



ENVIRONMENTAL PRODUCT DECLARATION

porcelain stoneware tiles

(Water absorption group Bla)

DECLARATION MADE BY:

APAVISA PORCELÁNICO, S.L.

21st February, 2020

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GENERAL INFORMATION

APAVISA PORCELÁNICO, S.L.

Carretera Castellón – San Juan de Moró, Km. 7.5

12130 San Juan de Moró

Castellón, Spain

Declaration made by:

Instituto de Tecnología Cerámica – (ITC-AICE)

Campus Universitario Riu Sec

Av. Vicent Sos Baynat s/n

12006, Castellón

Life Cycle Assessment made by:

Instituto de Tecnología Cerámica – (ITC-AICE). Report reference C183903,

21st February 2020.

APAVISA PORCELANICO, S.L.

APAVISA PORCELÁNICO is a leading company in its sector, which manufactures and sells high quality technical porcelain tiles. The objective of APAVISA is to offer exclusive products that combine the skilful form with technique and design, offering the market the highest quality, versatile and reliable porcelain tiles adapted to the clients needs.

For further information, please contact APAVISA PORCELANICO, S.L. by e-mail to info@APAVISA.com.

THE PRODUCT

Identification of the product in the Environmental Product Declaration

This environmental product declaration provides environmental information on the life cycle of ceramic tiles of APAVISA PORCELÁNICO considering the geographical and technological context of Spain in the year 2017.

These tiles are manufactured by Tecnigrés and Azulejos y Pavimentos SA., located in Sant Joan de Moró, Castellón, Spain.

The ceramic tiles included in this study belong to water absorption group Bla, according to standard EN 14411:2016 (counterpart to standard ISO 13006:2018), i.e. ceramic tiles with water absorption $\leq 0.5\%$ (commonly designated porcelain stoneware tile).

The porcelain stoneware tiles included in this study includes different models with different sizes. Specifically, the product sizes considered within the scope of the study are between 5.1 mm and 20 mm thick and with an average weight of 20.9 kg/m².



Representativeness of the EPD

This Environmental Product Declaration contains environmental information about the ceramic tiles of APAVISA PORCELÁNICO belonging to water absorption group Bla (Porcelain Stoneware). It contains environmental information about a group of products, so the results presented set out the average environmental performance, weighted by the production of all formats included in the scope of this document. Additionally, the Annex of this document presents the environmental data of the tiles that exhibit a minimum and a maximum impact, thus delimiting the results obtained in the Life Cycle Assessment.

The Life Cycle Assessment (LCA) on which this declaration is based was performed according to standards ISO 14040 and ISO 14044 and the PCR document on construction products EN 15804:2012+A1:2013 and PCR documents on ceramic coverings of Spanish EPD programs have also been considered.

This Environmental Product Declaration is valid for 5 years.

This EPD may not be comparable with those developed in other programs or under different reference documents; it may not be comparable with EPDs not prepared in accordance with the EN 15804:2012+A1:2013 standard. Similarly, EPDs may not be comparable if the origin of the data is different (e.g. databases), if not all relevant information modules are included or if they are not based on the same scenarios.

Comparison of construction products shall be done regarding the same function, using the same functional unit and building level (or architectural or engineering work), i.e. including the performance of the product throughout its life cycle and considering the specifications of section 6.7.2 of standards EN ISO 14025 and EN 15804:2012+A1:2013.

Functional Unit

The Functional Unit is *“1 m² covering of a (floor) surface for 50 years with porcelain stoneware tiles (group Bla)”*.

Application of the product

The product is intended for surface covering in both indoor and outdoor environments. The product can be used as floor covering, wall cladding, or even in façades. Moreover, the versatility of the product also allows this type of ceramic tile to be used in different environments, such as homes, shops, offices, and hospitals. For further information, please request the manufacturer's technical data sheet on the model involved.



