants in Greece are equipped with state-of-the-art technology and staffed with qualified personnel, ensuring top-quality products. THRAKON also operates its quarries, producing white marble and high-quality silica sand, enabling us to manufacture the best products. THRAKON's commitment to excellence is reflected in every step of our manufacturing process.

| |
|---|
| **Name**: THRAKON S.A. |
| **Address**: 130 SYNGROU AVENUE,11745, ATHENS |
| **Website**: www.thrakon.gr |
| **E-mail**: info@thrakon.gr |

## *Product Information*

The products included in this EPD are listed below:

| | |
|---|---|
| ***SKW 110 adhesive*** | ***VKW 126 adhesive*** |
| ***SKW 112 adhesive*** | ***VKW 127 adhesive*** |
| ***SKW 114 adhesive*** | ***VKW 128 adhesive*** |
| ***SKW 116 adhesive*** | ***VKW 129 adhesive*** |
| ***VKW 118 adhesive*** | ***MKW 136 adhesive*** |
| ***VKW 121 adhesive*** | ***GEL adhesive*** |
| ***VKW 122 adhesive*** | ***GEL + adhesive*** |
| ***VKW 124 adhesive*** | ***FKW 134 adhesive*** |

It should be noted that for the adhesives product category, the worst-case results of the category are presented. The maximum deviations in core indicators from the declared worst-case are presented on **Appendix**.

THRAKON offers a comprehensive selection of high-performance tile adhesives engineered for professional applications, ensuring robust adhesion and long-term durability. These adhesives are compatible with a wide variety of surfaces and can be applied in both horizontal and vertical orientations. They are particularly effective in environments subjected to high vibrations and persistent humidity.

Engineered for use in construction and renovation, THRAKON adhesives deliver reliable performance across diverse substrates and under various environmental conditions. All products adhere to European standards EN 12004 and EN 998-2, ensuring consistent quality, safety, and performance.

THRAKON adhesives are suitable for different tile types, including ceramic, porcelain, terracotta, and mosaics, as well as both natural and engineered stone. They are designed for use in both dry and wet environments, including areas such as bathrooms, kitchens, swimming pools, and facades. Specific formulations offer additional properties such as slip resistance, extended open time, and high elasticity, making them ideal for demanding applications, including heated floors, high-traffic zones, and substrates that undergo movement or thermal expansion.

The product range includes thin-layer adhesives for standard ceramic tiles, thick-bed adhesives for heavy tiles and natural stone, and highly elastic adhesives for external facades and complex substrates. Additionally, specialized mortars are available for materials such as marble and glass bricks, alongside ready-to-use acrylic and epoxy adhesives for industrial and commercial settings.

| Raw material | Weight (versus the product) * | Biogenic carbon content** |
|---|---|---|
| **Cement** | 0,20-0,40 | - |
| **Limestone** | 0,30-0,50 | - |
| **Quartz sand** | 0,20-0,40 | - |
| **Other additives** | <0,05 | |
| **Packaging materials** | | |
| **Paper bag** | 6,40E-03 | 3,20E-03 |
| **Pallets** | 1,05E-02 | 5,25E-03 |

*The content declaration (this table will be presented in EPD) is given in content declaration range), due to confidentiality reasons).

**Biogenic carbon content of wood and wood-based materials is assumed as 50% of the mass of the material, adopted from EN 16449.

According to the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Regulation, the product does not contain any substance included in the Candidate List of Substances of Very High Concern (SVHCs) for authorization with concentrations higher than 0.1% weight by weight (w/w).

## *System Boundaries*

| X= Included, ND= Module Not Declared | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Product stage | | | Construction stage | | Use stage | | | | | | | End-of-life stage | | | | Resource recovery stage |
| | **Raw Materials Supply** | **Transport** | **Manufacturing** | Transport | **Construction installation** | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | **De-construction and demolition** | **Transport** | **Waste processing for reuse, recovery and/or recycling** | **Disposal** | **Reuse-Recovery-Recycling-potential** |
| **Module** | **A1** | **A2** | **A3** | A4 | **A5** | B1 | B2 | B3 | B4 | B5 | B6 | B7 | **C1** | **C2** | **C3** | **C4** | **D** |
| **Module Declared** | **X** | **X** | **X** | ND | **X** | ND | ND | ND | ND | ND | ND | ND | **X** | **X** | **X** | **X** | **X** |
| **Geography** | **GLO** | **GLO** | **GR** | - | | | | | | | | | **EU** | **EU** | **EU** | **EU** | **EU** |
| **GWP-GHG share of Specific data used** | **3,36%** | | | - | | | | | | | | | - | - | - | - | - |
| **Variation-products (GWP-GHG)** | **Maximum deviation 57,62% in modules A1-A3** | | | - | | | | | | | | | - | - | - | - | - |
| **Variation-sites** | **<10%** | | | - | | | | | | | | | - | - | - | - | - |

