

ENVIRONMENTAL PRODUCT DECLARATION



In accordance with ISO14025 and EN15804 for
Ceramic Wall Tiles

from

Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.

Programme :	The International EPD® System	EPD Turkey, fully aligned regional programme
Programme Operator :	EPD Turkey www.epdturkey.org	EPD International AB www.environdec.com
EPD Registration Number:	S-P-00873	
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Geographical Scope:	Global	

 **Kale**



The LCA for this EPD is conducted according to the guidelines of ISO 14040/44 and the requirements given in the Product Category Rules (PCR) document for Construction Products and CPC 54 Construction Services (Version 2.2, 2017 05 30) and SUB-PCR-D bricks, blocks, tiles, flagstone of clay and siliceous earths (construction product) with reference to EN 15804 and the general program guidelines by The International EPD System in accordance with ISO 14025 standards.

The inventory for the LCA study is based on the 2016 production figures for ceramic wall tiles manufactured by Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş. in their Çan production plant located in Çanakkale, Turkey.

The LCA was modelled with SimaPro 8.4 LCA software using the impact factors and the Ecoinvent database (V3.2) for secondary data and Turkish Life Cycle Inventory Database (TLCID) developed by Turkish Centre for Sustainable Production Research and Design (SÜRATAM) for local data.

EPD Programme	The International EPD® System www.environdec.com
EPD Programme Operator	EPD Turkey, Istanbul - Turkey www.epdturkey.org
EPD Owner	Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş. www.kale.com.tr
Declared Unit	1 m ² average ceramic wall tiles
EPD Based on Product Category Rules (PCR)	The CEN standard EN 15804 serves as the core PCR The International EPD® System's PCR 2012:01 Construction products and Construction services, Version 2.2, 2017-05-30 SUB-PCR-D bricks, blocks, tiles, flagstone of clay and siliceous earths
PCR Review Conducted by	The Technical Committee on the International EPD ® System. Chair Massimo Marino. Contact via www.environdec.com info@environdec.com
Independent Verification and data, according to ISO 14025:2006	<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External <input type="checkbox"/> EPD® Process Certification
System Boundaries	<input type="checkbox"/> Cradle to Gate <input type="checkbox"/> Cradle to Gate with Option <input checked="" type="checkbox"/> Cradle to Grave
Approved and Verified by	Vladimír Kočí, PhD

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 Norm.

The EPD certificate, its background data and the results will be used for business-to-business communications and is expected to be a reliable document for green building designers, architectures, manufacturers of construction products and the other stakeholders in the construction sector to understand the potential environmental impacts caused by steel profiles and accessories.

For more information about this Environmental Product Declaration or its contents, please contact kaleseramik@kale.com.tr

Laying its foundation with Çanakkale Ceramic Factories Corporation in 1957, Kale Group pioneered the formation of the ceramics industry in Turkey, and has become an industry giant with its investments. It has grown over the course of time with investments in construction products, machinery and equipment manufacturing, defence, chemistry, electrical appliances, energy, IT, transportation, tourism and food industries. Kale Group is currently comprised of 17 companies, and is regarded as one of the most important industrial enterprises of Turkey with over 5000 employees, spanning over a geography across Çanakkale to several locations in Turkey to Italy and Russia. Today, Kale Group is Europe's 3rd and the world's 12th largest ceramics manufacturer. Kale Group provides its products to consumers in over 100 countries via more than 400 sales points.

Kaleseramik, a company of Kale Group, manufactures ceramic tiles with a production capacity of 66 million m² ceramic tile/year. Kaleseramik's tile products take place in market under Çanakkale Seramik, Kalebodur and Kale brand names.

Kaleseramik that aims for continuous development has received the following certifications within the scope of the system standards; TS EN ISO 9001:2015, ISO 10002:2006, TS EN ISO 14001:2015, ISO 50001:2011, ISO 27001 and OHSAS 18001:2014.