Product features

The table below refers to the technical performance of porcelain stoneware manufactured in APAVISA:

Table 1 Product features.

| Feature | Calculation or testing method | | Units |
|---|-------------------------------|------------------------------|-----------------|
| Length (deviation W) | ISO 10545-2 | ±0,2 | % |
| Thickness (deviation W) | | ±5 | % |
| Straightness of lines | | ±0,2 | % |
| Orthogonality | | ±0,2 | % |
| Centre curvature | | ±0,2 | % |
| Lateral curvature | | ±0,2 | % |
| Warp curvature | | ±0,2 | % |
| Superficial aspect | | > 95 | % |
| Water absorption | ISO 10545-3 | ≤ 0,1 | % |
| Breaking strength (e≥7,5mm) | ISO 10545-4 | ≥2800 | N |
| Breaking strength (e<7,5mm) | | ≥1200 | N |
| Impact strength | ISO 10545-5 | Available by product | |
| Deep abrasion | ISO 10545-6 | Available by product | mm ³ |
| Surface abrasion | ISO 10545-7 | Available by product | |
| Thermal growth | ISO 10545-8 | 6,4-6,6 X 10 ⁻⁶ | 1 / °C |
| Thermal impact | ISO 10545-9 | Meets | |
| Moisture expansion | ISO 10545-10 | Available by product | |
| Cracking | ISO 10545-11 | Meets | |
| Frost | ISO 10545-12 | Meets | |
| Acid and Base Resistance (low concentration) | ISO 10545-13 | Available by product | |
| Acid and Base Resistance (high concentration) | | Available by product | |
| Household cleaning products and swimming pool salts | | A | |
| Stain resistance | ISO 10545-14 | 5 | |
| Pb and Cd extraction | ISO 10545-15 | Available by product | |
| Slight differences in colour | ISO 10545-16 | Available by product | |
| Slide | CEN/TS 16165 | Available by product | |
| Reaction to fire (no mesh) | EN 13501-1 | A1 _f /a1 | |
| Reaction to fire (with mesh) | | Available by product | |
| Adhesion | EN 12004 | Type C2 >1 N/mm ² | |
| Tactile properties | CEN/TS 15209 | Available by product | |

LIFE CYCLE DESCRIPTION

Information modules and system boundaries

The considered system includes the following modules and processes:

