ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for:

Floor Tile

from

VitrA Karo

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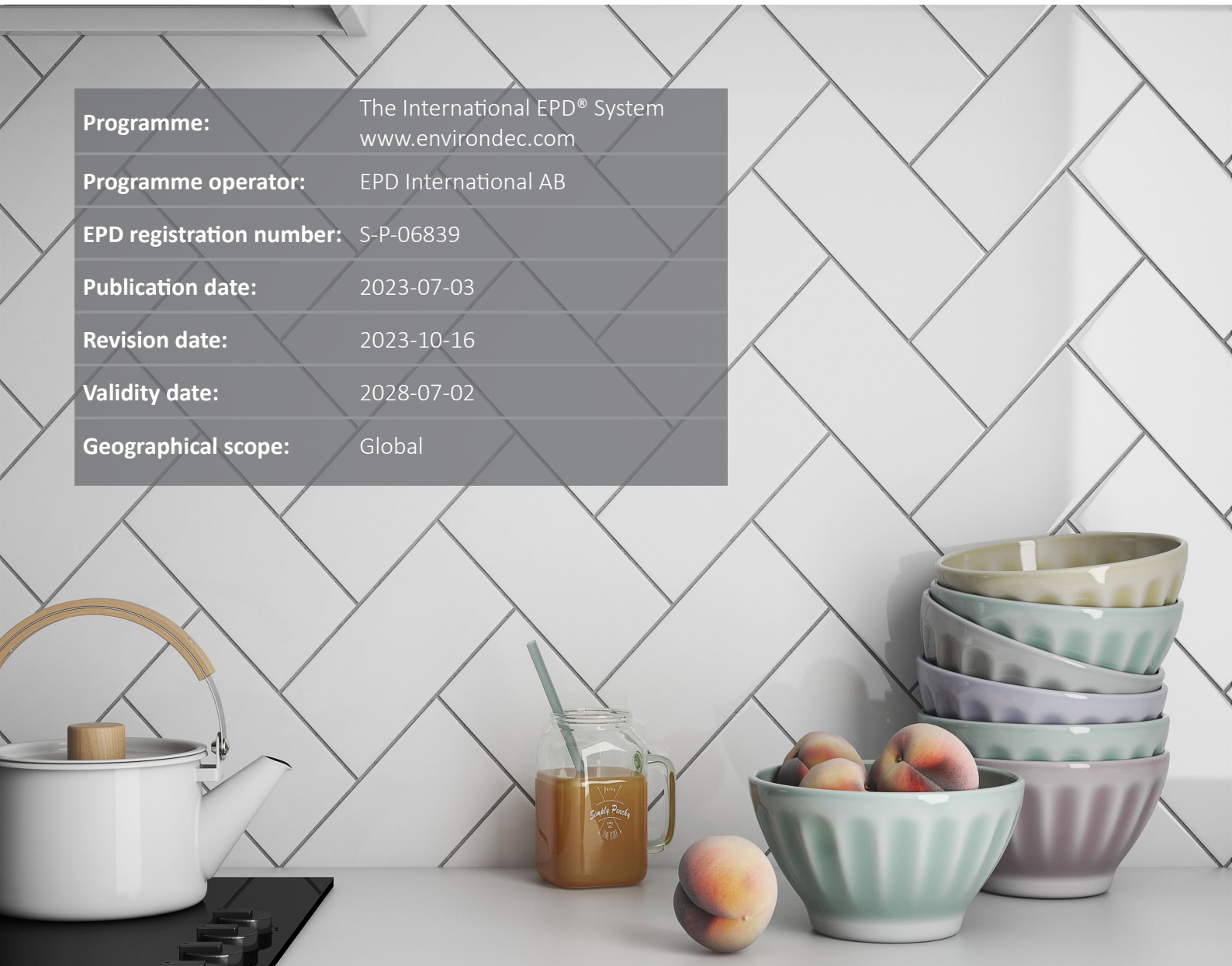

PROGRAMME INFORMATION

Programme	EPD Turkey. a fully aligned regional programme SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15 34415 Kağıthane/Istanbul. TURKEY www.epdturkey.org info@epdturkey.org	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

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Independent third-party verification of the declaration and data. according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Third party verifier: Vladimír Kočí. PhD - LCA Studio

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

It all started with a small workshop in the Istanbul district of Kartal...

