



ENVIRONMENTAL PRODUCT DECLARATION

Product name:
Porcelain stoneware
ceramic tiles and slabs

Plant location:
Via dell'Industria 1,
42013, Casalgrande (RE), Italy

in compliance with ISO 14025 and EN 15804

Program Operator	EPDIItaly
Publisher	EPDIItaly
Declaration Number	EPD-04-KEO
EPDIItaly Registration Number	EPDITALY0035
ECO EPD Registration Number	00000760
Issue Date	01/09/2018
Valid to	01/09/2023



SECTION 1

Programme owner

EPDIItaly



Owner of the declaration

Ceramiche Atlas Concorde SpA, Keope division

via dell'Industria 1 – Villaggio La Macina - 42013 Casalgrande (RE), Italy.



Declaration number

EPD-04-KEO

Date of issue 01.09.2018

Valid until 01.09.2023

Verification

Independent verification of the EPD and the data contained therein run in compliance with ISO 14025

internal external

Run by ICMQ S.p.A. – Via de Castillia 10 – 20124 Milan (www.icmq.it)

Scope

This document refers to a typical 'ceramic tile and slab' product manufactured by Ceramiche Keope – via dell'Industria 1 – Villaggio La Macina - 42013 Casalgrande (RE), Italy.

Comparability

Environmental declarations published for the same category of products, but resulting from different programmes, may not be comparable. In particular, EPDs (Environmental Product Declarations) for construction products may not be comparable if non-compliant with EN 15804.

Responsibilities

Ceramiche Keope relieves EPDIItaly of all liability resulting from non-observance of the environmental legislation declared by the manufacturer himself.

The owner of the declaration is responsible for the justificatory information and test elements; EPDIItaly declines all liability for the manufacturer's information, data and results of the life cycle assessment.

SECTION 2 - GENERAL INFORMATION

THE COMPANY

Ceramiche Keope is a leading manufacturer of porcelain stoneware floor and wall tiles. Its story began in 1995 in Casalgrande (Reggio Emilia) and it has led the brand to be currently present with its products in more than 80 countries worldwide, with an annual production of over 5 million square metres.

Ceramiche Keope offers solutions with a sophisticated design and superior technical performance levels for both indoor and outdoor settings, retail, public and residential locations.



The company is a member of the Concorde Group, the leading European ceramic group, and shares the latter's values of professionalism, honesty, attention to persons and protection of the environment.

The key factors in Ceramiche Keope's success during all these years are its constant dedication to improvement of its production processes, research which reflects the changing needs of the market, the engagement of all its staff and the desire to offer solutions for the most demanding design requirements.

CERAMIC TILES

Ceramic tiles are formed by dry pressing natural raw materials such as clay, feldspar, sand and kaolin. The company manufactures porcelain stoneware tiles with a very dense structure and high performance. The present analysis considers a typical product taken to be representative of the entire production of Ceramiche Keope.



APPLICATIONS

The ceramic tiles considered in this analysis are designed for use on walls and floors, both indoors and outdoors, for residential, non-residential and commercial applications.

SCOPE AND TYPE OF EPD

In conformity with the reference PCRs (Product Category Rules), the LCA (Life Cycle Analysis) is of the **cradle-to-grave** type. The analysed system accounts for all phases of production from raw materials to finished and packaged end product (A1-A3), distribution to the end customer (A4), to the end of the product's service life including transport (C2), energy recovery (C3) and scrapping (C4), with the addition of any applicable energy credits (D).

The LCA was run with "EPD Tool Creator for Ceramic Tile – V5 (13-07-18) - DB version 2018 SP36" developed by Thinkstep AG, Leinfelden-Echterdingen, 2016 and validated by ICMQ and IBU Institut Bauen und Umwelt.

The declaration is classified as:

- 1 a: The manufacturer's EPD for a specific product by a specific manufacturer

Furthermore, this declaration was drawn up in conformity with the EPDIItaly programme and is based on the following PCRs:

- IBU PCR Part B:30-11-17 V1.6
- EPDIItaly - PCR ICMQ-001/15 rev. 2 21/04/2017

EN 15804 is the framework standard for the PCRs.

Declared product / Declared unit of measurement:

1 m² of ceramic tile.

The LCA data refer to the entire production for the year 2016.