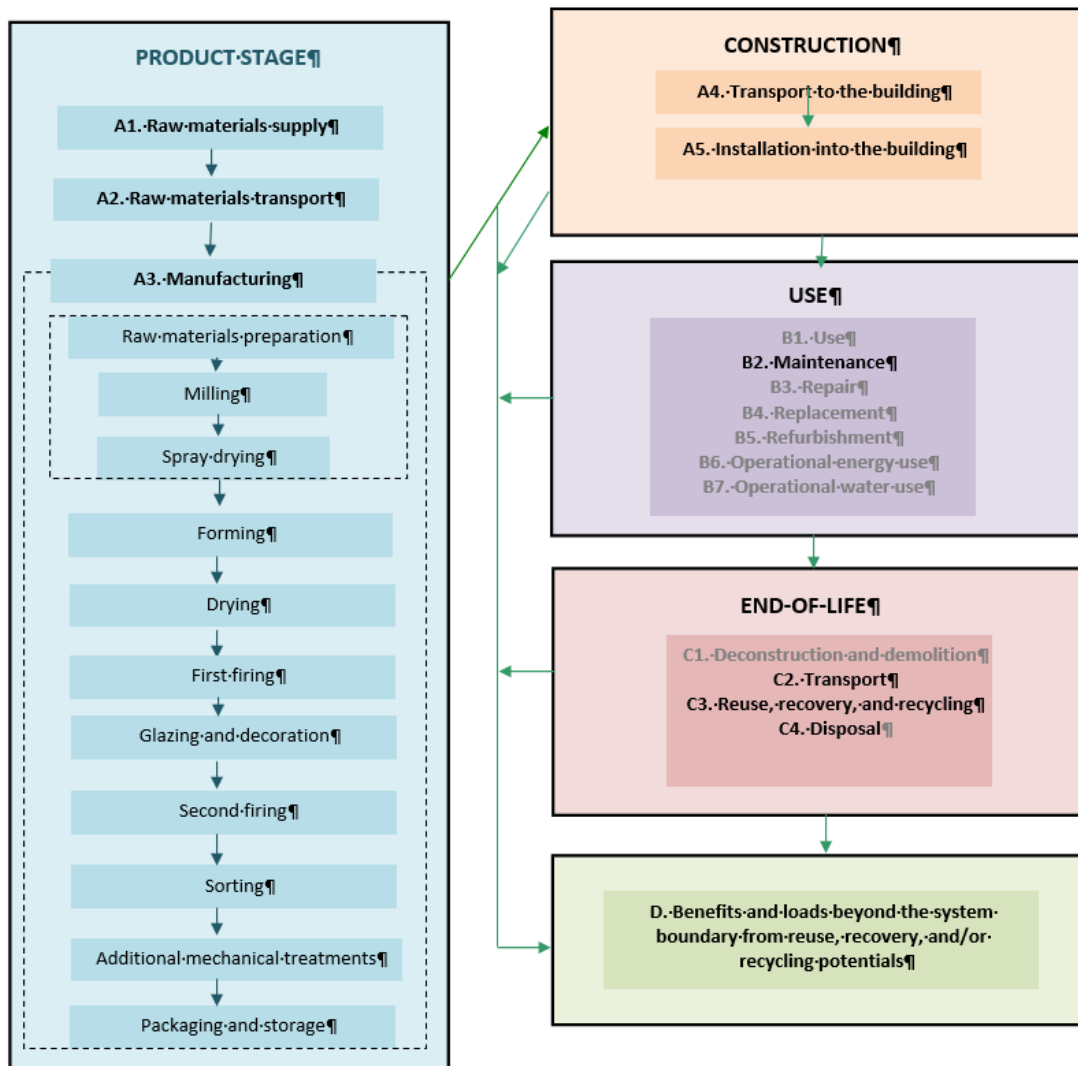


Figure 1 System boundaries

This environmental product declaration refers to the environmental performance of the porcelain stoneware product marketed by APAVISA PORCELÁNICO, S.L. taking into account its entire life cycle, and including the following stages:

Product stage:

Raw materials extraction and processing (A1)

Transport to the manufacturer (A2)

Manufacturing (A3)

Construction:

Transport to the building site (A4)

Installation into the building (A5)

Use:

Use or application of the installed product (B1)

Maintenance (B2)

Repair (B3)

Replacement (B4)

Refurbishment (B5)

Operational energy use (B6)

Operational water use (B7)

End-of-life:

Deconstruction and demolition (C1)

Transport to waste processing (C2)

Waste processing for reuse, recovery, and/or recycling (C3)

Disposal (C4)

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

Life cycle description

PRODUCT STAGE

Raw materials supply (A1)

The porcelain stoneware product essentially consists of a body and a fine decorative surface coating. The body accounts for 98% of the total weight of the tile and consists of clay, sand, feldspar, and recycled ceramic material.

The decoration materials are manufactured at specialised companies, where part of the raw materials is subjected to a fritting process (raw materials fusion and quenching) to obtain insoluble glasses. The frits and other raw materials are mixed and usually wet milled. 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, deflocculants, or binders.

No end-product components are included in the Candidate List of Substances of Very High Concern for Authorization.

Raw materials transport (A2)

The raw materials used have different origins, in accordance with their nature and properties. The arriving raw materials that are transported by freighter reach the port of Castellón and are hauled from there by truck to the manufacturing facilities. For sea transportation, a transoceanic type of freighter was chosen; the distance travelled differs in each case, depending on the origin. The raw materials are transported in bulk, that is, they require no packaging material.

Manufacturing (A3)

After the materials have been received at the spray-dried granule production plant and stored in semi-closed and closed sheds, they are proportioned and mixed in the appropriate quantities. These raw materials are subjected to a wet milling process followed by a drying process to obtain the spray-dried granules.

The spray-dried powder supplier has a heat and electric energy cogeneration system installed at the spray dryer. The cogeneration produces electricity using the waste heat from combustion, through a system of steam turbines and alternators. All the hot gases are used in the spray dryer. A part of the generated electric energy is used in the production process, thus reducing the electricity demand from the grid, while the rest is sold to the grid.

Once the spray-dried granules have been manufactured, they are transported in bulk in a 27 t dump truck from the spray-dried powder producer to the factory. At the factory, the spray-dried powder is unloaded into storage hoppers. A feed system of conveyor belts with weight control then conveys the granules to the forming stage.

The tiles are formed by dry uniaxial pressing and fed into a continuous dryer to reduce tile moisture content, thus doubling or tripling tile mechanical strength for subsequent processing.

Some of these pieces are subjected to a double-firing process, that is, these tiles undergo a first firing after exiting the dryer, whereas the rest are glazed and decorated before they undergo a single firing process.

The glazing and decoration processes consist in applying one or more layers of glaze and engobes using various techniques, such as waterfall, bell glazing, spraying (discing) and inject application.