## Product stage (A1-A3)

Product stage (modules A1-A3) includes raw material supply, transportation, and manufacturing.

### A1: Raw Material Supply

Production starts with the material supply. This module includes the mining and pretreatment processes before production (processing of raw materials, generation of electricity and fuels required for the manufacturing, recycling process of secondary materials). Cement, calcium carbonate and other additives such as calcium formate, fibers and other dispersions are the main raw materials used for mortars production.

**A2: Transportation of raw materials to manufacturer**

Transportation module includes the delivery of raw, auxiliary and packaging materials from suppliers to the gate of manufacturing plant. All raw materials (calcium carbonate, cement, lime, additives), and packaging materials are imported from suppliers located in Europe, except for cement that derives from north Africa.

**A3: Manufacturing**

This module includes all emissions that may occur during the manufacturing process (direct emissions in water/air from fuels combustion and water treatment, manufacturing waste treatment). Personnel-related activities, such as transportation of employees to and from work, and production of infrastructure and capital goods are not included in the scope of this study.

The manufacturing process for mortars starts with proportioning of raw materials, where they are proportioned according to specific formulations designed to meet the desired properties of the mortar. Then, the mixing process takes place. The mixing process involves dry mixing, where dry ingredients (cement, calcium carbonate etc.) are thoroughly mixed to ensure a uniform distribution of materials, and wet mixing, where water and any liquid admixtures are added to the dry mix. This is typically done in a high-shear mixer to ensure thorough blending and consistency.

**Installation stage (A5)**

This module includes impacts related to the installation of mortars into customer's place. Installation is conducted manually, so electricity required during the installation process is zero. Impacts from water needed is also taken into account. According to technical datasheets of mortars, an average water consumption during mortars installation is 0,5 l per 1 kg of mortar. Furthermore, in this module, impacts from the treatment of waste packaging materials and the compensation of biogenic emissions from wooden pallets and paper cores are taken into account.

For all packaging materials, data from European Statistical Authority have been acquired. Based on the most recent data of 2022 (Packaging materials waste end-of-life), 43,4% of packaging materials are recycled, 43,4% are incinerated with energy recovery and 14,2% are landfilled.

| Scenario Information (module A5) | Unit |
|---|---|
| **Ancillary materials for installation (specified by material)** | None |
| **Water use** | 0,5 l per kg of mortar |
| **Quantitative description of energy type kWh or MJ (regional mix) and consumption during the installation process** | None |
| **Waste materials on the building site before waste processing, generated by the product's installation (specified by type)** | Packaging waste:<br>**Wooden pallets:** 1,05E-02 kg per kg of mortar<br>**Paper bags:** 6,40E-03 kg per kg of mortar |

## End of life stage (C1-C4)

The end-of-life stages begin with the deconstruction and demolition from the installation site and then the waste is transferred for recycling and disposal of the product.

### C1: De-construction and demolition

This module refers to the impact arising from the diesel consumption of the heavy vehicles during demolition process. The end-of-life stages begin with the deconstruction and demolition from the installation site and then they transferred for recycling and disposal. Usually, this phase results in little impact because the product is generally part of a larger system (e.g., machine or building) and for that reason, impacts from dismantling should be allocated to all components of that system. For this reason, the impact of the dismantling phase was considered negligible.

### C2: Transportation to waste processing

This module includes the transportation of the discarded product either to the recycling site or to landfills for final disposal. A distance of 50 km by lorry 16-32 tonnes from construction/demolition sites to scrap dealers and disposal sites has been chosen as a conservative assumption.

### C3: Waste processing for reuse, recovery and/or recycling

This module includes impacts related to the reuse/recycling of products after their life cycle. As a conservative assumption, all mortars waste after the demolition process will be landfilled. So, there are no environmental impacts assigned to this module.