PRODUCT INFORMATION

Kaleseramik produces 2,200 varieties of wall tiles in 60 different dimensions. Kaleseramik Wall tiles are primarily made of kaolin and clay, but they also include other raw materials such as marble, frit, dolomite, bentonite and quartz. The production technology of tiles is dry pressing. The required composition is blended with water to form uniform slurry. This slurry then fed into spray driers to form uniform granules ready for compaction. These granules are then shaped to form the bisque or green body. This can be glazed or left unglazed depending on its intended use. The green ceramic body is fired at high

Technical Specification		Kaleseramik Wall Tiles	Related Standards
Water Absorption (%)		ave. 16%	ISO 10545-3
Breaking Strength(N)	Thickness ≥ 7.5 mm	1100 N	ISO 10545-4
	Thickness < 7.5 mm	850 N	
Modules of Rupture (N/mm ²)	Thickness ≥ 7.5 mm	Ave. 23 N/mm ²	ISO 10545-4
	Thickness < 7.5 mm		
Linear Thermal Expansion Coefficient (100°C)		6x10-6 /°C	ISO 10545-8
Resistance to Thermal Shock		Affirmative	ISO 10545-9
Moisture expansion (mm/m)		Affirmative	ISO 10545-10
Crazing Resistance for Glazed Tiles		Affirmative	ISO 10545-11
Resistance to Low Concentrations of Acids and Alkalis		Affirmative	ISO 10545-13
Resistance to High Concentrations of Acids and Alkalis		Affirmative	ISO 10545-13
Resistance to Household Chemicals and Swimming Pool Salts (glazed&unglazed)		Affirmative	ISO 10545-13
Resistance to Stain		min Class-3	ISO 10545-14

Areas of Use

Kaleseramik Wall Tiles are largely used as interior and exterior wall coverings. Interior applications are mainly in bathrooms and kitchens in residential applications while the exterior applications can include swimming pools, façades, commercial and industrial applications etc. For interior applications, ceramic wall tiles should be selected regarding the technical specifications such as PEI value, hardness, stain resistance, chemical resistance and easy cleaning, if they are to be used in the interiors of a residence. The tiles selected for exteriors should be frost resistant and have low water absorbency. For outdoor uses they normally have less than 3% water absorption but for internal applications this might rise to 16%. Depending on the use, ceramic tiles might be glazed to control abrasion and slip resistance.

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 Kaleseramik, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

SYSTEM BOUNDARY

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.

CONSTRUCTION PROCESS STAGE

A4. Transport includes transportation of ceramic tiles to the construction site. Kaleseramik transport tiles by road haulage (89%), railway (8%) and seaway (3%) to the distribution centres. From there, local road transport of 50 km with Euro 5 class truck with capacity of 27 tones is assumed.

A5. Installation of the Product stage includes the adhesive mortar usage in the construction site in addition packaging waste transportation and disposal processing. For 1 m² ceramic tile installation; 3.3 kg mortar and 0.8 L water usage assumed. It has been considered a 3% (in mass) loss of the product during the installation.

Packaging waste scenario is created separately depending on the geographic location of the installation process. Packaging waste is assumed to end up at packaging recycling streams due to the relevant national law in Turkey, which requires at least 54% of the packaging waste to be recovered in 2016. For Europe case; according to the Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, 60% of the packaging waste is assumed to go to reuse, recovery, and recycling. Average distance from waste container to destination is assumed as 30 km.

USE STAGE

B1. Use stage concerns emissions into environment. Use phase is not relevant for this product.

B2. Maintenance includes cleaning facilities with

water and detergent. Kaleseramik advices to use detergent containing stain remover or neutral low-sulphate and rinse with tap water after cleaning. 0.2 mL detergent and 0.1 L water use is assumed to wash 1 m² ceramic tiles. Maintenance cycle of wall tiles is 4 times a year.

B3. Repair: Kaleseramik ceramic tiles require no repairing during the use phase and therefore no impacts should be declared in module B3.

B4. Replacement: Kaleseramik ceramic tiles require no replacement during the use phase and therefore no impacts should be declared in module B4.

B5. Refurbishment: Kaleseramik ceramic tiles require no refurbishment during the use phase and therefore no impacts should be declared in module B5.

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 the C1 phase are very low and therefore can be neglected.

C2. Transport (Waste) includes the transportation of the discarded tiles and adhesive mortar to final disposal. Average distance from waste container to final destination is assumed as 50 km.

