



Tiles for every home



ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME

Porcelain stoneware 8,5 mm

SITE

Khan Asparuh AD; Ahinora Str., 1 -
7400 ISPERIH – Bulgaria

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

Program Operator	EPDItaly
Publisher	EPDItaly
Declaration Number	KAI_BG_24_0001
Registration Number	EPDITALY1446
Issue Date	01/10/2026
Expiry Date	01/10/2031



GENERAL INFORMATION

EPD OWNER

Company Name	Khan Asparuh AD
Registered Office	Ahinora Str., 1 - 7400 Isperih – Bulgaria
Contact for EPD Information	ambiente@marazzigroup.com

PROGRAM OPERATOR

EPDItaly	Gaetano De Castilia street n° 10 - 20124 Milan, Italy
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EPD INFORMATION

Product Name	Porcelain stoneware with thickness of 8,5 mm
Production Site	Khan Asparuh AD; Ahinora Str., 1 - 7400 ISPERIH – Bulgaria
Brief Description and Technical Information of the Product	Porcelain stoneware with thickness of 8,5 mm, manufactured from natural raw materials including clays, feldspars and sands. The product is produced through pressing, glazing and high-temperature firing processes, providing durability, mechanical resistance and suitability for indoor and outdoor floor and wall applications.
Product Application	The porcelain stoneware covered by this study is intended for installation as both floor and wall coverings and may be used in indoor and outdoor residential, non-residential, and commercial environments.
EPD Type	Average product/service EPD (EPDItaly)
Product Reference Standard	EN14411
CPC Code (number) https://unstats.un.org/unsd/classifications/Econ	37370

VERIFICATION INFORMATION

PCR (title, version, publication/update date)	PCR ICMQ-001/15 Rev. 3.2 Construction products and construction services, Date of issuance: 03/11/2025
EPDItaly Regulation (version, publication/update date)	EPDItaly Program Regulations REV 6. Date of Issuance: October 30, 2023
Project Report LCA	Life Cycle Assessment and Environmental Product Declaration Analysis
Independent Verification Statement	Independent verification of the declaration and data was carried out according to ISO 14025:2010. ☐ Internal ☒ External. Third-party verification performed by ICMQ S.p.A., Gaetano De Castilia Street n° 10, 20124 Milan, Italy. Accredited by Accredia.
Comparability Statement	Environmental declarations published within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable unless they comply with EN 15804:2012+A2:2019.
Responsibility Statement	The EPD Owner releases EPDItaly from any responsibility for non-compliance with environmental legislation. The declaration holder shall be responsible for the information and supporting evidence. EPDItaly disclaims any liability regarding the information, data and results provided by the EPD Owner for the life cycle assessment.

1. THE COMPANY



KAI Group brand boasts a rich history that began in the 1970s with our two manufacturing units: Khan Asparuh AD in Ispereh and Khan Omurtag AD in Shumen. Following a strategic merger in 2004 and a major modernization program across our two manufacturing units, the company strengthened its industrial and technological capabilities.

Since 2015, as an official member of Mohawk Industries - the world's leading tile manufacturer - KAI has become one of Europe's largest producers of ceramic tiles and porcelain surfaces. Production takes place in technologically advanced facilities, supported by highly specialized Italian technicians who ensure outstanding quality, reliability, and attention to detail.

With an annual production capacity exceeding 28 million sqm, KAI combines decades of manufacturing tradition with the global strength and resources of an international industry leader.

By combining this creative vision with the expertise of highly specialized Italian technicians and advanced technologies from global industry leaders, we deliver:

- High-definition digital printing that faithfully reproduces the intricate, non-repeating veining of natural marble and the organic warmth of aged wood.
- Specialized processes incl. waterjet cutting, diamond polishing, and triple firing with platinum, creating finishes of exceptional refinement.

Full compliance with ISO 9001 and European standard EN 14411, ensuring that aesthetic beauty is always supported by durability and performance.

KAI Group exports more than half of its production to over 25 countries, including the United Kingdom, France, Germany, Italy, and Scandinavia.

From corporate ethics to environmental responsibility, our commitment remains unwavering: to create reliable, high-quality products that customers and partners can trust, bringing a touch of Italian-inspired sophistication to homes and spaces around the world.

