

Waterproof

ENVIRONMENTAL PRODUCT DECLARATION

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

EPD of multiple products, based on worst-case results of the product group.
The products included are DSF 360, DSF 363, DSF 370, DSF 310, DSF 315

EPD OWNER	THRAKON S.A.
PROGRAM	The international EPD System, https://environdec.com/
PROGRAM OPERATOR	EPD INTERNATIONAL AB
EPD REGISTRATION NUMBER	EPD-IES-0034492:001
CPC CODE	375
VERSION DATE	2026-09-11
VALIDITY DATE	2031-09-10
GEOGRAPHICAL SCOPE	Global

An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

GENERAL INFORMATION

Programme Information	
Program	The International EPD System
Address	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden
Website	www.environdec.com
E-mail	support@environdec.com

Product category rules (PCR)
CEN standard EN 15804 serves as the core Product Category Rules (PCR)
Product category rules (PCR): Construction products, PCR 2019:14, v. 2.0.1
PCR review was conducted by: The Technical Committee of the International EPD System. A full list of members is available at **www.environdec.com**
Review chair: Rob Rouwette (chair), Noa Meron (co-chair). The review panel may be contacted via e-mail **(**support@environdec.com**)**
Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☑ Individual EPD verification without a pre-verified LCA/EPD tool **Third-party verifier**: **Business Quality Verification P.C** Address: 5, Konitsis Street, Marousi, GR 15125, Attica/Greece www.bqv.gr - info@bqv.gr Accredited by: Hellenic Accreditation System (E.S.Y.D) with accreditation No. 1218
Procedure for follow-up of data during EPD validity involves third party verifier: ☐**Yes** ☑ **No**

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

"EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison."

For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Name	THRAKON S.A.
Address	130 Syngroy Avenue, 11745, Athens, Greece
Telephone	+30 210 3633 512-3
Website	www.thrakon.gr
E-mail	info@thrakon.gr

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.

Information on LCA Practitioner commissioned	
Name	Envirometrics S.A.
Address	3, Kodrou Str, Chalandri, Athens, Greece
Telephone	(+)30 21 0723 0592
Website	www.envirometrics.gr
E-mail	vpapalouka@envirometrics.gr

PRODUCT INFORMATION

THRAKON offers a range of high-performance waterproofing systems designed for the protection and sealing of buildings structures. The product range includes cementitious, polyurethane, acrylic and bituminous materials suitable for a wide range of construction applications.

The products are applied to substrates such as concrete, cement and stone and are suitable for both indoor and outdoor use, including roofs, basements, underground structures, water tanks and swimming pools.

Based on cement, quartz aggregates, polymers and specialized admixtures, THRAKON waterproof products provide strong adhesion, high flexibility and effective sealing performance. They are resistant to moisture, frost, aging and chemical exposure. They, also, perform reliably under negative and positive pressures, even on surfaces permanently exposed to water and are not flammable.

All products are manufactured under ISO 9001-certified processes, ensuring consistent quality and performance.

This EPD is based on the worst results of a product group, produced on multiple sites. The study analyses DSF 360, DSF 363, DSF 370, DSF 310, DSF 315 all being under Waterproof by THRAKON S.A.



CONTENT DECLARATION

Declared unit

The studied products are grouped into one category, and the results of the worst-case product are presented. The declared unit of this study is 1 kg of waterproof manufactured in THRAKON plants located at Oinofyta, Chalkidona and Orestiada, Greece. Data for the inventory and impact assessment are expressed based on the declared unit.

Product content

In the table below, the range of the content of the included products is declared.

Product content (range)[1]	Mass-% (versus the product)	Post-consumer recycled material, mass-% of product	Biogenic material, kg C/declared unit[2]
Cement	0.15-0.5	0%	0
Quartz sand	0.1-0.5	0%	0
Calcium carbonate	0.45-0.55	0%	0
Sodium silicate	<0.1	0%	0
Other additives	<0.25	0%	0
Packaging Materials	**Mass (versus the product)**	**Mass-% (versus the product)**	**Biogenic material, kg C/declared unit**
Paper bag	6.40E-03	0.64%	3.20E-03
Pallet	4.67E-03	0.47%	2.33E-03

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

[2]Biogenic carbon content of wood and wood-based materials is assumed as 50% of the mass of the material, adopted from EN 16449.
1kg of biogenic carbon in the packaging is equivalent to the uptake of 44/12 kg CO_2.