SECTION 3 – DESCRIPTION OF THE PRODUCT AND THE PRODUCTION PROCESS

BASIC MATERIALS / AUXILIARY MATERIALS

Main raw materials for ceramic tiles:

- Clay 39%
- Sand 24%
- Feldspar 26%

Main components of the glaze:

- Clay powder
- Alumina
- Natural pigments
- Frits

Main auxiliary additives:

- Dispersing agents
- Binders
- Fluidisers
- Levelling agents
- De-aerating agents

PRODUCTION PROCESS

We now describe the production process of the ceramic tiles considered in this EPD.

The mixture of raw materials, including recycled materials, is mixed and ground in a wet milling system: the resulting slip (a suspension with 25-30% water content) is dried in a spray dryer using thermal energy generated with natural gas at high atmospheric pressure to yield a dry powder with spherical grains of the right particle size distribution, which is now ready for pressing.

Energy is produced during the drying process using co-generation.

The ceramic tiles are formed by means of dry pressing using special moulds (isostatic pressing).

The pressed and dried tiles are then glazed and decorated.

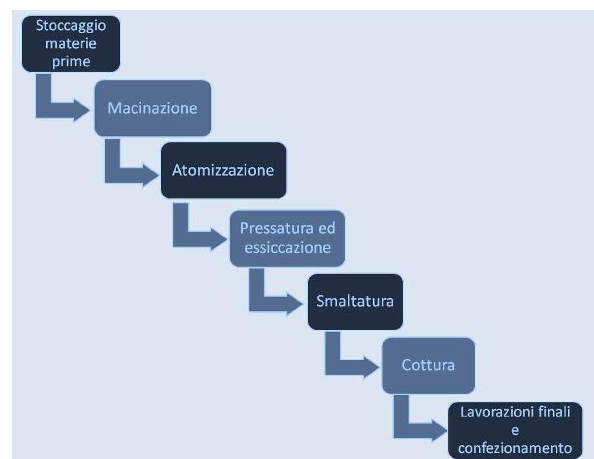
Both dry and wet application processes are employed.

The tiles are fired at different temperatures (from 1000°C to 1300°C, depending on the type of tile) to obtain the characteristics of resistance to abrasion, water and chemicals and durability typical of ceramic tiles.

Upline of the selection and packaging lines, the ground product is cut and squared off to the desired sizes.

The end product is then packaged in carton boxes, stacked on wooden pallets and wrapped in PET film. The tiles are stored in the warehouse until orders are filled for shipping to the customer.

Production performance is primarily monitored by the quality management system and process certification compliant with international standards ISO 9001 and OHSAS 18001.



TECHNICAL DATA

The ceramic tiles in question are compliant with the following standards and specifications:

Pursuant to EN 14411 in Europe and ISO 13006 internationally, the ceramic tiles are classified BIa in the annex with water absorption $E \leq 0.5\%$.

The requisites listed in annexes A to L of ISO 13006 and EN 14411 are:

length and width (ISO 10545-2 section 2), thickness (ISO 10545-2 section 3), straightness of edges (ISO 10545-2 section 4), squareness (ISO 10545-2 section 5), centre bending (ISO 10545-2 section 6), edge bending (ISO 10545-2 section 6) and warpage (ISO 10545-2 section 6).

Surface quality (ISO 10545-2 section 7), 95% min. of tiles must be free from visible defects affecting the main area of the tile.

STANDARD	Value	Unit of measurement
Dimensional characteristics and surface quality, ISO 10545-2		Compliant
Water absorption, ISO 10545-3		Compliant
Breaking load, ISO 10545-4	8 – 35 (min)	N/mm ²
Bending resistance, ISO 10545-4	200 -1300 (min)	N/mm ²
Resistance to surface wear – Glazed tiles, ISO 10545-7	0 - 5	Abrasion class
Linear thermal expansion coefficient, ISO 10545-8	9 E10-6 (max)	1/K
Resistance to thermal shock, ISO 10545-9		Resistant
Resistance to cracking, ISO 10545-11		Resistant
Frost resistance, ISO 10545-12		Resistant
Slip resistance (class A, B or C), /CEN/TS 16165/		Resistant
Cohesion/adhesion resistance, EN 12004		Resistant
Impact resistance, ISO 10545-5		Resistant
Resistance to fire without test (CWT)		A1-A1FL
Resistance to chemicals, ISO 10545-13		A-C
Resistance to household chemicals and swimming pool additives, ISO 10545-13		B (min)
Resistance to low and high concentrations of acids and alkalis, ISO 10545-13		Resistant
Resistance to stains, ISO 10545-14		Resistant
Lead and cadmium given off - Glazed tiles, ISO 10545-15		When requested
Moisture expansion, ISO 10545-10		Resistant
Resistance to deep abrasion (unglazed tiles), ISO 10545-6	<175	mm ³

APPLICABLE STANDARDS

To be sold in the UE/EFTA market, with the exception of Switzerland, Regulation EU no. 305/2011 must be applied.