Management systems, environmental and quality brands:

In order to keep its competitive position on the international market, KAI Group applies strict quality control and management in every step of the manufacturing process, the resources selection, and the end-product evaluation process. As a result of the international scope of operation and distribution of products, the company is frequently found to be under inspections by Clients- thus, quality control, control over social and ethical policy of the company, environmental audit etc. maintain crucial importance.

Khan Asparuh AD and Khan Omurtag AD are Bulgarian manufacturers of wall and floor ceramics that are certified under ISO-9001 and the production process complies with the requirements of the European standard EN 14411.

Products by KAI Group comply with the following standards:

- /EN 14411:2016/ Ceramic tiles - Definitions, classification, characteristics, evaluation of conformity and marking
- /ISO 10545-1÷18/ methods for test
- /ISO EN 16165 ANNEX C/ pendulum test;
- /ISO EN 16165 ANNEX B/ Testing of floor coverings. Determination of the anti-slip properties. Workrooms and fields of activities with slip danger, walking method-ramp test;
- /ISO EN 16165 ANNEX A/ ramp method barefoot test;
- /British Ceramic Research Association LTD/: Method for the determination of the coefficient of friction of floor tiles and floor surfaces;
- /ANSI 326.3.2021/ digital tribometer;
- /ANSI 137.1.2022/
-  /DEVL1104875A/ Ministère de l'écologie, du développement durable, des transports et du logement - Arrêté du 19 avril 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils;
- /UKCA 2019 No.465/ and subsequent modifications
- /Regulation (EU) No 305/2011/ of the European Parliament and of the Council of 9 March 2011 and subsequent modifications laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

For additional information on certifications and current versions of technical standards, please check the website [KAI | KAI](https://www.kai.bg)

2. GOAL AND SCOPE OF EPD

The entire life cycle of the product is considered (Type of EPD: cradle to grave) and the modules described below are declared in this EPD:

Modules **A1-A3** include those processes that provide energy and material input for the system (A1), transport up to the factory gate of the plant (A2), manufacturing processes as well as waste processing (A3).

Module **A4** includes the transport from the production site to the customer or to the point of installation of the tiles.

Module **A5** considers all tile installation steps (like adhesives consumption) also packaging waste processing (recycling, incineration, disposal). Credits from energy substitution are declared in module D. During this phase a ceramic material loss of 6,5% has been considered.

Module **B1** considers the use of tiles. During the use of ceramic tiles, no hazardous indoor emissions are expected to occur.

Module **B2** includes the cleaning of the tiles. Provision of water, cleaning agent for the cleaning of the tiles, incl. wastewater treatment is considered.

Modules **B3-B4-B5** are related to the repair replacement and refurbishment of the tiles. If the tiles are properly installed no repair, replacement or refurbishment processes are necessary.

Modules **B6-B7** consider energy use for operating building integrated technical systems (B6) and operational water use for technical building-related systems. No operational energy or water use are considered. Cleaning water is declared under B2.

Module **C1** concerns the process of demolition and deconstruction of the tiles from the building. It is not considered relevant for the environmental impacts.

Module **C2** considers transportation of the discarded tile to a recycling or disposal process.

Module **C3** considers every process (collection, crushing process etc.) properly for recycling the tiles.

Module **C4** includes all the landfill disposal processes, including pre-treatment and management of the disposal site.

Module **D** includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. Loads from packaging incineration (A5) and resulted energy credits (electricity and thermal energy) are declared within module D.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

EPD TYPE:

The type of EPD is an average EPD for the product Porcelain stoneware with an average thickness of 8,5 mm produced by KAI plant located in Ispirih and sold worldwide. All data refer to the 2024 production and sales. According to the PCR ICMQ-001/15 rev. 3 the LCA study and the relative EPD, is "cradle to grave". Modules included are A1, A2, A3, A4, A5, B, C and D. All manufacturing activities and packaging/auxiliary's production are in module A3, while energy production and input materials are in A1. Transport to clients (A4) and installation (A5) are included together with end-of-life scenarios (benefits and loads included according to D module).