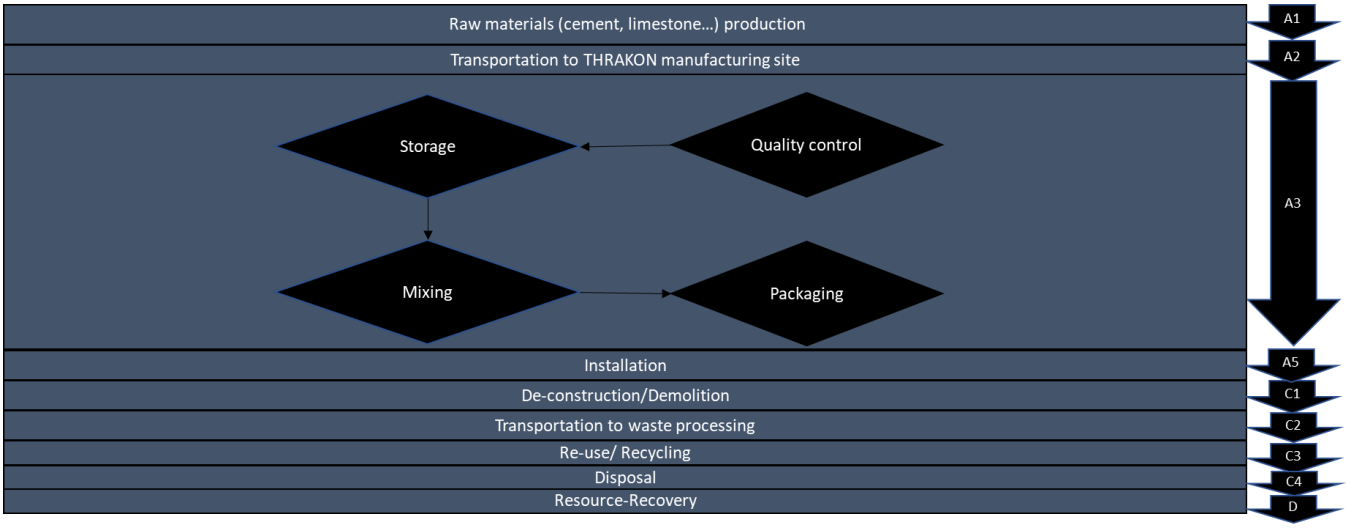
### C4: Disposal

This module includes impacts related to the reuse/recycling of products after their life cycle. As said above, 100% of the mortars will be landfilled.

## Resource and recovery stage (D)

### D: Reuse-Recovery-Recycling-potential

Module D encompasses all avoided burdens related to the potential reuse and/or recycling of the product after its end-of-life stage. In particular, all benefits from the recycling and incineration of packaging materials, that can substitute the production of primary wood, paper or energy.



## *LCA Information*

### *Declared unit*

The declared unit of the study is 1 kg of adhesive mortars manufactured in **THRAKON** Plants located at **Oinofyta and Chalkidona, Greece.**

### Goal and Scope

This EPD evaluates the environmental impacts of the production of 1 kg of adhesive mortars, from cradle to gate (modules A1-A3), along with construction/installation stage (module A5) end-of-life modules (C1-C4) end module D.

### Cut-off rules

The cut-off criteria adopted is as stated in ''EN 15804:2012+A2:2019'' and ''PCR 2019:14, v.1.3.4''. Where there are insufficient data or data gaps for a unit process, the cut-off criteria are 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass. In this case, cut-off was applied only in generated wastes from the manufacturing waste (categorized as municipal solid waste) and in lubricants for equipment operation. The quantity of cut-off was 1%.