C3. Waste Processing concerns crushing of discarded ceramic tiles before recycle or reuse. The environmental impacts generated during the C3 phase are very low and therefore can be neglected.

C4. Disposal construction and demolition waste scenario is created separately depending on the geographic location of the use phase. After domestic usage, ceramic tile products end up at construction and demolition waste landfills as their final fate and modelled as such in the LCA. For Europe's construction and demolition waste scenario, 50% of the waste is assumed to go to recycling according to EU Construction and Demolition Waste Protocol published on 09/11/2016.

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

PRODUCT STAGE

- A1. Raw Material Supply
- A2. Raw Material Transport
- A3. Manufacturing
 - Greenbody Preparation
 - Forming
 - Drying
 - Glaze&Paste Preparation
 - Glazing
 - Firing
- Packaging & Storage

CONSTRUCTION PROCESS STAGE

- A4. Transport to construction site
- A5. Installation of the Product

USE STAGE

- B1. Use
- B2. Maintenance
- B3. Repair
- B4. Replacement
- B5. Refurbishment
- B6. Operational Energy Use
- B7. Operational Water Use

END OF LIFE STAGE

- C1. Deconstruction and Demolition
- C2. Transport
- C3. Reuse, Recovery and Recycling
- C4. Disposal

Functional Unit/ Declared Unit

The declared unit is the production of 1 m² average ceramic wall tiles (14.0 kg)

Goal and Scope

Evaluation of environmental impacts for 1 m² average ceramic wall tiles 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, no cut-off criteria was applied.

Background Data

For local data specific for Turkey, TLCID (V1.01) developed by SÜRATAM was used. For any other background data the Ecoinvent database (V3.2) was used.

Data Quality

Raw materials, energy and water consumption, waste and material and product transport data is collected from Kaleseramik.

Period Under Review

All primary data collected from Kaleseramik is for the period year of 2016.

Allocations

There are no co-products in the production of ceramic tile manufactured by Kaleseramik. Hence, there was no need for co-product allocation. Kaleseramik sources raw materials from different locations across Turkey and other parts of the world and by different means of transport (truck and ship). For this reason, transport was allocated according to tonnages for almost all raw materials bought by Kaleseramik. Kaleseramik manufactures various ceramic tiles in the Company's Çanakkale plant in Turkey. Electricity and combined heat power (CHP) powered by natural gas are used. Raw materials, transport, packaging, waste, and energy consumption data were allocated for each product using related production tonnages from Kaleseramik's Çanakkale plant for the average product.

PRODUCT STAGE		CONSTRUCTION PROCESS STAGE					USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	MND	
X	X	X	X	X	NR	X	X	X	X	NR	NR	X	X	X	X			
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		

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

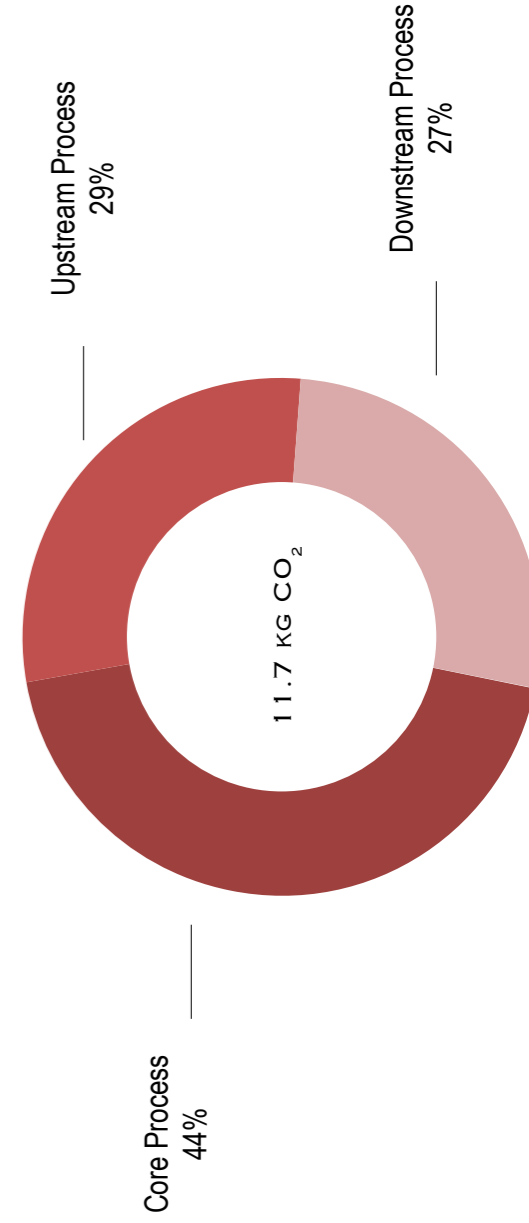
The results of the LCA with the indicators as per EPD requirement are given in the following tables for product product stage (A1 - A3), construction process (A4, A5), use stage (B1 - B7), and end of life (C1 - C4). The system boundaries in tabular form for all modules are shown in the table above.