GEOGRAPHICAL VALIDITY:

Performance was calculated with reference to the plant of Khan Omurtag AD, SHUMEN, 1 Varnensko Shose, Bulgaria. The reference market is Worldwide.

DATABASE: Managed LCA Content 2024.1

SOFTWARE: Marazzi Group LCA Tool - V5 [03/11/2025 - DB version 2024,1 – validated tool

EPD PRODUCED USING A VALIDATED CALCULATION ALGORITHM:

In 2026, the KAI Group implemented and certified a process for generating EPDs using a calculation algorithm validated and certified by ICMQ S.p.A., in accordance with EPDItaly requirements. The process is based on the automatic collection of data from the factories, which is subsequently integrated, verified and validated in accordance with internal procedures. The validated calculation algorithm enables the automatic generation of EPDs for ceramic tiles

This EPD has been automatically generated for the selected product(s) to quantify the environmental impacts associated with their specific use.

3. DETAILED PRODUCT DESCRIPTION

KAI Group's ceramic tiles are mainly produced from natural raw materials such as clay, feldspar and sand. Porcelain stoneware has a water absorption rate of less than 0.5%.

MANUFACTURING PROCESS DESCRIPTION

Entry, storage and entry into production of raw materials:

The incoming raw materials are stored in piles inside covered sheds

The dosing of the components for the input in the production cycle is carried out by automatically controlled weighing systems, which implement previously programmed recipes.

Manufacturing:

Raw material grinding:

The raw materials are finely chopped with a wet milling process in continuous drum mills, with the use of suitable grinding bodies. The slip obtained at the end of the grinding is stored in tanks out of ground in reinforced concrete and continuously moved by agitators.

Spray Drying:

This phase consists of spray drying in streams of hot air (about 600 ° C) of the slip to obtain the semi-finished "mixture" (powders), having dimensional characteristics and water contents suitable for the subsequent phase of pressing the tiles. The residual humidity of the spray-dried powder mix obtained is normally between 5% and 6.5%. The product is stored in silos, from which it is transferred to the pressing departments.

Pressing and Drying:

Pressing is the phase of the production process that provides the spray-dried powder mix with sufficient mechanical consistency for its subsequent handling, creating the unfired tile.

The forming of the tiles is realized by means of hydraulic presses, fed with the dust pressing powder, on which are installed molds suitable to the size to be obtained. The rapid single firing process requires a drying step of the pressed ceramic support which carries out the residual moisture at levels not exceeding 0.1%. The drying is obtained through systems that use hot air currents at temperatures around 200 ° C.

Preparation of glazes and glazing:

Glazes and decorations are applied on the dried ceramic support before the cooking phase. Glazes are "conveyed" by preparing them in aqueous suspensions and applying them along the glazing lines; the need to apply different types of glazes and decorations involves the installation of long transport lines, on which the semi-finished application stations are activated (aerography, rotating disc devices, ink-jet station etc.). The preparation of the glazes is carried out by wet grinding of the various constituents (frits, kaolin, sand, etc.), dosed in mills according to specific recipes. In plants, there are also present tintometers, that is systems which automatically mix wet-colored oxides with glaze bases to obtain the appropriate applications for the glazing.

Firing:

It is the thermal process that allows to obtain the greification of the ceramic product. In a thermal cycle lasting about 45 minutes, the tiles are brought to a temperature of about 1,200 ° C and then cooled.

Mechanical processing:

Before being sent to the final choice, the fired tiles can be cut, squared and lapped.