### Allocations

Allocation rules have been performed in accordance with the requirements of ISO 14044:2006. Wherever possible, allocation was avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes. Where allocation cannot be avoided, the inputs and outputs of the system were partitioned between its different products or functions in a way that reflects the underlying physical relationships between them. In this case, allocation based on the mass of produced quantities was applied to the following streams:

- Fuels used for the manufacturing process (diesel and LPG)
- Electricity consumed throughout the manufacturing process

The allocation of waste shall follow the polluter-pays principle that is made operational according to the following rules. Processes of waste processing shall be assigned to the product system that generates the waste until the end-of-waste state is reached. The system boundary to the subsequent product system is set where the waste (e.g., the discarded product) reaches the end-of-waste state, i.e., when the material has become a usable flow (e.g., for reuse, energy recovery and/or recycling). The end-of-waste state is reached when all the following criteria are fulfilled:

- the recovered material or product (including, e.g., energyware such as fuel, electricity and heat) is commonly used for specific purposes

- a market or demand, identified for example by a positive economic value, exists for such a recovered material or product

- the recovered material or product fulfils the technical requirements for the specific purposes for which it is used and meets the existing legislation and standards applicable to its use

- the use of the recovered material or product will not lead to overall adverse environmental or human health impacts, which shall be understood as content of hazardous substances below limit values in applicable legislation

The following rules indicate that for all waste that require disposal in modules A5, C4, impacts from the whole disposal activity will be assigned in this product system. For waste (or parts thereof) that require recycling in module A5, only the sorting and transportation of waste will be assigned to this product system. Impacts from incineration of packaging materials in A5 module with energy recovery are not taken into account, based on the assumption that the incinerator pays for the material or receives it or picks it up for free, so environmental burden is assigned to the product system using the energy. Only manually added as *''Materials for energy recovery (MER)''* in module A5.

### Data quality

ISO 14044 was applied in terms of data collection and quality requirements. The impact of the production of raw materials recovered from *Ecoinvent database v.3.10.1+EN 15804 add-on*. The data concerning the modules A2 (Transportation) and A3 (Product manufacturing) were provided by THRAKON and concerns the full year 2023. These data were the quantities of all input and output materials extracted from the company's SAP system and predetermined recipes, the consumed utilities (energy, LPG and diesel) from bills and invoices. Regarding electricity mix, the latest (2023) national residual electricity mix as published in DAPEEP S.A. was utilized. The climate impact (GWP-GHG) of this electricity, as calculated from a manually created dataset in openLCA is 0,7068 kg $CO_2$ eq./kWh. The $CO_2$ emissions from diesel and LPG combustion data were calculated from the National Inventory Report (NIR) of Greece (NIR Greece) The end-of-life are based on the most representative scenarios for this product. Background data for this stage are retrieved from *Ecoinvent v.3.10.1+EN 15804 add-on.*

### Time representativeness

Data obtained refer to the year 2023

### Software used

*OpenLCA v.2.3*

### Characterization factors (JRC)

Based on Reference package EF 3.1

## *Environmental Performance*

The results of the studied category of adhesive mortars, based on the worst-case results, are presented. The maximum deviations from the declared worst-case product are presented in **Appendix**. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The use of the results of modules A1-A3 is discouraged without considering the results of module C. For Primary Energy Use indicators, option B of PCR 2019:14 v.1.3.4 has been followed.

| IMPACTS | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| **GWP-total** | **kg CO2 eq** | 6.72E-01 | 2.64E-02 | 0.00E+00 | 7.11E-03 | 0.00E+00 | 6.26E-03 | -1.17E-02 |
| **GWP-fossil** | **kg CO2 eq** | 7.00E-01 | 5.85E-04 | 0.00E+00 | 6.75E-03 | 0.00E+00 | 6.25E-03 | -1.17E-02 |
| **GWP-biogenic** | **kg CO2 eq** | -2.23E-02 | 2.58E-02 | 0.00E+00 | 9.82E-05 | 0.00E+00 | 8.62E-07 | 0.00E+00 |
| **GWP-luluc** | **kg CO2 eq** | 3.61E-04 | 9.60E-07 | 0.00E+00 | 2.59E-04 | 0.00E+00 | 3.22E-06 | -3.64E-05 |
| **GWP-GHG[1]** | **kg CO2 eq** | 7.00E-01 | 1.90E-03 | 0.00E+00 | 7.01E-03 | 0.00E+00 | 6.26E-03 | -1.18E-02 |
| **ODP** | **kg CFC-11 eq** | 1.37E-08 | 7.81E-12 | 0.00E+00 | 2.57E-10 | 0.00E+00 | 1.81E-10 | -4.84E-10 |
| **AP** | **mol H+ eq** | 2.09E-03 | 3.08E-06 | 0.00E+00 | 2.19E-05 | 0.00E+00 | 4.43E-05 | -5.15E-05 |
| **EP-freshwater** | **kg P eq** | 1.32E-04 | 1.72E-07 | 0.00E+00 | 5.30E-07 | 0.00E+00 | 5.19E-07 | -1.23E-05 |
| **EP-marine** | **kg N eq** | 5.27E-04 | 2.54E-06 | 0.00E+00 | 9.62E-06 | 0.00E+00 | 1.69E-05 | -1.10E-05 |
| **EP-terrestrial** | **mol N eq** | 5.67E-03 | 9.80E-06 | 0.00E+00 | 8.12E-05 | 0.00E+00 | 1.84E-04 | -9.34E-05 |
| **POCP** | **kg NMVOC eq** | 2.45E-03 | 3.77E-06 | 0.00E+00 | 3.11E-05 | 0.00E+00 | 6.60E-05 | -3.53E-05 |
| **ADPe[2]** | **kg Sb eq** | 3.50E-06 | 2.25E-09 | 0.00E+00 | 2.53E-08 | 0.00E+00 | 9.97E-09 | -1.52E-08 |
| **ADPf[2]** | **MJ** | 9.93E+00 | 8.25E-03 | 0.00E+00 | 9.69E-02 | 0.00E+00 | 1.53E-01 | -1.73E-01 |
| **WDP[2]** | **$m^3$ eq** | 1.21E-01 | 1.26E-04 | 0.00E+00 | 6.33E-04 | 0.00E+00 | 4.29E-04 | -2.11E-03 |