All energy calculations were obtained using Cumulative Energy Demand V1.09 methodology, while environmental impacts are calculated with the CML-IA baseline V4.2 within SimaPro LCA Software. The net fresh water use reflect the water consumption during manufacturing processes.

LCA RESULTS

ENVIRONMENTAL IMPACTS FOR 1 m² WALL TILES

	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	TOTAL
Fossil	[kg CO ₂ eq.]	8.33	1.07	0.968	NR	0.028	0.00	0.000	0.000	0.000	NR	0.00	0.862	0.000	0.054	11.3
Biogenic	[kg CO ₂ eq.]	7.70x10 ⁻³	364x10 ⁻⁶	218x10 ⁻³	NR	491x10 ⁻⁶	0.000	0.000	0.000	NR	NR	0.000	52.8x10 ⁻⁶	0.000	8.65x10 ⁻⁶	0.226
Land Use & Transformation	[kg CO ₂ eq.]	6.90x10 ⁻³	379x10 ⁻⁶	553x10 ⁻⁶	NR	125E-3	0.000	0.000	0.000	NR	NR	0.000	38.5x10 ⁻⁶	0.000	10.5x10 ⁻⁶	0.133
Total	[kg CO ₂ eq.]	8.34	1.07	1.19	NR	0.153	0.00	0.000	0.000	NR	NR	0.000	0.862	0.000	0.054	11.7
ODP	[kg CFC11 eq.]	0.830x10 ⁻⁶	184x10 ⁻⁹	39.2x10 ⁻⁹	NR	5.85x10 ⁻⁹	0.000	0.000	0.000	NR	NR	0.000	161x10 ⁻⁹	0.000	11.8x10 ⁻⁹	1.23x10 ⁻⁶
POCP	[kg C ₂ H ₄ eq.]	0.002	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.002
AP	[kg SO ₂ eq.]	0.027	0.007	0.003	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.004	0.000	0.000	0.042
EP	[kg PO ₄ ³⁻ eq.]	0.045	0.003	0.002	NR	0.001	0.000	0.000	0.000	NR	NR	0.000	0.001	0.000	0.000	0.052
ADPE	[kg Sb eq.]	7.56x10 ⁻⁶	18.8x10 ⁻⁹	59.9x10 ⁻⁹	NR	51.0x10 ⁻⁹	0.000	0.000	0.000	NR	NR	0.000	2.51x10 ⁻⁹	0.000	16.3x10 ⁻⁹	7.71x10 ⁻⁶
ADPF	[MJ]	137	15.8	5.45	NR	0.489	0.000	0.000	0.000	NR	NR	0.000	13.2	0.000	1.03	174