Propelled by a vision of smart and sustainable living for people of every age, ability, and cultural background, the Eczacıbaşı Building Products Division is gaining prominence in global design markets while maintaining its longstanding leadership in Turkey's ceramic sanitary ware and ceramic tile markets.

In pursuing this vision, the Division is supported by its multi-brand/multi-manufacturing site/multi-market growth strategy. Eight of the Division's 13 manufacturing sites are located in major international markets, including France, where it is the majority shareholder of V&B Fliesen GmbH, the former tile division of Villeroy & Boch AG, and Germany, where it owns Burgbad AG, the leader of the European luxury bathroom furniture market. In Russia, another major market, the Division has established two manufacturing plants for tiles and ceramic sanitary ware that are supporting its growing sales in the region.

Investments in capacity have been matched by an expansion of the Division's marketing network in international markets, high profile brand and product communication campaigns, and the development of innovative products and collections – an area where it is collaborating with prominent international designers.

VitrA also has a team of in-house designers who represent the backbone of its design philosophy and culture. These emerging stars are supported by multidisciplinary teams at the VitrA Innovation Center, Turkey's first R&D center for building products, which the Division established in 2011. Increasingly contributing to the performance of the Division, the VitrA Innovation Center has received the distinction of "Best R&D Center in the Ceramics and Refractory Industry" from the Turkish Ministry of Science, Industry and Technology for five consecutive years.

International sales, which account for about two-thirds of the Division's total sales, are supported by the Division's marketing and sales companies in Germany, the UK, and Russia. In collaboration with the marketing and sales offices of the Division's manufacturing subsidiaries in Europe, this network serves some 21,000 retail sales points (including sub-dealers) and 150 exclusive showrooms in major international markets.

VitrA Tile manufactures some 4000 varieties of ceramic, porcelain tiles for building interiors and exteriors, terracing and swimming pools. Most of these tiles are produced at its plant at the Building Product Division's production compound at Bozüyük, which has an annual tile capacity of 27.2 million square meters.

Product Description

Floor tiles contains inorganic materials such as clay, calcite and feldspar, but they may also include other raw materials. Floor tiles are ceramic tiles that can be used on the floor and on the wall. Floor tiles are baked Between 1050 - 1100 °C and always glazed. The water absorption rate, which indicates the durability of the product, is between 0.5% and 3% for floor tiles. It is harder and more durable than wall tiles. So it has a higher load-bearing capacity. The breaking strength is over 1100 N for tiles over 7.5 mm thick.
The coating material on its surface is harder than wall tiles, so it wears less than wall tiles.

This EPD covers the production of floor tiles in Bozüyük, Bilecik plant. UN CPC code for Floor tiles is 3731. The assessment is based on the most produced tile type within the product range for 1 m^2 of floor tile.

