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A VERIFIED ENVIRONMENTAL DECLARATION

Environmental product declaration

Ceramic tiles, porcelain tiles

(BIa clasification according to EN 14411:2013)

EN ISO 14025:2010
EN 15804:2012

Designation Code: GlobalEPD 002-013
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1 General information

1.1. Identification and description of the organisations carrying out the declaration

Declaration made by:
Instituto de Tecnología Cerámica – (ITC-AICE)
Cyclus Vitae Solutions S.L.

Life Cycle Assessment made by:
Instituto de Tecnología Cerámica – (ITC-AICE).
Report reference C120901, 24 of September, 2014.

Commissioned by:
Pamesa Cerámica S.L.
Cno. Alcora nº 8, Apdo. Correos 14
12550 Almazora, Castellón. España

1.2. Identification of the product

This environmental product declaration describes the environmental information based on a life cycle assessment of porcelain tiles (BIa water absorption group) manufactured by PAMESA CERÁMICA S.L., considering the geographical and technical coverage of Spain during 2013.

The ceramic tiles included in the study belong to the BIa water absorption group according to UNE-EN 14411:2013 (equivalent to ISO 13006:2012); i.e they have a water absorption ≤ 0,5% (porcelain tiles).

The product sizes that lie within the scope of the study have a thickness between 8 mm and 14 mm, and are as follows.

25x25 cm	40x40 cm	50x50 cm	30x60 cm
16x100 cm	30x30 cm	45x45 cm	30,3x61,3 cm
60x60 cm	50x100 cm	24,5x100 cm	

1.3. Declared or functional unit

The Declared Unit is "1 m² covering of a (floor, partitions and façade) surface with porcelain tiles (BIa group)".

1.4. Name of the Program

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AENOR is a founding member of the Association ECO Platform of European EPD Program Operators.

1.5. Conformity

This Environmental Product Declaration has been developed and verified in accordance with ISO 14025 and EN 15804.

1.6. Identification of the Product Category Rules (PCR)

Descriptive title of the PCR	Ceramic coverings
Panel that approved this PCR	CERAMIC COVERINGS
PCR registration date and code	2013-09-06 RCP-002-AENOR GlobalEPD
PCR version number	001
Public consultation period for the PCR	2013-05-07 to 2013-05-31
Approval date of the PCR	2013-09-06
PCR valid until	2018-09-05
Programme Operator	AENOR

1.7. Date of issue of the declaration and period of validity

This EPD, with code 002-013, is issued on 2014-11-06 and will be valid for 5 years.

1.8. Information modules

The life cycle stages considered are:

Product stage:

Raw materials extraction and processing (A1)
Transport to the manufacturer (A2)
Manufacturing (A3)

Module D: Benefits and loads beyond the system boundary from reuse, recovery, and/or recycling potentials

This EPD is thus "cradle to gate with options".

Product stage (modules A1, A2 Y A3)

Raw materials supply (A1)

The basic materials for these tiles are mainly clay, feldspar, sand, recovered ceramic material generated after the firing and additives.

The most common glaze raw materials are quartz, kaolin, alkaline feldspars, calcium carbonate, borates, zircon, clay, calcined alumina, ceramic frits, pigments, and additives such as suspending agents, defloculants, or binders.

Transport (A2)

Raw materials have different sources according to their nature and properties.

All raw materials are transported in bulk, i.e. with no packing. Based on the distances, raw materials are transported by land, using tracks, of shipped using cargo freighters.

Manufacturing (A3)

Both the preparation of the raw materials and the manufacturing of the tiles are made in the factory of PAMESA CERÁMICA S.L. (hereinafter referred to as PAMESA).

In this factory the dosage and the mix using the appropriate rations is made, after the reception of the materials and its storage in a warehouse. These raw materials are first grinded with a wet process and then dried to obtain an atomized granule. Only in case of feldspars there is a pre-treatment to ensure they are acceptable for the use.

The drying process by atomization includes a system of cogeneration for combined heat and electric power. In this cogeneration process electricity is generated using a system of gas turbines; part of the heated gases generated during the combustion of the natural gas for electric power is used in the atomization process. Both the heated gases and part of the electric power generated are incorporated and used in the manufacturing process itself, thus reducing the energy demand from the grid.

The atomized granules are stored in silos. Using a feeding

system that uses belts with weight control, it is sent to the forming stage.

Once the tiles are formed using unidirectional pressing with a dry process, they are sent to a dryer with a continuous process to reduce moisture and thus increase the mechanical resistance, to allow the downstream processing. Once the tiles are removed from the dryer they are decorated with a slim layer of ceramic glaze. This glaze is manufactured in specialized factories located in the same region of Castellón.