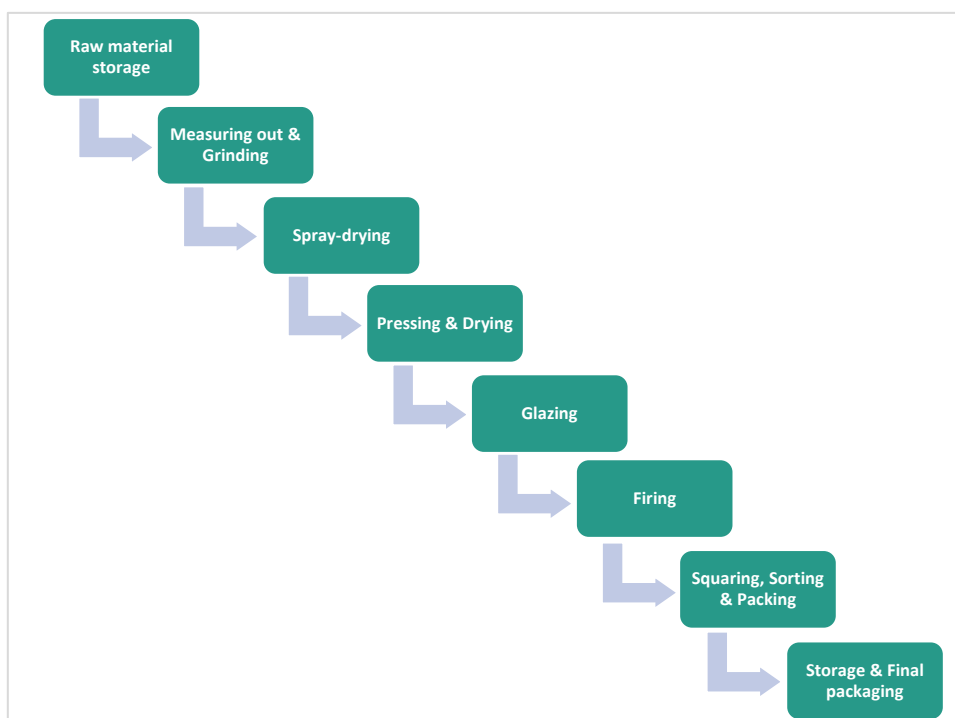
Sorting and packing:

The final stage of the process is constituted by the selection of the tiles: every single tile is controlled according to predetermined criteria, in terms of size and quality; depending on the results of checks carried out, the tiles are divided into classes of choice, before being suitably boxed.

This phase also includes the final packaging and identification of the finished product. The tiles are packed in cardboard boxes, wrapped in polyethylene film and plastic strapping, and then stacked on wooden pallets. The amount of packaging material can vary depending on the size of the tiles. The cardboard and the PET film used for the packaging of the final product contain recycled material.

Shipping warehouse:

The boxed and palletized material is transported by means of forklift trucks, to the finished product warehouse, where it remains stored until shipment



ENERGY and ENVIRONMENTAL PROTECTION

At the Ispirih plant, the environmental impact of emissions into the atmosphere, generated during the production process, is reduced by using bag filters that retain particulate matter.

Carbon dioxide emissions are closely monitored with reference to the ETS (European Emissions Trading Scheme) Directive.

100% of the electricity consumed at the plant is covered by Guarantees of Origin (GOs) from renewable energy sources.

Heat recovery is active from cooling air flows inside the kilns into the spray driers.

Technical data:

Porcelain stoneware produced in the plant of Ispirih complies with the following standards and specifications:

Name	Value	Unit
Water absorption acc. to ISO 10545-3	≤0,5	%
Breaking Strength acc. to ISO 10545-4	≥1300	N
Flexural strength acc. to ISO 10545-4	>35	N/mm ²
Resistance to surface wear– Glazed tiles acc. to ISO 10545-7 (PEI value)	I-II-III-IV-V	
Coefficient of linear thermal expansion acc. to ISO 10545-8	≤9	MK ⁻¹
Thermal shock resistance acc. to ISO 10545-9	resistant	
Frost resistance acc. to ISO 10545-12	resistant	
Nonslip property (class A, B or C) acc. to. CEN/TS 16165	NC; A; A+B; A+B+C	
Impact resistance acc. to ISO 10545-5	0,80	
Resistance to low concentrations of acids and alkalis acc. to ISO 10545-13	LA-LB	
Resistance to household chemicals and swimming pool salts acc. to ISO 10545-13	A-B	
Resistance to low and high concentrations of acids and alkalis acc. to ISO 10545-13	HA-HB	
Resistance to staining acc. to ISO 10545-14	Class 3 minimum	

BASE MATERIALS / ANCILLARY MATERIALS:

Main raw materials:

- Clay 35-50%
- Feldspar 30-38%
- Other raw materials 13-20%

Main glaze components:

- Clay powder
- Quartz
- Alumina
- Natural pigments
- Frits

Main auxiliary additives:

- Fluidifying agents
- Pigments

PRODUCT PROCESSING/INSTALLATION

Tiles are fixed to the walls and floors surfaces using different materials and amounts, for example, dispersion and cementitious adhesives and mortars, sealants or liquid applied membranes. During the installation, no emissions occur, and no health or environmental risks derive from ceramic tile installations. For the use of installation and/or cleaning materials, please refer to the technical data sheets of the material used.