Products must have a Declaration of Performance pursuant to EN 14411 "Ceramic tiles - Definition, classification, characteristics, assessment and verification of constancy of performance and EC marking".

STATE OF DELIVERY

The dimensions of the product may vary in relation to the various sizes; the thickness may vary from 6 mm to 20 mm.

ENVIRONMENT AND HEALTH – MANUFACTURE

Workers are informed about the physical and chemical risks associated to their work and place of work. They are trained and equipped with personal protective equipment.

Ceramiche Keope is also certified BS OHSAS 18001.

Water / ground

The production process does not contaminate the water or ground: all waste water is recycled or treated internally for internal or external re-use.

Air

Natural gas is used solely to generate energy. Combustion emissions are monitored and kept below rigorous limits. Environmental protection measures have been adopted.

The company also uses electrical energy it produces itself by means of co-generation.

MANUFACTURING/INSTALLING THE PRODUCT

The tiles are secured to the wall and floor using materials in different quantities, including dispersion adhesives, cementitious adhesives and mortar, sealants and liquid membranes. No emissions are generated during installation and the installation of ceramic tiles incurs no health or environmental risks.

It follows that 60 years may be an alternative service life for ceramic tiles, according to the US GBC.

The provided results consider the use of ceramic tiles for 1 year, so that if we multiply the B2 values by 50 or 60, we obtain the B2 values for 50 or 60 years respectively.

No standard service life is given pursuant to ISO 15686.

PACKAGING

The tiles are packed in carton boxes, wrapped in polyethylene film and plastic straps, and stacked on wooden pallets. The amount of packaging material will vary in relation to the size of the tiles.

The end of life of the packaging includes (according to Eurostat 2013):

- Paper: recycling, energy recovery, scrapping;
- Plastic: recycling, energy recovery, scrapping;
- Wood: reuse, energy recovery, dumping.

EXTRAORDINARY CONDITIONS

Fire: According to EN 13501-1:2007+A1:2009, ceramic tiles may be classified as belonging to fire resistance class A1 since they do not contribute to the propagation of fire.

Water: Ceramic tiles cannot react with water, since they are insoluble.

Mechanical destruction: Ceramic tiles can be crushed mechanically but no attendant environmental hazard is known.

CONDITIONS OF USE

Ceramic tiles are robust and inert since they are fired at high temperature. The environmental impacts generated during phase B1 are very low and can be considered negligible.

REUSE

Following demolition and deconstruction, ceramic tiles can be crushed and used in a vast range of different applications, for instance as aggregate for concrete or road building.

ENVIRONMENT AND HEALTH – USE

Ceramic is intrinsically inert and chemically stable and hence, in use, does not emit pollutants or substances which pose an environmental or health hazard, such as: COV and Radon.

SCRAPPING

Pursuant to the European Waste Catalogue (EWC), ceramic tiles fall under Group 17 “Construction and demolition wastes”, tiles and ceramics (code: 17 01 03).

SERVICE LIFE

The service life of ceramic tiles is generally longer than 50 years (BNB 2011). Furthermore, according to the US Green Building Council, the service life of ceramic tiles may be as long as that of the building itself.

FURTHER INFORMATION

Further information is available at:

www.keope.com

<http://www.confindustriaceramica.it/site/en/home.html> <https://www.ceramica.info/en/>

SECTION 4 - LCA (LIFE CYCLE ANALYSIS): RESULTS

The following tables give the results of the LCA (Life Cycle Analysis). Basic information about all declared modules is given in the preceding section.

DESCRIPTION OF SYSTEM LIMITS

PRODUCTION PHASE			INSTALLATION PHASE		USE PHASE							END OF LIFE PHASE				BENEFITS EXCLUDED BY THE SYSTEM LIMITS
Supply of raw materials	Transport	Manufacture	Transport from gate to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Use of operating energy	Use of operating water	Deconstruction and demolition	Transport	Waste treatment	Scraping	Potential for reuse-recovery-recycling
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

(X = INCLUDED IN THE LCA; MND = MODULE NOT DECLARED)

RESULTS OF THE LCA

ENVIRONMENTAL IMPACT: 1 m² OF AVERAGE CERAMIC TILE (24.3 kg/m²)