Firing is the most important stage in the ceramic tile production process because it is when the properties of the formed tiles are fundamentally changed, yielding a hard material that is resistant to water and chemicals. The products are fired in single-deck roller kilns.

Once the tiles have been fired, additional mechanical treatments are applied, as required, to given tiles to provide them with specific characteristics. The most common treatments are polishing (enhancing tile surface gloss by an abrasion process) and rectification (edge-grinding, so that there are not noticeable joints between the tiles once they are installed).

After the tiles have passed the relevant quality control processes, also known as sorting, they are packaged using cardboard, pallets, and polyethylene. The prepared pallet is then stored in the logistics area of the plant.

In order to reduce air emissions from the different sources, so-called fabric filter baghouses and wet filters are used: the former consists of a textile membrane that is permeable to gases but retains dust, while the latter consists of a curtain or shower of recycled water that carries away the dust particles.

CONSTRUCTION

Transport to the building (A4)

Product distribution is as follows: 27% in Spain, 33% in Europe, and 40% to the rest of the world. Three transport scenarios were estimated, see Table 2.

Table 2. Scenarios applied to transport the product to the place of installation

| Destination | Means of transport | Distance (km) |
|-------------------|------------------------|---------------|
| National | 27 t truck | 300 |
| Europe | 27 t truck | 1390 |
| Rest of the World | Transoceanic freighter | 6250 |

Road transport was estimated based on a 27t truck, EURO VI class. Transcontinental transport was estimated based on an average transoceanic freighter. All models used are included in the database [GaBi v.9].

Installation into the building (A5)

The product is then duly unpacked for installation. Data show that, in a real scenario, the tiles need to be installed with fast-setting mortars. Fast-setting mortars are cementitious adhesives that consist of a mixture of hydraulic binders, mineral fillers, and organic additives, which only need to be mixed with water or a liquid addition just before use. These mortars consist of a mixture of grey or white cement, mineral fillers of a siliceous and/or limestone nature, and organic additives: water retainers, water-redispersible polymers, rheological modifiers, fibres, etc.

Tile packaging waste is separately handled; the disposal mode depends on the geographic location of the installation site.

USE

Once it is installed, the porcelain stoneware product requires no energy input for use. Nor does it require any maintenance after installation, except normal cleaning operations. Consequently, of all the modules mentioned previously, only the environmental loads related to product maintenance are considered (Module B2). The rest of life cycle modules are considered as no relevant.

According to APAVISA PORCELÁNICO, the reference service life of the product is the same as that of the building where it is installed because, provided it is properly

installed, it is a durable product that will not require replacing. The product is assumed to have a service life of 50 years.

Maintenance (B2)

Cleaning is performed with a moist cloth and, if the surface exhibits any dirt or grease, cleaning agents such as detergents or bleaches can be added. The present study has considered water and disinfectant consumption once a week in a residential use scenario.

END-OF-LIFE

Deconstruction and demolition (C1)

When its service life has ended, the product is removed, either as part of building refurbishment or building demolition. In building demolition, the impacts assignable to product disassembly are negligible.

Transport (C2)

Product waste is transported in a truck that conforms to Euro VI regulations, over a distance of 50 km to the waste destination.

Waste processing for reuse, recovery, and/or recycling (C3)

Based on the distribution of tiles (A5), and the latest statistical data (Eurostat, 2016), 75% of the construction and demolition waste is assumed to go to reuse, recovery, and recycling.

Disposal (C4)

Twenty-five per cent of the product is sent to a controlled landfill.

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

It is assumed that loads are avoided in manufacturing (such as cardboard, film, and wood waste), in product installation (such as cardboard, plastics, and wood packaging waste), and in product end-of-life.

ENVIRONMENTAL INFORMATION

It should be borne in mind that this EPD may not be directly comparable with EPDs developed in other programmes due to possible differences in assumptions, scope, and calculation rules.

It should further be noted that comparison of construction products shall be with regard to the same function, using the same functional unit and building level (or architectural or engineering work), i.e. including the performance of the product throughout its life cycle and considering the specifications of European standard EN 15804+A1.