RELEVANT EFFECTS DURING USE

Fire: In accordance with /EN 13501-1:2007+A1:2009/, ceramic tiles can be classified as fire resistance class A1 as they are non-flammable.

Coating ceramic tiles in the event of fire has been shown to reduce the heat input on them and thus the risk of collapse.

Water: Ceramic tiles are insoluble materials and do not react to water.

ENVIRONMENT AND HEALTH DURING USE

Ceramic is intrinsically inert, chemically stable and therefore, during the use stage, does not emit any pollutants or substances which are harmful to environment and health such as: VOCs and Radon.

DECLARED UNIT and REFERENCE FLOW

The declared unit is 1 m² Porcelain stoneware for covering walls and floors for 1 year. The mass of the surface considered is 19 kg/m² with a thickness of 8,5 mm.

REFERENCE SERVICE LIFE (RSL)

The service life of tiles is typically more than 50 years (BNB 2011). Furthermore, according to the US Green Building Council, the useful life of tiles could be the same as the useful life of the building itself. Therefore, 60 years represents an alternative for tiles. The reported results consider the use of tiles for 1 year, multiplying the B2-values by 50 or 60 gives B2-values for 50 or 60 years. No RSL was defined according to ISO 15686.

MECHANICAL DESTRUCTION

Ceramic tiles can be smashed mechanically, but no harmful damage on the environment is expected.

RE-USE PHASE

After the demolition and deconstruction stage, ceramic tiles can be crushed and then used in a range of different applications, like concrete aggregates or road construction.

DISPOSAL

According to the /European Waste Catalogue/ (EWC) ceramic tiles waste belongs to the group 17 "Construction and demolition wastes", tiles and ceramic (code:17 01 03).

4. LCA RESULTS

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m²

ENVIRONMENTAL IMPACTS																		
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP - total	[kg CO ₂ eq.]	4,25	0,504	4,23	1,25	3,5	0	0,0114	0	0	0	0	0	0,017	0,12	0,0477	0,113	-0,155
GWP - fossil	[kg CO ₂ eq.]	4,22	0,486	5,33	1,2	2,21	0	0,00875	0	0	0	0	0	0,0163	0,115	0,0469	0,112	-0,213
GWP - biogenic	[kg CO ₂ eq.]	0,0247	0,0186	-1,11	0,0509	1,28	0	0,00264	0	0	0	0	0	0,000697	0,00492	0,000159	0,000324	0,0587
GWP - luluc	[kg CO ₂ eq.]	0,00129	6,05E-005	0,00279	0,000161	0,00295	0	2,49E-006	0	0	0	0	0	2,17E-006	1,56E-005	0,000635	0,000674	-0,000461
ODP	[kg CFC11-eq.]	1,38E-010	6,06E-014	2,86E-012	1,56E-013	1,37E-011	0	4,27E-014	0	0	0	0	0	2,09E-015	1,51E-014	8,48E-014	3,03E-013	-1,79E-012
AP	[Mole of H ⁺ eq.]	0,00702	0,00316	0,011	0,00154	0,00428	0	1,46E-005	0	0	0	0	0	7,87E-005	0,000705	0,000235	0,000797	-0,000427
EP - freshwater	[kg P eq.]	4,74E-006	1,33E-007	1,51E-005	3,3E-007	8,45E-006	0	3,31E-006	0	0	0	0	0	4,42E-009	3,18E-008	1,83E-007	2,55E-007	-9,87E-007
EP - marine	[kg N eq.]	0,00169	0,00111	0,00443	0,000544	0,00159	0	1,64E-005	0	0	0	0	0	3,76E-005	0,00035	0,000108	0,000205	-0,000151
EP - terrestrial	[Mole of N - eq.]	0,0192	0,0123	0,0477	0,00611	0,0173	0	4,39E-005	0	0	0	0	0	0,000411	0,00384	0,0012	0,00226	-1,28
POCP	[kg NMVOC eq.]	0,0055	0,00262	0,0132	0,00164	0,00375	0	1,92E-005	0	0	0	0	0	0,000108	0,000685	0,000299	0,000628	-0,000449
ADPE	[kg Sb eq.]	0,000515	1,33E-008	1,55E-007	3,36E-008	3,64E-005	0	5,67E-010	0	0	0	0	0	4,5E-010	3,24E-009	4,92E-008	7,28E-009	-2,82E-008
ADPF	[MJ]	134	6,62	12,2	16,7	20,2	0	0,183	0	0	0	0	0	0,223	1,61	0,878	1,48	-4,12
WDP	[m3]	17,7	0,00123	0,0249	0,00314	1,26	0	0,00149	0	0	0	0	0	4,21E-005	0,000303	0,00898	0,0129	-0,0183
Caption	GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.																	