OUTPUT FLOWS AND WASTE CATEGORIES FOR 1 m ² CERAMIC WALL TILES																
Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	TOTAL
HWD	[kg]	0.307	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	-	0.307
NHWD	[kg]	0.592	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	20.3	20.9
RWD	[kg]	-	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	-	-	0.000
Legend: HWD: Hazardous Waste Disposed, NHWD: Non-Hazardous Waste Disposed, RWD: Radioactive Waste Disposed, NR: Not Relevant																
RESOURCE USE FOR 1 m ² CERAMIC WALL TILES																
PERE	[MJ]	61.8	0.606	0.771	NR	1.01	0.000	0.000	0.000	NR	NR	0.000	0.023	0.000	0.013	64.2
PERM	[MJ]	0.000	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.000
PERT	[MJ]	61.8	0.606	0.771	NR	1.01	0.000	0.000	0.000	NR	NR	0.000	0.023	0.000	0.013	64.2
PENRE	[MJ]	138	15.82	5.46	NR	0.489	0.000	0.000	0.000	NR	NR	0.000	13.2	0.000	15.8	188
PENRM	[MJ]	0.000	0.000	0.000	NR	0.00	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.000
PENRT	[MJ]	138	15.8	5.46	NR	0.489	0.000	0.000	0.000	NR	NR	0.000	13.2	0.000	15.8	188
SM	[kg]	0.000	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.000
RSF	[MJ]	0.000	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.000
NRSF	[MJ]	0.000	0.000	0.000	NR	0.000	0.000	0.000	0.000	NR	NR	0.000	0.000	0.000	0.000	0.000
FW	[m ³]	0.031	-	8.00x10 ⁻³	NR	270x10 ⁻³	0.000	0.000	0.000	NR	NR	0.000	-	-	-	0.309
WSI	[m ³]	12.9	0.126	0.293	0.000	0.17	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.000	0.022	13.5
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 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, WSI: Water Scarcity Index, NR: Not Relevant																

REFERENCES





- /ISO 9001:2015/ Quality Management System
- /ISO 10002:2006/ Customer Satisfaction Management System
- /ISO 14001:2015/ Environmental Management System
- /ISO 50001/ Energy Management System
- /ISO 27001/ Information Security Management System
- /OHSAS 18001:2014/ Occupational Health and Safety Management System
- /ISO 14020:2000/ Environmental labels and declarations - General principles
- /EN 14411/ Ceramic tiles. Definitions, classification, characteristics, evaluation of conformity and marking
- /ISO 10545-2/ Ceramic tiles - Part 3: Determination of dimensions and surface quality
- /ISO 10545-3/ Ceramic tiles - Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density
- /ISO 10545-4/ Ceramic tiles - Part 4: Determination of modulus of rupture and breaking strength
- /ISO 10545-5/ Ceramic tiles - Part 5: Determination of impact resistance by measurement of coefficient of restitution
- /ISO 10545-6/ Ceramic tiles -- Part 6: Determination of resistance to deep abrasion for unglazed tiles
- /ISO 10545-7/ Ceramic tiles - Part 7: Determination of resistance to surface abrasion for glazed tiles
- /ISO 10545-8/ Ceramic tiles - Part 8: Determination of linear thermal expansion
- /ISO 10545-9/ Ceramic tiles - Part 9: Determination of resistance to thermal shock
- /ISO 10545-10/ Ceramic tiles - Part 10: Determination of moisture expansion
- /ISO 10545-11/ Ceramic tiles - Part 11: Determination of crazing resistance for glazed tiles
- /ISO 10545-12/ Ceramic tiles - Part 12: Determination of frost resistance
- /ISO 10545-13/ Ceramic tiles - Part 13: Determination of chemical resistance
- /ISO 10545-14/ Ceramic tiles - Part 14: Determination of resistance to stains
- /DIN 51130/ Testing of floor coverings; determination of slip resistance; work rooms and work areas subject to pronounced risk of slipping
- /EN 15804/ EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products
- /ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures
- /ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)
- /PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trå, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 2.2, Date 2017-05-30.
- /SUB-PCR Bricks, blocks, tiles, flagstone of clay and siliceous earths/ (construction product) (v2.2.) The International EPD® System, 2012:01 Version 2.2, Date 2018-03-09.
- /The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD@s as well as keeping a library of EPD@s and PCRs in accordance with ISO 14025. www.environdec.com
- /Ecoinvent / Ecoinvent Centre, www.Eco-invent.org
- /TLCID/ Turkish Life Cycle Inventory Database, Turkish Centre for Sustainable Production Research and Design - SÜRATAM , www.suratam.org
- /SimaPro/ SimaPro LCA Package, Pré Consultants, the Netherlands, www.pre-sustainability.com
- /Kaleseramik/ User's Guide for Ceramic Tiles

VERIFICATION & REGISTRATION

Programme	The International EPD System www.environdec.com EPD registered through the fully aligned regional programme: EPD Turkey www.epdturkey.org	
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