Environmental impact indicators

The following table sets out the averaged data of the assessed impact indicators related to 1m² of surface covered with porcelain stoneware tiles inside a home for 50 years. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The LCA was performed with the support of the GABI 9.1.053 software.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 3. Parameters describing the environmental impacts of 1 m² of porcelain stoneware tiles (Bla) [average values]

| | GWP [kg CO ₂ eq.] | ODP [kg CFC11 eq.] | AP [kg SO ₂ eq.] | EP [kg Phosphate eq.] | POCP [kg Ethene eq.] | ADP- Element [kg Sb- Equiv.] | ADP-fosil [MJ] |
|--------------------------------------|---------------------------------|--|--------------------------------|--|----------------------------|--|-------------------|
| A1 | 2.0 | 5.2E-08 | 9.4E-03 | 1.8E-03 | 7.6E-04 | 4.9E-06 | 32.2 |
| A2 | 2.4E-01 | 1.8E-11 | 4.6E-03 | 4.5E-04 | 2.5E-04 | 1.1E-08 | 3.3 |
| A3 | 11.3 | -2.4E-10 | 1.8E-02 | 1.5E-03 | 1.4E-03 | 8.8E-07 | 184.0 |
| A4 | 7.2E-01 | 1.2E-16 | 6.3E-04 | 1.3E-04 | 8.6E-05 | 5.5E-08 | 9.8 |
| A5 | 1.2 | 1.8E-13 | 1.8E-03 | 4.2E-04 | 1.7E-04 | 1.6E-06 | 5.5 |
| B2 | 3.6E-01 | 1.7E-07 | 1.9E-03 | 4.8E-04 | 6.2E-04 | 5.0E-07 | 1.9 |
| C2 | 1.6E-01 | 2.6E-17 | 1.2E-04 | 2.7E-05 | 1.8E-05 | 1.2E-08 | 2.1 |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 1.0E-01 | 1.1E-13 | 6.1E-04 | 8.3E-05 | 4.8E-05 | 3.7E-08 | 1.3 |
| D | -4.2E-01 | -7.1E-09 | -1.5E-03 | -1.8E-04 | -1.6E-04 | -1.3E-07 | -9.3 |
| A1. Raw materials | | B1. Use | | C1. Deconstruction | | D. Benefits and loads beyond the system boundary | |
| A2. Transport | | B2. Maintenance | | C2. Transport | | | |
| A3. Manufacturing | | B3. Repair | | C3. Waste processing | | | |
| A4. Transport | | B4. Replacement | | C4. Disposal | | | |
| A5. Installation | | B5. Refurbishment | | | | | |
| | | B6. Operational energy use | | | | | |
| | | B7. Operational water use | | | | | |
| GWP: Global Warming Potential | | AP: Acidification Potential | | ADPE: Abiotic Depletion Potential for non-fossil resources | | | |
| ODP: Ozone Layer Depletion Potential | | EP: Eutrophication Potential | | ADPF: Abiotic Depletion Potential for fossil resources | | | |
| | | POCP: Photochemical Ozone Creation Potential | | | | | |

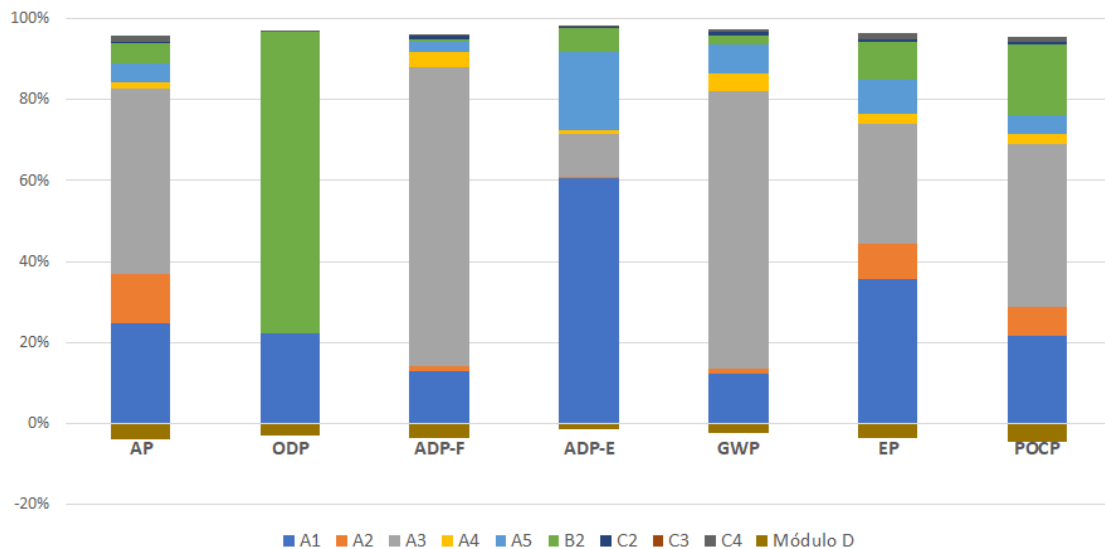


Figure 2. Environmental profile of 1m² of porcelain stoneware tile (Group Bla).