Product Application

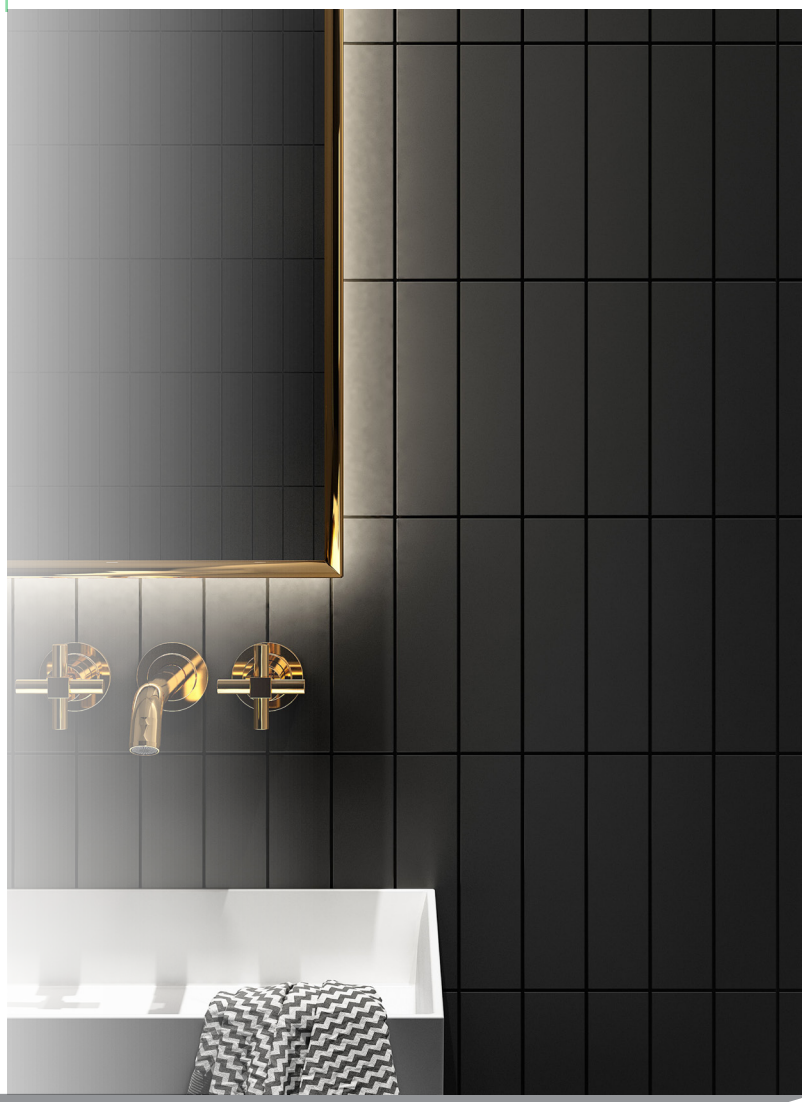
Floor tiles are used for inside and outside applications. Thanks to its superior technical characteristics, the product may be utilised in the following areas: commercial buildings, residential areas, public buildings education and cultural buildings, floors, walls and exterior facades; and floors of outdoor facilities such as gardens, terraces, pool sides and recreational areas.

No substances included in the Candidate List of Substances of Very High Concern for authorisation under the REACH Regulations are present in the ceramic tiles manufactured by VitrA, either above the threshold for registration with the European Chemicals Agency or above 0.1 % (wt/wt).

Technical Specifications

Tests such as dimension and surface quality. physical and chemical properties are applied to floortiles. All VitrA tiles ready for delivery pass these tests.

Water absorption	0,5% < E ≤ 3%
Breaking strength	>1100 N for thickness ≥ 7.5 mm >700 N for thickness < 7.5 mm
Modulus of rupture	30 N/mm²
Deep abrasion	N.A.
Surface abrasion	As specified in the catalogue
Coefficient of friction	As specified in the catalogue
Staining resistance	min. Class 3
Resistance to household chemicals. pool salts	min. Class B



Base and Ancillary Materials

Main raw materials for Floor tiles:

- Clay: 40 - 50%
- Feldspar: 25 - 35%
- Calcite: 5 - 10%
- Recycled Content 0 - 30%
- Other: <1 %