Parameter	GWP	ODP	AP	EP	POCP	ADPE	ADPF	
Unit of measurement	[kg CO ₂ -eq.]	[kg CFC11-eq.]	[kg SO ₂ -eq.]	[kg (PO ₄) ₃ -eq.]	[kg ethylene-eq.]	[kg Sb-eq.]	[MJ]	
PHASE OF LIFE CYCLE	A1-3	1.20E+01	2.86E-11	2.18E-02	3.27E-03	1.93E-03	9.45E-05	1.99E+02
	A4	6.47E-01	2.36E-14	5.34E-03	5.94E-04	2.74E-04	4.71E-08	8.57E+00
	A5	2.69E+00	4.48E-12	3.75E-03	7.93E-04	3.15E-04	1.02E-05	2.08E+01
	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B2	4.04E-02	7.63E-12	5.85E-05	4.47E-05	6.56E-06	1.33E-08	3.46E-01
	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C2	5.25E-02	1.85E-15	2.30E-04	5.84E-05	-9.05E-05	5.57E-09	9.23E-01
	C3	5.08E-02	2.29E-14	3.63E-04	8.73E-05	3.96E-05	6.71E-08	9.88E-01
	C4	1.37E-01	3.11E-14	8.12E-04	1.12E-04	6.31E-05	5.27E-08	1.77E+00
D	-2.48E-01	-7.87E-13	-6.18E-04	-1.01E-04	-6.41E-05	-1.01E-07	-4.32E+00	

Key	GWP = global warming potential ODP = ozone depletion potential (stratospheric) AP = acidification potential (soil and water) EP = eutrophication potential	POCP = Photochemical ozone creation potential ADPE = abiotic depletion potential - elements ADPF = abiotic depletion potential - fossil fuels

RESULTS OF THE LCA

USE OF RESOURCES: 1 m² OF AVERAGE CERAMIC TILE (24.3 kg/m²)

Parameter	PERE	PERM	PERT	PENRE	PENRM	PENRT	SM	RSF	NRSF	FW	
Unit of measurement	[MJ]	[MJ]	[MJ]	[MJ]	[MJ]	[MJ]	[kg]	[MJ]	[MJ]	[m ³]	
PHASE OF LIFE CYCLE	A1-3	18.4	8.56	27	201	1.24	203	1.22	0	0	0.0367
	A4	3.50E-01	0.00E+00	3.50E-01	8.61E+00	0.00E+00	8.61E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-04
	A5	1.42E+01	-9.12E+00	6.16E+00	2.29E+01	-1.32E+00	2.18E+01	7.94E-02	0.00E+00	0.00E+00	6.41E-03
	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B2	1.87E-02	0.00E+00	1.87E-02	3.67E-01	0.00E+00	3.67E-01	0.00E+00	0.00E+00	0.00E+00	2.84E-04
	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C2	5.11E-02	0.00E+00	5.11E-02	9.26E-01	0.00E+00	9.26E-01	0.00E+00	0.00E+00	0.00E+00	9.41E-05
	C3	6.90E-02	0.00E+00	6.90E-02	1.03E+00	0.00E+00	1.03E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04
	C4	2.28E-01	0.00E+00	2.28E-01	1.84E+00	0.00E+00	1.84E+00	0.00E+00	0.00E+00	0.00E+00	3.52E-04
D	-1.86E+00	0.00E+00	-1.86E+00	-5.09E+00	0.00E+00	-5.09E+00	1.84E+01	0.00E+00	0.00E+00	-1.27E-03	

Key	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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

**RESULTS OF THE LCA – OUTPUT FLOWS AND CATEGORIES OF WASTE MATERIALS:
1 m² OF AVERAGE CERAMIC TILE (24.3 kg/m²)**

Parameter	HWD	NHWD	RWD	CRU	MFR	MER	EEE	EET	
Unit of measurement	[kg]	[kg]	[kg]	[kg]	[kg]	[kg]	[MJ]	[MJ]	
PHASE OF LIFE CYCLE	A1-3	2.36E-06	6.95E-01	1.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	A4	3.48E-07	5.42E-04	1.62E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	A5	2.87E-07	1.82E+00	3.79E-04	1.97E-01	1.49E-01	0.00E+00	6.66E-01	9.81E-01
	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B2	2.54E-03	5.72E-03	8.51E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C2	5.36E-08	7.76E-05	1.27E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	C3	3.32E-08	2.18E-04	1.58E-05	0.00E+00	2.01E+01	0.00E+00	0.00E+00	0.00E+00
	C4	3.17E-08	8.64E+00	2.66E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D	-2.70E-08	-8.16E-01	-3.07E-04	-	-	-	-	-	