[1] GWP-GHG indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product, with characterization factors (CFs) based on IPCC (2013).

[2] The results of this environmental impact indicators of ADPf, ADPe and WDP shall be used with care as the uncertainties of these results are high or as there is limited experienced with the indicator.

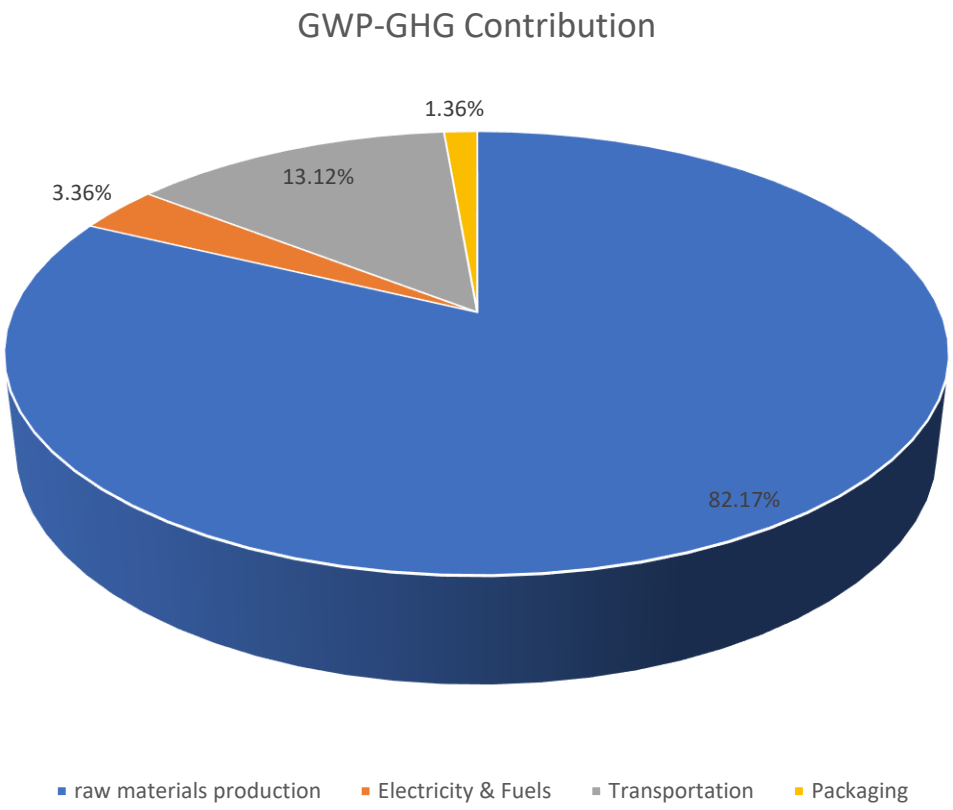
| RESOURCE USE | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| **PERE** | **MJ** | 3.77E-01 | 6.85E-04 | 0.00E+00 | 1.75E-03 | 0.00E+00 | 1.21E-03 | -1.43E-02 |
| **PERM** | **MJ** | 7.60E-01 | -7.60E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **PERT** | **MJ** | 1.09E+00 | -7.60E-01 | 0.00E+00 | 1.75E-03 | 0.00E+00 | 1.21E-03 | -1.43E-02 |
| **PENRE** | **MJ** | 9.20E+00 | 7.77E-03 | 0.00E+00 | 8.97E-02 | 0.00E+00 | 1.39E-01 | -1.71E-01 |
| **PENRM** | **MJ** | 7.28E-01 | -7.28E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **PENRT** | **MJ** | 9.93E+00 | -7.20E-01 | 0.00E+00 | 8.97E-02 | 0.00E+00 | 1.39E-01 | -1.71E-01 |
| **SM** | **kg** | 2.64E-02 | 7.46E-03 | 0.00E+00 | 1.11E-04 | 0.00E+00 | 7.16E-05 | 2.39E-03 |
| **RSF** | **MJ** | 1.07E-02 | 2.31E-05 | 0.00E+00 | 1.09E-05 | 0.00E+00 | 1.47E-05 | -1.79E-04 |
| **NRSF** | **MJ** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **FW** | **$m^3$** | 3.20E-03 | 4.94E-04 | 0.00E+00 | 2.53E-05 | 0.00E+00 | 1.59E-04 | -6.05E-05 |