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).

LCA INFORMATION

Declared unit
The studied products are grouped into one category, and the results of the worst-case product are presented. The declared unit of this study is 1 kg of waterproof manufactured in THRAKON plants located at Oinofyta, Chalkidona and Orestiada, Greece. Data for the inventory and impact assessment are expressed based on the declared unit.

Time representativeness
The reporting year of this study is the calendar year 2023.

Geographical scope
The geographical scope is global.

Database and Software used
Ecoinvent database 3.11+EN 15804 add-on in OpenLCA v.2.6.0

Description of system boundaries
The EPD system boundary is cradle-to-gate with modules A5, C1-C4 and module D and a description of modules is as follows:

A1 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 are the main raw materials used.

A2 Transportation module includes the delivery of raw, auxiliary and packaging materials from suppliers to the gate of manufacturing plant. All raw materials and packaging materials are imported from suppliers located in Europe and Turkey, except for cement that derives from north Africa.

A3 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 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.

A5 This module includes impacts related to the installation of waterproofs into customer's place. Installation is conducted manually, so electricity required during the installation process is zero. Impacts from water needed are also considered. According to technical datasheets of the products, the average water consumption during mortars installation is 0.2 l per 1 kg of mortar. Furthermore, in this module, impacts from the treatment of waste packaging materials are considered.

For all packaging materials, data from European Statistical Authority has been acquired. Based on the most recent data of 2023 (Packaging materials waste end-of-life), 48% of packaging materials are recycled and 52% are landfilled.

Scenario information	Unit (expressed per declared unit)
Ancillary materials for installation	None
Water use	0.2 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: Wooden pallets: 4.67E-03 kg per kg of product Paper bags: 6,40E-03 kg per kg of product

C1 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 This module includes the transportation of the discarded product either to the recycling site or to landfills for final disposal. A distance of 80 km by lorry 16-32 tonnes from construction/demolition sites to scrap dealers and disposal sites has been chosen as a conservative assumption, according to PCR 2019:14, v.2.0.1.

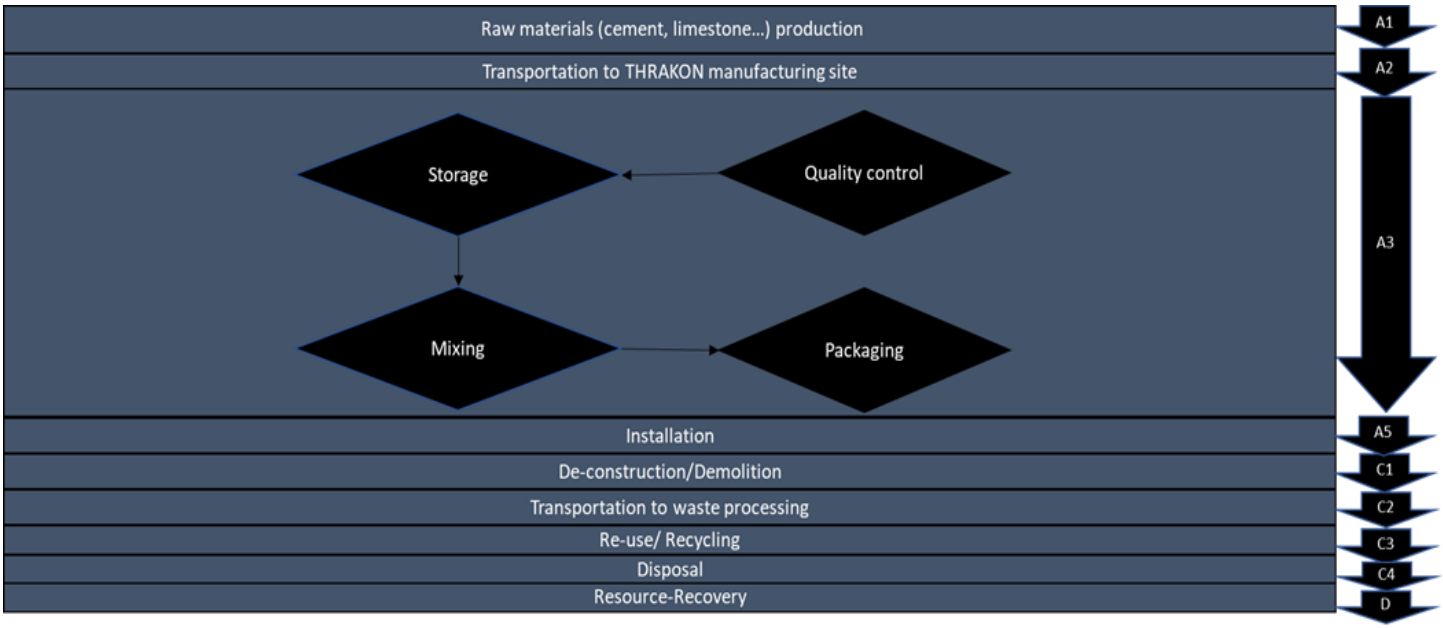
Scenario information	Unit (expressed per declared unit)
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc.	EURO 5 truck, diesel
Distance	80 km
Capacity utilisation (including empty returns)	100%
Bulk density of transported products	Not applicable
Volume capacity utilisation factor (factor: =1 or <1 or ~1 for compressed or nested packaged products)	Not applicable