Part of the raw materials used for decoration is fritted (fusion of the raw materials and sudden cooling, obtaining insoluble glass. This fritted raw materials, and the rest, are milled with a wet process in the factory of PAMESA, and other techniques are applied like bells and disks . Over these pieces an additional decoration can be applied with ink injection or gravure. Once the pieces are decorated, they are fired in a single layer oven with roller. This is the most important stage in the production process, as the materials have a fundamental change in the properties, obtaining a hard material, resistant to water and to chemical products that has, generally, high performance.

After the quality control procedures, also known as sorting, some pieces are treated with additional mechanical surface treatments, to obtain new effects in the ceramic pieces. These treatments are made in the factory of PAMESA and are pre-cuts, cuts, surface polishing, beveling, etc.
For the packaging of the pieces cardboard, pallets, and polyethylene is used. Once the pallet is prepared is stored in the logistic area of the factory.

All the waste from raw ceramic pieces is incorporated to the process as raw material for the manufacturing of other type of tiles made in the factory of PAMESA; regarding the waste of fired pieces they are used again as raw materials after a crushing process, and only a small fraction is disposed in a inert landfill. In addition, for the treatment of the atmospheric emission generated in different points, the company has bag filters; the material recovered in this system is used again in the process.

Module D: Benefits and loads beyond the product system boundary

The avoided loads related with the management of the waste from packaging generated in the manufacturing stage.

1.9. Representativeness of the EPD

This Environmental Product Declaration contains environmental information regarding tiles of the water absorption group BIa. The results presented set out the average environmental performance, weighted by the production.

In addition this EPD includes the environmental data on the tiles that exhibit a minimum and a maximum impact, thus delimiting the average results obtained in the LCA.

Comparison of construction products shall be based on the same function, using the same functional unit at building level (or architectural or civil engineering works), i.e. including the performance of the product during the life cycle and the requirements stated in EN ISO 14025, 6.7.2.

EPD from different type III program operators might be not directly comparable as the assumptions, scope and calculation rules might be different.

1.10. Where can further information on this EPD be obtained?

For further information regarding please contact the manufacturer, PAMESA CERÁMICA S.L., via web http://www.pamesa.com or using the following email: nacional@pamesa.com (Spain) or export@pamesa.com (International).

2 Product

2.1. Description of the product

This Environmental Product Declaration covers the ceramic tiles from the water absorption group BIa (porcelain tiles) the classification is based on EN 14411:2013:2013 (equivalent to ISO 13006:2012), the geographical and technical coverage of Spain with data from 2013.

The porcelain tiles included in the study covers different models with different formats. The product dimensions included in the study are (in cm):

25x25 cm	40x40 cm	50x50 cm	30x60 cm
16x100 cm	30x30 cm	45x45 cm	30,3x61,3 cm
60x60 cm	50x100 cm	24,5x100 cm	

Figure 1 – *Installed product*

2.2. Application of the product

The intended use of the product is surface covering, both indoor and outdoor. Generally, this product is used for floorings, but it can also be used for wall cladding. In addition, the versatility of the ceramic tile also allows the installation in different environments such as in homes, offices, shops, hospitals, etc. Annex I provides the technical characteristics of the product, but the data sheet for a particular model can be provided by the manufacturer on request.

The life cycle assessment (LCA) on which this declaration was performed according to standards ISO 14040 and ISO 14044 and the PCR document on ceramic coverings V.001, PCR nº 2 of AENOR GlobalEPD.

The Declared Unit is "1 m^2 covering of a surface (floor, partitions and façade) with porcelain tiles(water absorption group BIa)".

This LCA is "cradle-to-grave with options"; i.e. it includes the product manufacturing with additional modules (module D in this case), but not covering the full life cycle.