| WASTE CATEGORIES | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| HWD | kg | 1.14E-02 | 2.43E-05 | 0.00E+00 | 1.56E-04 | 0.00E+00 | 1.14E-04 | -6.89E-05 |
| NHWD | kg | 1.35E-01 | 1.83E-02 | 0.00E+00 | 9.85E-04 | 0.00E+00 | 1.00E+00 | 1.05E-02 |
| RWD | kg | 9.17E-06 | 1.96E-08 | 0.00E+00 | 2.14E-08 | 0.00E+00 | 2.38E-08 | -1.74E-07 |
| CRU | kg | -1.21E-20 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -8.53E-22 |
| MFR | kg | 2.01E-02 | 7.33E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -3.39E-04 |
| MER | kg | 4.82E-06 | 7.33E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -8.02E-08 |
| EE,e | MJ | 5.60E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -8.07E-05 |
| EE,t | MJ | 2.12E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -2.61E-05 |

| ADDITIONAL | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| PM | Disease incidence | 2.02E-08 | 4.97E-11 | 0.00E+00 | 6.41E-10 | 0.00E+00 | 1.01E-09 | -1.68E-10 |
| IR[3] | kBq U235 eq | 3.61E-02 | 7.67E-05 | 0.00E+00 | 8.83E-05 | 0.00E+00 | 9.78E-05 | -6.89E-04 |
| EF | CTUe | 2.19E+00 | 4.06E-02 | 0.00E+00 | 2.80E-01 | 0.00E+00 | 2.10E-02 | -2.90E-02 |
| HT-c | CTUh | 3.61E-02 | 7.67E-05 | 0.00E+00 | 8.83E-05 | 0.00E+00 | 9.78E-05 | -6.89E-04 |
| HT-nc | CTUh | 6.19E-09 | 1.79E-11 | 0.00E+00 | 9.29E-11 | 0.00E+00 | 2.76E-11 | -3.37E-11 |
| LU | Dimensionless | 5.47E+00 | 4.45E-03 | 0.00E+00 | 8.39E-02 | 0.00E+00 | 3.02E-01 | -5.13E-01 |

[3]Ionizing radiation potential (IRP) impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

## *Interpretation*



## *Additional information*

The EPD does not give information on release of dangerous substances to soil, water and indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available.