C3 This module includes impacts related to the reuse/recycling of products after their life cycle. As a conservative assumption, all products waste after the demolition process will be landfilled. So, there are no environmental impacts assigned to this module.

C4 This module includes impacts related to the reuse/recycling of products after their life cycle. As said above, 100% of the product will be landfilled.

D 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 of packaging materials, that can substitute the production of primary wood, paper or energy.

Process flow diagram



Modules declared, Geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results)

	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
Modules Declared	**X**	**X**	**X**	ND	**X**	ND	ND	ND	ND	ND	ND	ND	**X**	**X**	**X**	**X**	**X**
Geography	**GLO**	**GLO**	**Multi-site GR**	-	**EU**	-	-	-	-	-	-	-	**EU**	**EU**	**EU**	**EU**	**Global**
Share of primary data	**14.74%**			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – Products[1]	**34.16%**			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – Sites[1]	**43.83%**			-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] *This variation represents the difference between the worst and best-case GWP-GHG results for Modules A1-A3.*

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

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. No allocation of co-products has been carried out, since there are no co-products during the process. 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 reaches the end-of-waste state, i.e., when the material has become a usable flow.

The previous rules indicate that for all waste that requires 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.

Cut-off rules

The cut-off criteria adopted are as stated in PCR 2019:14, v.2.0.1 and EN 15804:2012+A2:2019/AC:2021. Where there is 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%.

Electricity Modelling

Regarding electricity consumed in the manufacturing stage, electricity from the grid was used. In accordance with the requirements set out in PCR 2019:14 v2.0.1, a market-based approach has been applied for electricity modelling. As no contractual instruments (e.g., Guarantees of Origin or Power Purchase Agreements) were in place during the reporting year, the residual mix for Greece has been used, particularly as calculated by the Association of Issuing Bodies (AIB) and presented by the dataset electricity, medium voltage, residual mix | electricity, medium voltage | EN15804GD, S - GR". The composition of the residual mixes is valid for the year 2023 and sourced by AIB (2024) using grexel methodology resulting in a factor of 0.75 kg CO2 eq/kWh, including the upstream emissions and transmission losses. According to AIB, the residual mix of Greece is the following:

RE total	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO total	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	Untracked
13.71 %	0.00 %	0.20 %	5.55 %	0.00 %	3.68 %	4.10 %	1.43 %	84.87 %	1.60 %	10.06 %	13.14 %	11.36 %	48.66 %	63.63 %

Data quality and declaration

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.3.11+EN 15804 add-on. The data concerning modules A2 and A3 concerns the full year 2023. These data extracted from the company's SAP system and predetermined recipes, the consumed utilities from bills and invoices. The technical representativeness has been concluded as Good, the geographical and time representativeness has been characterized as Very Good since the data is collected within the organization boundaries. Regarding electricity mix, AIB's dataset for 2023 and for the residual energy mix of Greece was utilized. The CO2 emissions from diesel and LPG combustion data were calculated from the National Inventory Report (NIR) of Greece. The end-of-life are based on the most representative scenarios for this product. For the secondary data, database Ecoinvent database v.3.11+EN 15804 add-on has been used, presenting a Good score on average geographical, time and technical representativeness.