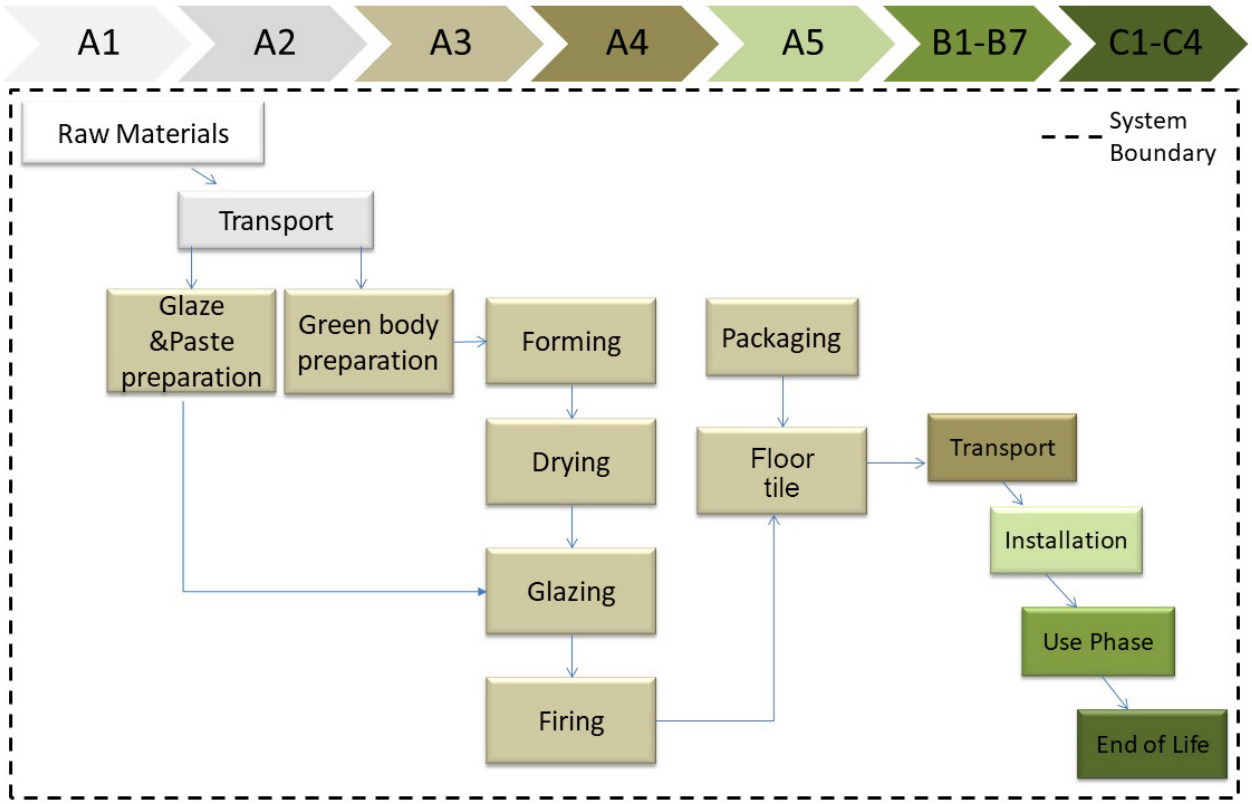
Auxiliary substances / additives:

- Dispersant
- Pigment
- Binder
- Rheological additives

Manufacturing

Floor tiles include several different products with different recipes. According to the recipe, raw materials are loaded into the mills for wet grinding and to form a slurry. The slurry then spray dried to form granules and after sieving process stored in the press-feeding silos ready for dry compaction. Hydraulic presses are used for dry compaction to form green tile. Green tiles are then dried in fast vertical-drying unit to remove the excess humidity before glazing applications or might remain unglazed. Within the glazing unit printing and other surface design applications are performed. Tiles are then fired at high temperatures to form hard body. After quality checks, tiles are packed for dispatch.

Manufacturing process of Floor tiles can be seen in detail from the flow chart given below.



Flow chart of manufacturing floor tiles and LCA system boundary.

Product Processing / Installation

Floor tiles are fixed to the floor and walls using tile cement and subsequently the seams are filled with mortar. No emissions occur during the installation stage.

Packaging

Products are packed in cardboard boxes, strech hoods, plastic stripes and glue.

Packaging Material	Weight, %/m²
Cardboard	83.8
Plastic	13.0
Glue	3.2

Information on biogenic carbon content according to EN 15804+A2		
Biogeniz Carbon Content	Unit	Quantity
Biogenic carbon content in product	kg C	0.001
Biogenic carbon content in packaging	kg C	0.029

Reference Service Life (RSL)

The Reference Service Life (RSL) of the Floor tiles is thought to be same as with the whole building life.

Reuse Phase

Floor tiles are not collected for the purposes of reuse or recycled materials.

Disposal

According to the European Waste Catalogue and The Waste Code List of the Turkish Ministry of Environment and Urban Planning. Floor tiles waste belongs to the group of construction and demolition wastes - tiles and ceramics" (code: 17 01 03). After domestic usage. ceramic tile products end up at construction and demolition waste landfills.

Environment at VitrA

Environmental protection

VitrA Tiles Co.'s environmental policy is based on the principle "Being aware of our responsibilities towards the environment and society. our aim is to bequeath a viable and clean environment to future generations". Adopting a green approach both to the production process and to products. protecting the environment and reducing the consumption of resources such as raw materials. energy and water are vital components of all processes.