RESULTS OF THE LCA - RESOURCE USE: 1 m²

RESOURCE USE																		
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	31,8	0,0472	4,18	0,122	12,6	0	0,0244	0	0	0	0	0	0,00163	0,0118	0,0937	0,258	-2,19
PERM	[MJ]	0	0	10,9	0	-10,9	0	0	0	0	0	0	0	0	0	0	0	0
PERT	[MJ]	31,8	0,0472	15	0,122	1,75	0	0,0244	0	0	0	0	0	0,00163	0,0118	0,0937	0,258	-2,19
PENRE	[MJ]	134	6,62	10,1	16,7	10,7	0	0,183	0	0	0	0	0	0,223	1,61	0,878	1,48	-4,12
PERNM	[MJ]	0	0	2,15	0	-2,15	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	134	6,62	12,2	16,7	8,56	0	0,183	0	0	0	0	0	0,223	1,61	0,878	1,48	-4,12
SM	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,2
RSF	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	[m3]	0,414	7,86E-005	0,00266	0,000133	0,0313	0	5,26E-005	0	0	0	0	0	1,78E-006	1,28E-005	0,000262	0,000392	-0,00092
Caption	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 materialRSF = Use of renewable secondary fuels; NRSF = Use of non-re																	

RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES: 1 m²

OUTPUT FLOWS AND WASTE CATEGORIES																		
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	2,35E-008	2,38E-010	4,45E-008	6,05E-010	3,87E-008	0	5,48E-011	0	0	0	0	0	8,11E-012	5,84E-011	1,27E-010	3,69E-010	-9,19E-009
NHWD	[kg]	0,277	0,000685	0,148	0,00173	1,45	0	0,00565	0	0	0	0	0	2,32E-005	0,000167	0,000241	7,51	-0,71
RWD	[kg]	0,000811	1,03E-005	0,000228	2,65E-005	0,000311	0	3,87E-006	0	0	0	0	0	3,55E-007	2,56E-006	1,1E-005	1,56E-005	-0,000193
CRU	[kg]	0	0	0	0	0,145	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0,623	0	0,258	0	0	0	0	0	0	0	0	0	17,5	0	0
MER	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	[MJ]	0	0	0	0	0,538	0	0	0	0	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	0,918	0	0	0	0	0	0	0	0	0	0	0	0
Caption	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; EEE = Exported electricity; EET = Exported thermal energy																	

RESULTS OF THE LCA - BIOGENICA CARBON CONTENT: 1 m²

BIOGENIC CARBON CONTENT OF PRODUCT AND PACKAGING																		
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Biog. C in packaging	[kg]	0	0	0,288	0	-0,288	0	0	0	0	0	0	0	0	0	0	0	0
Biog. C in product	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caption	Biog. C in packaging = Biogenic carbon content in packaging; Biog. C in product = Biogenic carbon content in product																	