Data quality declaration, as well as the share of primary data in GWP-GHG results are presented below as obliged by PCR 2019:14 for processes that contribute more than 10% to the GWP-GHG results:

Process	Source Type	Source	Reference Year	Data Category	Share of primary data, of GWP-GHG results for A1-A3
Product manufacturing	Collected data	EPD Owner	2023	Primary	0.03%
Production of Raw Materials	Collected data, database	EPD Owner, Ecoinvent 3.11 EN15804GD	2023	Secondary	0%
Generation of Electricity used in manufacturing process	Database	AIB (2024). 2023 European Residual	2023	Primary	4.30%
Transportation of Raw Materials	Collected data, database	EPD Owner, Ecoinvent 3.11 EN15804GD	2023	Primary	10.41%
Total share of primary data of GWP, GHG results for A1-A3					14.74%

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. It should be noted that this indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

Characterization factors (JRC)

Based on Reference package EF 3.1 in Ecoinvent database 3.11+EN 15804 add-on

ENVIRONMENTAL PERFORMANCE

The results of the studied category of waterproof, based on the worst-case results, are presented. The maximum variations 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. The impact results below refer to 1 kg of waterproof.

IMPACT CATEGORY	Unit	A1-A3	A5	C1	C2	C3	C4	D
Global Warming Potential (GWP)-GHG[1]	kg CO2 eq.	6.62E-01	5.40E-03	0.00E+00	1.12E-02	0.00E+00	6.26E-03	-3.59E-03
Global Warming Potential (GWP) -total	kg CO2 eq	6.50E-01	2.70E-02	0.00E+00	1.14E-02	0.00E+00	6.26E-03	-2.12E-04
Global Warming Potential (GWP) -fossil	kg CO2 eq	6.61E-01	4.71E-04	0.00E+00	1.08E-02	0.00E+00	6.25E-03	-3.47E-03
Global Warming Potential (GWP) -biogenic[3]	kg CO2 eq	-1.18E-02	2.66E-02	0.00E+00	1.57E-04	0.00E+00	8.62E-07	3.30E-03
Global Warming Potential (GWP) -luluc	kg CO2 eq	3.97E-04	5.50E-07	0.00E+00	4.15E-04	0.00E+00	3.22E-06	-4.17E-05
Ozone Depletion Potential (ODP)	kg CFC-11 eq	2.20E-08	6.46E-12	0.00E+00	4.11E-10	0.00E+00	1.81E-10	-1.42E-10
Acidification Potential (AP)	mol H+ eq	2.21E-03	2.82E-06	0.00E+00	3.50E-05	0.00E+00	4.43E-05	-2.07E-05
Eutrophication potential (EP) - freshwater	kg P eq	1.40E-04	1.16E-07	0.00E+00	8.49E-07	0.00E+00	5.19E-07	-4.17E-06
Eutrophication potential (EP) - marine	kg N eq	4.96E-04	6.07E-06	0.00E+00	1.54E-05	0.00E+00	1.69E-05	-6.80E-06
Eutrophication potential (EP) - terrestrial	mol N eq	5.39E-03	9.04E-06	0.00E+00	1.30E-04	0.00E+00	1.84E-04	-6.20E-05
Photochemical ozone creation potential (POCP)	kg NMVOC eq	2.86E-03	4.67E-06	0.00E+00	4.98E-05	0.00E+00	6.60E-05	-2.16E-05
Abiotic depletion potential (ADP) – minerals and metals[2]	kg Sb eq	3.88E-06	1.64E-09	0.00E+00	4.04E-08	0.00E+00	9.97E-09	-1.89E-08
Abiotic depletion potential (ADP) – fossils fuels[2]	MJ	1.47E+01	6.46E-03	0.00E+00	1.55E-01	0.00E+00	1.53E-01	-6.11E-02
Water deprivation potential (WDP)[2]	m3 eq	2.00E-01	8.23E-05	0.00E+00	1.01E-03	0.00E+00	4.29E-04	-2.84E-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 experience with the indicator.