VitrA Tiles Co. re-uses residual glaze and mud in production. recovers the waste heat of the kilns and uses it for spray drying. The company treats domestic and industrial wastewater and reuses over 90% of the treated industrial water in production. and has built a pallet repair station and begun repairing old pallets by re-using them in packaging.

Activities being conducted include: Reducing noise levels in the processes from 90 dbA to 80 dbA through sound insulation. making the dust collection system a closed-cycle combining the forklift battery charging points in a single location and establishing a "battery charging station". eliminating back injury risks in the Quality Separation areas by employing a conveyor system an establishing a ventilation system to reduce ambient temperature.

Protection of environment. decreasing and legal withdrawal of wastes. effective usage of natural resources. decreasing of environmental risks is of primary importance. Activities relating to recycling of wastes and effective usage of resources. casting of environmental effects before plant and process design are conducted according to certified ISO 14001 Environmental Management System.

Continuous improvement works for effective usage of energy. energy effectiveness projects. assessment of present-potential opportunities. development and application of energy policy and reduction of greenhouse gas emissions done according to ISO 50001 Energy Management System.

The technology investments of energy for conscious usage and recycling to nature. responsibility of preserving natural resources started from production phase for all processes and recycling systems were developed to decrease wastes to minimum.

Difference From Previous Version

This EPD has been revised due to spelling mistake.

PRODUCT STAGE

A1. Raw Material Supply includes raw material extraction and pre-treatment processes before production. In this report, production for each product starts with raw material acquisition.

A2. Transport is relevant for delivery of raw materials to the plant and involves forklift usage within the factory.

A3. Manufacturing stages include production of granules by spray drying. forming, drying, glazing, firing and packaging. Transport is only relevant for delivery of raw materials to the plant and forklift usage within the factory. Packaging waste scenario is created separately depending on the geographic location of the installation process. Renewable energy is used as energy source in the manufacturing.

CONSTRUCTION PROCESS STAGE

A4. Transport includes transportation of floor tiles to the construction site. VitrA transport tiles by seaway, airway and road haulage to the distribution centres for export.

A5. Installation of the Product stage includes the adhesive mortar and water usage in the construction site. For 1 m^2 floor tile installation; 3.6 kg mortar and 1.5 L water usage was assumed.

USE STAGE

B1. Use stage concerns emissions into environment. Floor tiles are inert materials, so during the use stage, they do not cause any emissions. Hence, use phase is not relevant for the assessment.

B2. Maintenance includes cleaning of tiles. VitrA advices to use 0.2 mL detergent which contains stain remover or neutral low-sulphate and rinse with 0.1 L tap water after cleaning. The results are given for a one-time cleaning activity, as the activity will vary by user.

B3. Repair: VitrA Floor tiles require no repairing during the use phase and therefore no impacts has ocurred in this module.

B4. Replacement: VitrA Floor tiles require no replacement during the use phase and therefore no impacts has ocurred in this module.

B5. Refurbishment: VitrA Floor tiles require no refurbishment during the use phase and therefore no impacts has ocurred in this module.

B6. Operational Energy Use: Operational energy use is not relevant for this product.

B7. Operational Water Use: Operational water use is not relevant for this product.

END OF LIFE STAGE

C1. De-construction. Demolition at the end of RSL is usually conducted with a selective deconstruction/ demolition. The environmental impacts generated during this phase are very low and therefore can be neglected.

C2. Transport (Waste) includes the transportation of the discarded tiles. packaging material and adhesive mortar to final disposal. Average distance from demolition site to inert landfil site for final disposal is assumed to be 50 km.

C3. Waste Processing concerns processing of discarded porselain tiles for recycle or reuse. The environmental impacts generated during this phase are very low and therefore can be neglected.

C4. Disposal is the final stage of product life. Floor tiles end up at construction and demolition waste landfills as their final fate and modelled as such in this LCA.