2.3. Product components

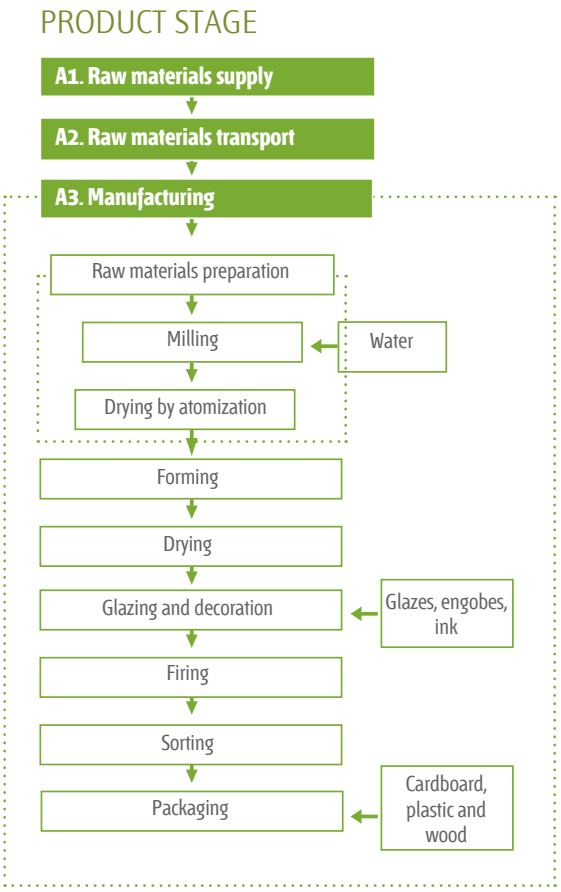
None of the end-product components are included in the Candidate List of substances of very high concern for authorisation.

Body raw materials (95%): clay, recycled fired and unfired ceramic material and additives

Glaze raw materials (5%): feldspars, carbonates,quartz, borates, silicates, kaolins, zirconium oxides, clays, alumina, and zinc oxide.

3 Results of the life cycle assessment (LCA)

3.1. System boundaries. Information modules



D. Benefits and loads beyond the system boundary from reuse, recovery and recycling

3.2. Declaration of environmental parameters derived from LCA

The environmental parameters derived from the LCA for the products under study are set out below.

3.2.1 Impact indicators

The following tables set out the averaged data of the assessed impact indicators for the sizes 25x25 cm and 33x33 cm classified within the absortion group BIIa. The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in the Annex I.

The LCA was developed with the life cycle analysis software GABI 4.4 (PE International). The characterization factors used are the factors included in the CML-2001 method, after the review of November de 2009.

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES			
			PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1	A2	A3	D
Global warming	Global warming potential	kg CO_2 equiv	2,0	2,9E-01	5,7	-1,7E-02
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	2,6E-07	5,3E-10	2,6E-07	-1,8E-09
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	1,1E-02	6,0E-03	1,3E-02	-2,3E-05
Eutrophication	Eutrophication potential	kg $(PO4)^{3-}$ equiv	7,8E-04	6,8E-04	2,1E-03	-8,7E-06
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	9,2E-04	3,8E-04	8,7E-04	-9,5E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,3E-04	5,8E-09	5,2E-07	-5,6E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	26,9	3,8	71,3	-3,5E-01

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 1. Parameters describing environmental impacts for porcerlanic tiles (BIa) [average values]

3.2.2 Use of resources

The following table shows the parameters that describe the use of resources associated to the life cycle for 1 m² of an average porcelain tiles.

The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in the Annex II.

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	3,9	5,0E-03	9,8	-3,4E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	3,9	5,0E-03	9,8	-3,4E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	36,8	3,8	124,0	-4,4E-01
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	36,8	3,8	124,0	-4,4E-01
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m³	5,1E-02	7,2E-05	2,9E-02	-6,7E-04

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 2. Parameters describing use of resources for porcelain tiles (BIa) [average values]

3.2.3. Waste categories and output flows

The following table shows the parameters that describe waste categories and other output flows associated to the life cycle for 1 m² of an average porcelain tiles.

The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in Annex III.

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Hazardous waste disposed	kg	3,1E-03	0	5,0E-02	1,4E-04
Non hazardous waste disposed	kg	5,6	9,4E-03	73,3	2,5E-01
Radioactive waste disposed	kg	2,2E-03	6,6E-06	3,2E-03	1,9E-05

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 3. Parameters describing waste categories for porcelanic gres tiles (BIa) [average values]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	-3,7E-02
Materials for energy recovery	kg	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 4. Parameters describing other output flows for porcelain tiles (BIa) [average values]

3.3. Additional information regarding the release of dangerous substances into indoor air, soil and water during use stage

3.3.1. Indoor air emissions

In the ceramic tile manufacturing process, tiles are subjected to a thermal process above 1000 ºC. At these temperatures, any organic compound in the compositions decomposes, yielding an inert end-product free of any volatile organic compounds that might be released in the use stage.