[3]According to Annex 2 of PCR 2019:14 "Construction products", the indicator GWP-biogenic has been calculated by taking into account the biogenic carbon content of the packaging materials, including carbon uptake and release over the product life cycle. 1kg of biogenic carbon is equivalent to 44/12 kg CO_2.

RESOURCE USE	Unit	A1-A3	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding resources used as raw materials (PERE)	MJ	8.25E-01	3.80E-04	0.00E+00	2.79E-03	0.00E+00	1.21E-03	-1.06E-02
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0.00E+00	3.44E-05	0.00E+00	3.88E-04	0.00E+00	2.18E-04	-1.50E-01

Total use of renewable primary energy resources (PERT)	MJ	8.25E-01	4.14E-04	0.00E+00	3.18E-03	0.00E+00	1.42E-03	-1.60E-01
Use of non-renewable primary energy excluding resources used as raw materials (PENRE)	MJ	1.47E+01	6.01E-03	0.00E+00	1.43E-01	0.00E+00	1.39E-01	-5.80E-02
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0.00E+00	4.49E-04	0.00E+00	1.45E-02	0.00E+00	1.47E-02	-3.17E-03
Total use of non-renewable primary energy resources (PENRT)	MJ	1.47E+01	6.46E-03	0.00E+00	1.58E-01	0.00E+00	1.53E-01	-6.11E-02
Use of secondary material (SM)	kg	2.50E-02	5.42E-03	0.00E+00	1.77E-04	0.00E+00	7.16E-05	4.43E-03
Use of renewable secondary fuels (RSF)	MJ	1.15E-02	1.24E-05	0.00E+00	1.74E-05	0.00E+00	1.47E-05	-2.20E-04
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water (FW)	m3	4.72E-03	1.80E-04	0.00E+00	4.05E-05	0.00E+00	1.59E-04	-6.84E-05

OUTPUT FLOWS	Unit	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	1.31E-02	1.71E-05	0.00E+00	2.50E-04	0.00E+00	1.14E-04	-3.14E-04
Non-hazardous waste disposed (NHWD)	kg	2.24E-01	3.12E-02	0.00E+00	1.58E-03	0.00E+00	1.66E-03	-3.95E-03
Radioactive waste disposed (RWD)	kg	1.05E-05	1.03E-08	0.00E+00	3.43E-08	0.00E+00	2.38E-08	-1.60E-07
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	2.21E-02	2.61E-05	0.00E+00	1.11E-04	0.00E+00	5.91E-05	-4.27E-04
Materials for energy recovery (MER)	kg	0.00E+00	5.57E-09	0.00E+00	7.80E-09	0.00E+00	6.62E-09	-9.89E-08
Exported energy (EE), electricity	MJ	7.70E-03	5.95E-06	0.00E+00	1.26E-05	0.00E+00	9.19E-06	-9.93E-05
Exported energy (EE), thermal	MJ	7.43E-03	1.08E-06	0.00E+00	2.41E-05	0.00E+00	5.95E-06	-3.97E-05

ADDITIONAL IMPACTS	Unit	A1-A3	A5	C1	C2	C3	C4	D
Particulate Matter (PM)	Disease incidence	2.18E-08	4.43E-11	0.00E+00	1.02E-09	0.00E+00	1.01E-09	-2.00E-10
Ionizing radiation, human health (IRP)[3]	kBq U235 eq	4.13E-02	4.07E-05	0.00E+00	1.41E-04	0.00E+00	9.78E-05	-6.23E-04
Eco-toxicity, freshwater (ETP-FW)	CTUe	2.32E+00	1.45E-01	0.00E+00	4.49E-01	0.00E+00	2.10E-02	-3.44E-02
Human toxicity, cancer effects (HTP-c)	CTUh	4.13E-02	4.07E-05	0.00E+00	1.41E-04	0.00E+00	9.78E-05	-6.23E-04
Human toxicity, non-cancer effects (HTP-nc)	CTUh	4.72E-09	2.67E-11	0.00E+00	1.49E-10	0.00E+00	2.76E-11	-4.12E-11
Soil Quality (SQP)	dimensionless	4.42E+00	5.22E-03	0.00E+00	1.34E-01	0.00E+00	3.02E-01	-8.50E-01