RESULTS OF THE LCA - ADDITIONAL ENVIRONMENTAL IMPACT CATEGORIES: 1 m²

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS																		
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	[Disease incidences]	5,82E-007	3,95E-008	3E-007	1,73E-008	1,34E-007	0	1,49E-010	0	0	0	0	0	9,46E-010	4,67E-009	4,62E-009	1E-008	-1,34E-008
IR	[kBq U235 eq.]	0,12	0,00147	0,0325	0,00379	0,0392	0	0,000574	0	0	0	0	0	5,08E-005	0,000366	0,00176	0,0018	-0,0301
ETF-fw	[CTUe]	20,3	4,95	6,58	12,5	6,35	0	0,209	0	0	0	0	0	0,167	1,2	0,612	0,853	-1,28
HTP-c	[CTUh]	1,48E-009	9,02E-011	5,96E-010	2,27E-010	4,03E-010	0	1,71E-011	0	0	0	0	0	3,04E-012	2,2E-011	1,34E-011	2,01E-011	-5,26E-011
HTP-nc	[CTUh]	6,9E-008	2,9E-009	1,23E-008	7,32E-009	2,75E-008	0	1,58E-009	0	0	0	0	0	9,83E-011	7,07E-010	4,9E-010	7,79E-010	-1,67E-009
SQP	[Pt]	6,31	0,0463	115	0,121	24,9	0	0,0163	0	0	0	0	0	0,00163	0,0117	0,275	0,408	-7,38
Caption	PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects, SQP = Soil quality potential/ Land use related impacts																	

Disclaimer for EN 15804+A2: additional indicators

(1) Potential Human exposure efficiency relative to U235 (IRP): 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 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.

(2) The results of the environmental impact indicator: ADP, WDP, ETP-fw, HTP-c, HTP-nc, SQP shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator

5. CALCULATION RULES

REFERENCE FLOW

Name	Value	Unit
Declared unit	1	m ²
Grammage	19	kg/m ²
Conversion factor to 1 kg	0,05	-

ELECTRICITY EMISSION FACTOR

Electricity emission factor for module A3:

Plant	Quantity	Unit
Isperih_BG	0,0267	kgCO ₂ eq,/kWh

BIOGENIC CARBON

The packaging contains material of biogenic origin; the composition is shown in the table below.

Name	Value	Unit
Biogenic carbon in packaging	3,46E-01	kg C
Biogenic carbon in the product	0	kg C

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

ASSUMPTIONS

The modules from A4, A5 to C4 are scenarios based on average data included into the PCR created by the "European Ceramic Tile Manufacturers Federation" /CET PCR 2014/ and subsequently implemented in the PCRB of the IBU program operator "Ceramic tiles and panels".

CUT-OFF CRITERIA

For this assessment all relevant input and output flows have been modelled so it conforms with the requirements of EN 15804+A2. The only omitted data relates to materials that are not directly connected with tile production but with extraordinary events (emergency, masonry works etc.). These still fall in the cut-off criteria, and are listed below:

Data omitted	Notes
Tap Water (used for emergency needs)	Consumption due to extraordinary activities (such as milling cleaning)
CER 150111	Such wastes refer to construction material due to extraordinary maintenance activities
CER 170202	
CER 170411	
CER 170604	
CER 17xxxx family	Wastes from construction and demolition operations

DATA QUALITY

The period of validity of background data from Sphera database is between 2018 and 2023. Most of the information (energy and water consumption, pollutant emissions, dust and ceramic tile production) is measured or calculated directly at the company level and declared in the official company documentation.

Detailed data were obtained not only for raw material mixtures (collected with company-specific primary data) but also for dyes, frits and other raw materials used.
The overall quality of the data can be considered satisfactory.

PERIOD UNDER REVIEW

The primary data collected in the study refers to 2024.

ALLOCATION

Energy and material supplies have been allocated to the product based on the annually produced mass of ceramic tiles. No further allocations have been applied within the subsequent module.

Moreover, some ceramic wastes are internally recycled; credits from energy recovery of packaging materials from the end-of-life of the product are considered.

VARIABILITY ANALYSIS

The average EPD covers the Porcelain stoneware with a thickness of 8,5 mm produced in the plant of Isperih.