BENEFITS AND LOADS

D. Benefits & Loads from the tiles are calculated in this stage.

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

Functional Unit	The functional unit is the production of 1 m^2 the most produced Floor tile with a mass of 13.17 kg.
Goal and Scope	Evaluation of environmental impacts for 1 m^2 Floor tile from the range of products that are produced the most from cradle to grave.
System Boundary	The system boundary covers A1 - A3 product stages referred as 'Raw material supply'. 'Transport' and ' Manufacturing', A4 - A5 'Construction', B1 - B7 'Use' and C1 – C4 'End of life' stages.
Cut-off Rules	For this LCA study. 1 % cut-off was applied.
Background Data	Ecoinvent database (Ver.3.9) (www.ecoinvent.org) is used for the background data.
Data Quality	Raw materials. energy and water consumption. waste and material and product transport data is collected from VitrA.
Period Under Review	All primary data collected from VitrA refers to the period year of 2022.
Allocations	No allocation was performed for this LCA study.

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS
	Raw Materials Supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse-Recycling-Recovery 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	X	X	X	X	X	X	X	X	X	X	X	X
Geography	GLO		TR	GLO													
Specific Data Used	>90%			-													
Variation - products	0%			-													
Variation - sites	0%			-													

Description of the system boundary (X = Included in LCA. MND= Module Not Declared. NR=Not Relevant)

The system boundaries in tabular form for all modules are shown in the table above. The results of the LCA with the indicators as per EPD requirement are given in the following tables for product stage (A1 - A3). construction process (A4. A5). use stage (B1 - B7). and end of life (C1 - C4).

Life Cycle Inventory Analysis indicators describing the use of resources are determined respectively to the following impact categories. calculated using CML-IA Baseline (Ver. 3.5) method: Global Warming Potential (GWP) for time span of 100 years, Ozone Layer Depletion Potential (ODP) with time span of infinity, Formation Potential of Tropospheric Ozone Photochemical Oxidants (POCP) with time span of 5 days, Acidification Potential (AP) with time span of eternity. Eutrophication Potential (EP) with time span of eternity, Photochemical Oxidation (POCP) and Abiotic Depletion Potential for Fossil (ADPF) and Non-fossil (ADPE) resources. All energy calculations were done using Cumulative Energy Demand (LHV) methodology. The freshwater use value for manufacturing life cycle was taken from the manufacturer as the net freshwater consumption occurs during the manufacturing stage only.