Key	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 electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – TRACE INDICATORS
1 m² OF AVERAGE CERAMIC TILE (24.3 kg/m²)

Parameter	Global Warming Air	Ozone Depletion Air	Acidification Air	Eutrophication	Smog Air	
Unit of measurement	[kg CO ₂ -eq.]	[kg CFC11-eq.]	[kg SO ₂ -eq.]	[kg N -eq.]	[kg O ₃ -eq.]	
PHASE OF LIFE CYCLE	A1-3	1.20E+01	2.87E-11	2.50E-02	1.51E-03	5.54E-01
	A4	6.47E-01	2.36E-14	5.65E-03	2.49E-04	1.04E-01
	A5	2.69E+00	4.49E-12	4.33E-03	6.57E-04	8.61E-02
	B2	4.04E-02	8.12E-12	8.71E-05	8.87E-05	1.31E-03
	C2	5.25E-02	1.85E-15	3.08E-04	2.73E-05	6.75E-03
	C3	5.08E-02	2.29E-14	4.86E-04	3.52E-05	1.61E-02
	C4	1.37E-01	3.11E-14	8.89E-04	7.50E-05	1.75E-02
	D	-2.48E-01	-7.87E-13	-6.98E-04	-7.35E-05	-1.49E-02

SECTION 5 - LCA (LIFE CYCLE ANALYSIS): CALCULATION RULES

DECLARED MEASUREMENT UNIT

The declared unit is 1 m² of wall or floor tile with a mean weight of 24,3 kg.

Declared measurement unit	1	m ²
Weight	24.3	kg/m ²
Factor of conversion to 1 kg	0.0411	

SYSTEM LIMITS

The entire life cycle of the product is considered (type of EPD: cradle to grave) and the following modules are declared in this EPD.

Modules A1-A3 include processes which involve the intake of energy and materials for the system (A1), transport to the factory gate (A2), fabrication and waste processing (A3).

Module A4 includes transport from the factory to the customer or to the point of installation of the tiles.

Module A5 considers all phases of installation of the tiles (such as consumption of adhesives) and also the treatment of packaging waste (recycling, incineration, scrapping). Energy replacement credits are declared in module

D. During this phase, we consider a loss of ceramic material to the amount of 6.5%.

Module B1 considers the use of the tiles. The use of ceramic tiles does not generate hazardous emissions indoors.

Module B2 considers the cleaning of tiles. It considers the supply of water and detergent for cleaning the tiles, including the treatment of waste water, over a year of use.

Modules B3-B4-B5 consider the repair, replacement and restoration of the tiles. If the tiles have been installed properly, no repair, replacement or restoration is required.

Modules B6-B7 consider the use of energy to operate the technical systems integrated into the building (B6) and the use of process water for technical systems associated with the building.

No use of energy or process water is envisaged. The cleaning water is declared in module B2.

Module C1 considers the demolition and deconstruction of the tiles from the building.

Module C2 considers the transport of scrapped tiles to a recycling or scrapping process.

Module C3 considers all processes (collection, crushing, etc.) employed in recycling the tiles.

Module C4 considers all processes of disposal at the dump, including pretreatment and the management of the dump itself.

Module D considers all benefits deriving from the all net flows in the end of life phase which leave the product limit system after having passed the end of waste phase. Loads due to incineration of packaging materials and the resulting energy credits (electricity and thermal energy) are declared in module D.

ESTIMATES AND HYPOTHESES

Modules A5 to C4 are scenarios based on average data, included in the PCR drawn up by the European Ceramic Tile Manufacturers' Federation CET PCR 2014.

For materials (glaze compounds, colouring agents and chemical additives) for which no primary data are available and of which the exact chemical composition (listed on the technical data sheet) is unknown, we used a typical composition and formulated hypotheses on the basis of common chemicals.

BACKGROUND DATA

The background data used to model the life cycle are taken from the most recent version of the GaBi 8 professional database.

Other sources of background data included ELCD FEFCO, *Perry's Chemical Engineers' Handbook*, *Ceramic Glaze Handbook* and the *European Ceramic Tile Manufacturers' Federation*.

QUALITY OF THE DATA

The period of validity of the background data used by the tool v.5 based on the thinkstep database runs from 2012 to 2018.