3.3.2. Release to soil and water

Ceramic tiles release no compounds into the soil or water during their use stage because a completely inert product is involved that undergoes no physical, chemical, or biological transformations, is neither soluble nor combustible, and does not react physically or chemically or in any other way, is not biodegradable, and does not adversely affect other materials with which it enters into contact such that it might produce environmental pollution or harm human health. It is a non-leaching product, so that it does not endanger the quality of surface water or groundwater.

4 Verification

CEN standard EN 15804 serves as core PCR

Independent verification of the declaration and data in conformity with standard **EN ISO 14025:2010**

☐ **internal** ☑ **external**

Third-party verifier

AENOR Asociación Española de Normalización y Certificación

Note 1: EPD developed in different program operators may not be comparable, due to differences in the assumptions, scope and calculation rules.

Note 2: Comparisons for construction product shall be made using for the same function, using the same functional unit and at building (or engineering works) level, i.e. considering the performance of the product in the full life cycle and including the specifications in UNE-EN ISO 14025, 6.7.2.

ANNEX I Parameters describing environmental impacts

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES			
			PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1	A2	A3	D
Global warming	Global warming potential	kg CO_2 equiv	1,0	3,2E-01	4,8	-8,0E-03
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	1,1E-07	6,5E-10	1,9E-07	-8,2E-10
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	5,8E-03	2,2E-03	7,0E-03	-6,2E-06
Eutrophication	Eutrophication potential	kg $(PO4)^{3-}$ equiv	3,5E-04	5,0E-04	1,9E-03	-3,0E-06
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	5,9E-04	2,1E-04	3,2E-04	-2,5E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,3E-04	6,9E-09	4,6E-07	-1,2E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	17,0	4,5	52,0	-1,2E-01

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 5. Parameters describing environmental impacts for porcelain tile (BIa) [values for the format with lower impact]

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES			
			PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1	A2	A3	D
Global warming	Global warming potential	kg CO_2 equiv	2,3	3,6E-01	8,0	-1,6E-02
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	3,2E-07	6,5E-10	3,9E-07	-1,7E-09
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	1,2E-02	8,2E-03	1,7E-02	-2,0E-05
Eutrophication	Eutrophication potential	kg $(PO4)^{3-}$ equiv	8,8E-04	9,1E-04	2,5E-03	-8,3E-06
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	1,1E-03	5,1E-04	1,1E-03	-8,8E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,6E-05	7,2E-09	7,6E-07	-5,5E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	31,0	4,6	100,5	-3,4E-01

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 6. Parameters describing environmental impacts for porcelain tile (BIa) [values for the format with higher impact]

ANNEX II Parameters describing use of resources

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	3,1	3,2E-03	5,2	-2,3E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	3,1	3,2E-03	5,2	-2,3E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	23,9	2,5	94,5	-4,2E-01
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	23,9	2,5	94,5	-4,2E-01
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m^3	2,8E-02	4,6E-05	2,3E-02	-6,6E-04

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 7. Parameters describing use of resources for porcelain tiles (BIa) [values for the format with lower impact]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	4,5	6,1E-03	9,7	-2,3E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	4,5	6,1E-03	9,7	-2,3E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	42,7	4,7	181,0	-4,2E-01
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	42,7	4,7	181,0	-4,2E-01
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m^3	4,9E-02	8,7E-05	4,1E-02	-6,6E-04

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 8. Parameters describing use of resources for porcelain tiles (BIa) [values for the format with higher impact]

ANNEX III Parameters describing waste categories and other output flows

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Hazardous waste disposed	kg	2,6E-03	0	2,7E-02	1,4E-04
Non hazardous waste disposed	kg	4,1	6,1E-03	42,1	2,5E-01
Radioactive waste disposed	kg	1,6E-03	4,3E-06	2,5E-03	1,9E-05

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 9. Parameters describing waste categories for porcelain tiles (BIa) [values for the format with lower impact]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Hazardous waste disposed	kg	3,7E-03	0	9,2E-02	1,4E-04
Non hazardous waste disposed	kg	7,7	1,2E-02	143,0	2,5E-01
Radioactive waste disposed	kg	3,0E-03	8,1E-06	4,9E-03	1,9E-05

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 10. Parameters describing waste categories for porcelain tiles (BIa) [values for the format with higher impact]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	-3,7E-02
Materials for energy recovery	kg	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 11. Parameters describing other output flows for porcelain tiles (BIa) [values for the format with lower impact]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	-3,7E-02
Materials for energy recovery	kg	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
D. Reuse, recovery and recycling potential

Table 12. Parameters describing other output flows for porcelain tiles (BIa) [values for the format with higher impact]

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