6. SCENARIOS

The following technical information about declared modules and related scenarios is based on average data, according to the "European Ceramic Tile Manufacturers Federation" and subsequently implemented in the PCR part B of the IBU program operator "Ceramic tiles and panels".

Transport (A4)

For transport distances of less than 300 km, trucks shall be assumed to make the return trip empty, whereas for distances exceeding 300 km, they will return full of other goods, so that the return trip is not included in the inventory of the system analysed.

Name	Value	Unit
Truck with domestic destination having a capacity of 27 tons (37% of tiles sold)	300	km
Truck with European destination having a capacity of 27 tons (34% of tiles sold)	1390	km
Transoceanic transport shipment (29% of tiles sold)	6520	km

Installation into the building (A5)

Three options are defined for the installation phase, in which different materials can be used.

- Option 1: adhesives, mortar and water;
- Option 2: mortar and polysulphide dispersion adhesives;
- Option 3: cement adhesives (different quantities for different tile sizes).

These considerations are based on average data provided by different ceramic tile manufacturers in Europe. In this EPD it is assumed that tiles are installed with cementitious adhesive (Option 3).

Option 3 (large format tiles)	Value	Unit
Cementitious adhesives	6	kg

For the treatment of packaging waste, an average European scenario is used, taken from "Eurostat, 2019"; thus end-of-life consists of recycling, energy recovery and landfill for plastic and paper, and reuse, energy recovery and landfill for wood.

The loss of ceramic material considered is 6.5%.

Use (B1)

Ceramic tiles are robust and have a hard, abrasion-resistant surface. There are no impacts on the environment during the use stage.

Maintenance (B2)

Only stage B2, the maintenance phase, is considered in terms of impact generation. Throughout its lifetime, the ceramic cladding product must be cleaned regularly, to a greater or lesser extent, depending on the type of building (residential, commercial, etc.) in which it is installed. If the surface is dirty or greasy, cleaning agents such as detergents or bleach can be added. In this way, the consumption of water and disinfectant chemicals has been taken into account.

Name	Value	Unit
Water consumption	0.1	l
Detergent	0.2	ml
Maintenance cycle	52	Number/LS

Repair, replacement and refurbishment (B3, B4, B5)

In general, the service life of ceramic tiles is the same as the building lifetime. Repair, replacement and refurbishment is not required for ceramic tiles.

Operational energy and water use (B6, B7)

These modules are not relevant for ceramic tiles.

End of life (C1-C4)

C1: This module considers the demolition phase considering an excavator (100kW) with a consumption of diesel of $1.72E-5$ per kg of product and all the emissions connected with the fuel burning process.

C2: The ceramic tile demolition waste is transported from the building site to a container or treatment plant by truck and an average distance of 20 km is considered. The return trip shall be included in the system. It can be considered an average distance of 30 km from the container or treatment plant to final destination.

C3-C4: the table below show the end-of-life stage.

Name	Value	Unit
Recycling percentage (C3)	70	%
Landfill percentage (C4)	30	%

Benefits and loads beyond the product system boundary (D)

Module D includes credits from materials recycling of products and packaging, energy credits from thermal recovery of the packaging.

7. REFERENCES

EN 15804+A2	EN 15804:2012+A2:2019: Sustainability of construction works -Environmental ProductDeclarations - Core rules for the product category of construction products
EN ISO 14025	EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmentaldeclarations - Principles and procedures
EN ISO 14040	EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles andframework
EN ISO 14044	EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements andguidelines
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BNB 2011	BBSR table "useful lives of components for Life Cycle Analysis by BNB ", Federal Institute for Building, Urban Affairs and Spatial Development, Division II Sustainable Building; available online at http://www.nachhaltigesbauen.de/baustoffundgebaeuedaten/useful-lives-of-bauteilen.html ; stand 12/2015
US GBC	US Green Building Council, Leed v3, 2009, Whole building life cycle assessment. LEED BD&C v4 (LEED Building Design & Construction).
PD CEN/TR 15941:2010	Sustainability of construction works – Environmental Product Declarations – Methodology for selection and use of generic data
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IBU PCR Part B	Part B: Requirements on the EPD for Ceramic tiles and panel 11/07/2023. www.ibu-epd.com