The majority of the information (energy and water consumption, polluting emissions, spray-dried powders and ceramic production) are measured or calculated directly by the company and declared in the Italian IPPC document called AIA, which is specific and verified for each plant considered in this study. The carbon dioxide emissions (attendant on the oxidation of carbonate) were drawn from the ETS (emissions trading system) declaration.

Detailed data were obtained not only for the mixtures of raw materials (resulting from the company's specific main data) but also for the colouring agents, frits and other raw materials used in glaze production.

The overall quality of the data can be considered to be excellent.

PERIOD UNDER EXAMINATION

The main data collected for this study refer to the entire production for year 2016.

ALLOCATIONS

Where it has not been possible to avoid recourse to allocation, this aspect has been handled according to the reference ISO standards (14040, 14044) in terms of allocation by weight. In particular, supplies of energy and materials have been allocated to the product on the basis of the weight of ceramic tile manufactured annually. No further allocations have been employed in the successive module.

Furthermore, some ceramic waste is recycled internally; we have considered the energy recovery credits for the packaging material at the end of life of the product (module D).

CUT-OFF

All incoming and outgoing mass and energy flows have been considered.

SECTION 5 - LCA: SCENARIOS AND SUPPLEMENTARY TECHNICAL INFORMATION

The following technical information relating to the declared modules and respective scenarios are based on average data, in conformity with the European Ceramic Tile Manufacturers' Federation and Confindustria Ceramica.

Transport to the site (A4)

Ceramiche Keope commercialises its ceramic tiles in Italy, Europe and the rest of the world. We list below the typical default modes of transport.

Name	Value	Unit of measurement
Litres of fuel (per functional unit)	31	l/100 km
Volume to capacity utilisation factor (including unloaded trips)	0.85	-
National road transport, truck with capacity of 27 ton (51% of tiles sold)	300	km
European road transport, truck with capacity of 27 ton (34% of tiles sold)	1390	km
Transoceanic shipping	6520	km

Installation in the building (A5)

3 material use options are defined for the phase of installation in the building. Option 1, adhesives, mortar and water, option 2 adhesives in a mortar and polysulphide dispersion, option 3 also cementitious adhesives (in different amounts for different tile sizes). Such considerations are based on average data supplied by a number of European ceramic tile manufacturers. In this EPD we assume that the tiles are installed with a cementitious adhesive (option 3).

In considering the treatment of packaging waste, we use and illustrate a typical European scenario, drawn from "Eurostat, 2013"; the end of life thus consists in recycling, energy recovery and dumping for plastic and paper, and re-use, energy recovery and dumping for wood. We considered a ceramic material wastage rate of 6.5%.

Use (B1)

Ceramic tiles are robust and have a rigid abrasion resistant surface. There are no environmental impacts attendant on their use.

Maintenance (B2)

Ceramic coating materials can be cleaned regularly, more or less intensely depending on the type of building: residential, commercial or health care. We have therefore considered the consumption of water and detergent. The values declared for this phase refer to a period of 1 year for residential use and are described in the following table.

Residential use: 0.2 ml of detergent and 0.1 l of water to wash 1 m² of ceramic tiles once a week. This scenario is based on average data supplied by a number of European ceramic tile manufacturers.

Name	Value	Unit of measurement
Water consumption	0.1	l
Detergent	0.2	ml
Maintenance cycle for wall and floor tiles	52	Number/year

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

In general, the service life of ceramic tiles is equal to that of the building. No repair, replacement or restoration are required for ceramic tiles.

Use of energy and process water (B6, B7):

These modules do not apply to ceramic tiles.

End of life (C1-C4)

C1: This module, in conformity with the PCRs drawn up by the European Ceramic Tile Manufacturers' Association, does not apply to ceramic tiles.

C2: ceramic tile demolition waste is transported from the building to a container or treatment plant by truck; we consider an average distance of 20 km. The return trip is included in the system. One could consider an average distance of 30 km from the container or treatment plant to the final destination.

C3-C4: The end of life scenario is described in the following table:

Name	Value	Unit of measurement
Percentage of material recycled (C3)	70%	
Percentage of material dumped (C4)	30%	

Benefits and loads not covered by the product system limits (D):

Module D includes credits due to the recycling of tile and packaging materials, and energy credits due to the thermal recovery of the packaging.

ELEMENTS USED TO PROVE THE REQUISITES

Ceramic is inert and hence, in use, does not emit pollutants or substances which pose an environmental or health hazard. For this reason, and in conformity with the PCR, no elements of proof are required since they do not apply to this category of product.

SECTION 6 - BIBLIOGRAPHY

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