## *Version History*

***2025-07-02 Editorial change:*** *The table listing the products included in the study has been updated, as it was previously incomplete—two products were missing despite being part of the calculations.*

## *Abbreviations*

| LCA | Life Cycle assessment |
|---|---|
| **EPD** | Environmental Product Declaration |
| **PCR** | Product category rules |
| **GWP-total** | Global Warming Potential total |
| **GWP-fossil** | Global Warming Potential fossil |
| **GWP-biogenic** | Global Warming Potential biogenic |
| **GWP-luluc** | Global Warming Potential land use and land use change |
| **ODP** | Ozone Depletion Potential |
| **AP** | Acidification Potential |
| **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 photochemical oxidants |
| **ADPe** | Abiotic depletion potential for non-fossil resources |
| **ADPf** | Abiotic depletion potential for fossil resources |
| **WDP** | Water use |
| **PERE** | Use of renewable primary energy excluding 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 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 fresh water |
| **HWD** | Hazardous waste disposed |
| **NHWD** | Non-hazardous waste disposed |
| **RWD** | Radioactive waste disposed |
| **CRU** | Components for re-use |
| **MFR** | Materials for recycling |
| **MER** | Materials for energy recovery |
| **EE** | Exported Energy |
| **PM** | Particulate matter emissions |
| **IR** | Ionizing radiation, human health |
| **ETP-FW** | Ecotoxicity, freshwater |
| **HTP-c** | Human toxicity, cancer |
| **HTP-nc** | Human toxicity, non-cancer |
| **SQP** | Land use related impacts/Soil quality |

## *References*


- ***General Programme Instructions*** *for the International EPD® System. Version 4.0*
- ***PCR 2019:14*** *v.1.3.4* ***(2024-04-30)*** *Construction products. EPD System.*
- ***EN 15804:2012+A2:2019/AC*** **(October 2019),** *Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products*
- ***ISO 14020:2000*** *Environmental labels and declarations — General principles*
- ***ISO 14025:2006*** *Environmental labels and declarations - Type III environmental declarations — Principles and procedures*
- ***ISO 14040:2006*** *Environmental management - Life cycle assessment-Principles and framework*
- ***ISO 14044:2006*** *Environmental management - Life cycle assessment - Requirements and guidelines*
- ***Ecoinvent / Ecoinvent Centre****, www.Eco-invent.org*
- ***TACKLING RECYCLING ASPECTS IN EN15804*** *- Christian Leroy, Jean-Sebastien Thomas, Nick Avery, Jan Bollen, Ladji Tikana*
- ***National Inventory Report for Greece***
- ***Residual Energy Mix 2023, DAPEEP***

## *Appendix*

### Maximum deviations from the declared worst case

| IMPACTS | Unit | A-C Modules |
|---|---|---|
| GWP-total | kg CO2 eq | 55.89% |
| GWP-fossil | kg CO2 eq | 56.52% |
| GWP-biogenic | kg CO2 eq | 217.19% |
| GWP-luluc | kg CO2 eq | 32.30% |
| GWP-GHG | kg CO2 eq | 56.40% |
| ODP | kg CFC-11 eq | 77.16% |
| AP | mol H+ eq | 57.28% |
| EP-freshwater | kg P eq | 60.90% |
| EP-marine | kg N eq | 50.41% |
| EP-terrestrial | mol N eq | 49.31% |
| POCP | kg NMVOC eq | 62.34% |
| ADPe | kg Sb eq | 72.99% |
| ADPf | MJ | 77.56% |
| WDP | m^{3} eq | 70.67% |

| RESOURCE USE | Unit | A-C Modules |
|---|---|---|
| PERE | MJ | 68.90% |
| PERM | MJ | 0.00% |
| PERT | MJ | 64.55% |
| PENRE | MJ | 77.41% |
| PENRM | MJ | 0.00% |
| PENRT | MJ | 77.41% |
| SM | kg | 46.67% |
| RSF | MJ | 68.70% |
| NRSF | MJ | 0.00% |
| FW | m^{3} | 58.89% |

| WASTE CATEGORIES | Unit | A-C Modules |
|---|---|---|
| HWD | kg | 74.12% |
| NHWD | kg | 95.89% |
| RWD | kg | 70.05% |
| CRU | kg | 0.00% |
| MFR | kg | 77.29% |
| MER | kg | 99.98% |
| EE,e | MJ | 70.05% |
| EE,t | MJ | 74.79% |

| ADDITIONAL | Unit | A-C Modules |
|---|---|---|
| **PM** | **Disease incidence** | 55.96% |
| **IR** | **kBq U235 eq** | 70.15% |
| **EF** | **CTUe** | 66.24% |
| **HT-c** | **CTUh** | 70.15% |
| **HT-nc** | **CTUh** | 64.71% |
| **LU** | **Dimensionless** | 35.16% |