[3] This 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 This 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

ABBREVIATIONS

LCA	Life Cycle assessment
EPD	Environmental Product Declaration
PCR	Product category rules
GLO	Global
RER	Europe
RoW	Rest of the world
GWP	Global Warming Potential
ODP	Ozone Depletion Potential
AP	Acidification Potential
EP	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
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
IRP	Ionizing radiation, human health
ETP-FW	Eco-toxicity (freshwater)
HTP-c	Human toxicity, cancer effects
HTP-nc	Human toxicity, non-cancer effects
SQP	Soil quality

REFERENCES

- **General Programme Instructions** (GPI) of The International EPD® System. Version 5.0.1, 2024-06-19.
- **ISO 14040:2006** "*Environmental management — Life cycle assessment — Principles and framework*"
- **ISO 14044:2006** *"Environmental management — Life cycle assessment — Requirements and guidelines"*
- **ISO 14020:2000 "***Environmental labels and declarations — General principles"*
- **ISO 14025:2006 "***Environmental labels and declarations - Type III environmental declarations"*
- **EN 15804:2012+A2:2019/AC:2021** *"Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products"*
- **PCR 2019:14** *"Construction products"*, version 2.0.1 (2025-06-05)
- **Ecoinvent / Ecoinvent Centre**, www.ecoinvent.org

APPENDIX

Variations

The maximum variations between the worst and the best-case results for waterproof in Modules A1-A3 are presented in the tables below.

IMPACT CATEGORY	Unit	A1-A3 Modules
GWP-GHG	kg CO2 eq	34.16%
GWP-total	kg CO2 eq	36.68%
GWP-fossil	kg CO2 eq	34.12%
GWP-biogenic	kg CO2 eq	52.90%
GWP-luluc	kg CO2 eq	68.66%
ODP	kg CFC-11 eq	137.72%
AP	mol H+ eq	55.59%
EP-freshwater	kg P eq	124.01%
EP-marine	kg N eq	38.61%
EP-terrestrial	mol N eq	38.24%
POCP	kg NMVOC eq	79.99%
ADPe	kg Sb eq	88.05%
ADPf	MJ	125.69%
WDP	m^3 eq	90.67%

RESOURCE USE	Unit	A1-A3 Modules
PERE	kg CO2 eq	48.24%
PERM	kg CO2 eq	0.00%
PERT	kg CO2 eq	48.24%
PENRE	kg CO2 eq	125.69%
PENRM	kg CO2 eq	0.00%
PENRT	kg CFC-11 eq	125.69%
SM	mol H+ eq	58.11%
RSF	kg P eq	87.79%
NRSF	kg N eq	0.00%
FW	mol N eq	88.47%

OUTPUT FLOWS	Unit	A1-A3 Modules
HWD	kg CO2 eq	108.08%
NHWD	kg CO2 eq	109.64%
RWD	kg CO2 eq	87.27%
CRU	kg CO2 eq	0.00%
MFR	kg CO2 eq	85.05%
MER	kg CFC-11 eq	0.00%
EE,e	mol H+ eq	85.57%
EE,t	kg P eq	26.60%

ADDITIONAL IMPACTS	Unit	A1-A3 Modules
PM	kg CO2 eq	67.18%
IR	kg CO2 eq	83.15%
ETP-FW	kg CO2 eq	60.61%
HTP-c	kg CO2 eq	83.15%
HTP-nc	kg CO2 eq	35.44%
SQP	kg CFC-11 eq	30.19%

VERSION HISTORY

Original Version of the EPD, 2026-09-11