ENVIRONMENTAL IMPACTS. 1 m² FLOOR TILE												
Parameter		Unit	A1-3	A4	A5	B1	B2	B3-7	C1	C2	C3	C4	D
Global Warming Potential	Total	kg CO_2 eq.	7.19	1.71	5.04	0	0.494	0	0	0.156	0	0.234	-0.541
	Biogenic	kg CO_2 eq.	-0.027	0.001	0.043	0	-0.536	0	0	143E-6	0	1.48E-3	-657E-6
	Fossil	kg CO_2 eq.	7.22	1.71	4.99	0	0.379	0	0	0.156	0	0.232	-0.540
	Land Use & Transformation	kg CO_2 eq.	3.13E-3	889E-6	0.005	0	0.651	0	0	77.0E-6	0	169E-6	-1.05E-3
Acidification		mol H+ eq	0.012	0.025	0.032	0	0.004	0	0	341E-6	0	0.002	-0.005
Particulate matter		disease inc.	138E-9	94.0E-9	325E-9	0	71.7E-9	0	0	11.6E-9	0	35.6E-9	-54.0E-9
Eutrophication. marine		kg N eq	0.004	0.005	0.005	0	0.005	0	0	86.0E-6	0	618E-6	-0.001
Eutrophication. freshwater		kg P eq	377E-6	185E-6	0.002	0	0.007	0	0	11.1E-6	0	60.8E-6	-59.0E-6
Eutrophication. terrestrial		mol N eq	0.039	0.059	0.056	0	0.016	0	0	874E-6	0	0.007	-0.016
Human toxicity. cancer		CTUh	1.82E-9	659E-12	3.10E-9	0	842E-12	0	0	71.1E-12	0	130E-12	-402E-12
Human toxicity. cancer - inorganics		CTUh	912E-12	365E-12	1.82E-9	0	273E-12	0	0	34.7E-12	0	63.8E-12	-148E-12
Human toxicity. cancer - organics		CTUh	908E-12	294E-12	1.28E-9	0	569E-12	0	0	36.5E-12	0	65.9E-12	-254E-12
Human toxicity. non-cancer		CTUh	28.4E-9	12.4E-9	74.5E-9	0	19.1E-9	0	0	1.57E-9	0	1.45E-9	-5.30E-9
Human toxicity. non-cancer - inorganics		CTUh	26.1E-9	11.9E-9	69.9E-9	0	16.9E-9	0	0	1.49E-9	0	1.34E-9	-4.72E-9
Human toxicity. non-cancer - organics		CTUh	2.29E-9	583E-12	4.60E-9	0	2.17E-9	0	0	84.3E-12	0	116E-12	-573E-12
Ionising radiation		kBq U^{-235} eq	0.085	0.087	0.251	0	0.021	0	0	0.003	0	0.007	-0.011
Land use		Pt	21.8	9.02	26.2	0	37.9	0	0	1.34	0	11.5	-14.2
Ozone depletion		kg CFC^{11} eq	175E-9	182E-9	197E-9	0	20.5E-9	0	0	3.40E-9	0	5.49E-9	-8.7E-9
Photochemical ozone formation		kg NMVOC eq	0.019	0.017	0.021	0	0.003	0	0	529E-6	0	2.24E-3	-0.005
Resource use. fossils		MJ	101	24.4	74.0	0	3.96	0	0	2.22	0	5.03	-7.4
Resource use. minerals and metals		kg Sb eq	16.9E-6	2.89E-6	57.4E-6	0	3.78E-6	0	0	510E-9	0	471E-9	-2.09E-6
Water use		m^3 depriv.	0.877	0.131	2.55	0	0.719	0	0	0.009	0	0.213	-0.619
Legend		A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1. A2, and A3. A4: Transport to Site, A5: Installation, B1: Use, B2: Maintenance, B3: Repair, B4: Replacement, B5: Refurbishment, B6:Operational Energy Use, B7: Operational Water Use, C1: De-Construction, C2: Waste Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.											

ENVIRONMENTAL IMPACTS. 1 m² FLOOR TILE												
Parameter	**Unit**	**A1-3**	**A4**	**A5**	**B1**	**B2**	**B3-7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG	kg CO_2 eq.	7.24	1.71	5.04	0	1.07	0	0	0.156	0	0.234	-0.542
Legend	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology which excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator.											

RESOURCE USE. 1 m² FLOOR TILE												
Parameter	**Unit**	**A1-3**	**A4**	**A5**	**B1**	**B2**	**B3-7**	**C1**	**C2**	**C3**	**C4**	**D**
PENRE	MJ	101	24.4	74.0	0	4.66	0	0	2.22	0	5.03	-11.2
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	101	24.4	74.0	0	4.66	0	0	2.22	0	5.03	-11.2
PERE	MJ	1.90	0.434	4.84	0	18.6	0	0	0.035	0	0.086	-0.232
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	1.90	0.434	4.84	0	18.6	0	0	0.035	0	0.086	-0.232
SM	kg	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m³	0.054	0.006	0.076	0	0.125	0	0	522E-6	0	0.007	-0.047
Legend	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, 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water											

WASTE OUTPUT FLOWS. 1 m² FLOOR TILE												
Parameter	**Unit**	**A1-3**	**A4**	**A5**	**B1**	**B2**	**B3-7**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	MJ	0.008	0	0	0	0	0	0	0	0	0	0
NHWD	MJ	1.30	0	0	0	0	0	0	0	0	14.9	0
RWD	MJ	0	0	0	0	0	0	0	0	0	0	0
CRU	MJ	0	0	0	0	0	0	0	0	0	0	0
MFR	MJ	0	0	0	0	0	0	0	0	0	0	0
MER	MJ	0	0	0	0	0	0	0	0	0	0	0
EE (Electrical)	kg	0	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy thermal.											

REFERENCES

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- /PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute. Swedish Environmental Protection Agency. SP Trä. Swedish Wood Preservation Institute. Swedisol. SCDA. Svenskt Limträ AB. SSAB. The International EPD System. 2019:14 Version 1.11 DATE 2019- 12-20
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