Indicators describing the resource use

The following table sets out the averaged data of the parameters describing resource use associated to life cycle of 1m² of porcelain stoneware tiles. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 4. Parameters describing the resource use of 1 m² of porcelain stoneware tiles (B1a) [average values]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D | |
|---|--------------------------|---|---------|--|---------|---------|---------|---|----|---------|----------|--|
| Use of renewable primary energy excluding renewable primary energy resources used as raw material | MJ (net calorific value) | 15.9 | 8.0E-02 | 17.9 | 5.7E-01 | 1.36 | 6.9 | 1.2E-01 | 0 | 1.6E-01 | -2.9 | |
| Use of renewable primary energy resources used as raw material | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Total use of renewable primary energy resources | MJ (net calorific value) | 15.9 | 8.0E-02 | 17.9 | 5.7E-01 | 1.36 | 6.9 | 1.2E-01 | 0 | 1.6E-01 | -2.9 | |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material | MJ (net calorific value) | 38.3 | 3.35 | 195.0 | 9.8 | 6.2 | 2.2 | 2.1 | 0 | 1.4 | -10.1 | |
| Use of non-renewable primary energy resources used as raw materials | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Total use of non-renewable primary energy resources | MJ (net calorific value) | 38.3 | 3.4 | 195.0 | 9.8 | 6.2 | 2.2 | 2.1 | 0 | 1.4 | -10.1 | |
| Use of secondary material | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Use of renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Use of non-renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Net use of fresh water | m ³ | 2.9 | 1.0E-02 | 1.1 | 4.1E-02 | 4.3E-01 | 2.8E-01 | 8.9E-03 | 0 | 7.7E-02 | -5.9E-01 | |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use | | C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal | | | | D. Benefits and loads beyond the system boundary | | | | |

Indicators describing the waste categories and output flows

The following tables set out the averaged data of the parameters describing waste production and output flows. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 5. Parameters describing the waste categories of 1 m² of porcelain stoneware tiles (B1a) [average values]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|---|------|---|---------|---------|---------|---------|---------|---------|----|---------|----------|
| Hazardous waste | kg | 3.1E-03 | 0 | 4.3E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 9.9E-04 |
| Non-hazardous waste | kg | 7.9 | 8.7E-03 | 298.0 | 3.3E-02 | 1.9 | 2.0E-01 | 7.2E-03 | 0 | 13 | -8.5 |
| Radioactive waste | kg | 2.0E-03 | 4.2E-06 | 4.3E-03 | 1.3E-05 | 2.6E-04 | 2.3E-05 | 2.9E-06 | 0 | 1.9E-05 | -3.6E-05 |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary | | | | | | | | | |

Table 6. Parameters describing other output flows of 1 m² of porcelain stoneware tiles (B1a) [average values]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|---|------|---|----|----|----|---------|----|----|------|----|----------|
| Components for reuse | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 4.3E-01 | 0 | 0 | 20.2 | 0 | -2.0E-02 |
| Materials for energy valorisation (energy recovery) | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exported energy | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary | | | | | | | | | |

ADDITIONAL ENVIRONMENTAL INFORMATION

Release of dangerous substances to air during the use stage

In the ceramic tile manufacturing process, tiles are subjected to a thermal process above 1000°C. 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.

Release of dangerous substances to soil and water during the use stage

Ceramic tiles release no compounds into the soil or water during their use stage because it is a completely inert product 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, thus not producing environmental pollution nor harming human health. It is a non-leaching product, so it does not endanger the quality of surface water or groundwater. For further information, please, request the manufacturer's safety data sheet.

ADDITIONAL TECHNICAL INFORMATION

Module: A4-A5: Construction process stage

Module A4: Transport to the construction site

Table 7. TECHNICAL INFORMATION. Construction process stage. Transport to the construction site

| Parameter | Result |
|--|---|
| Fuel type and consumption | 0.28 l/m ² diesel oil (27 t truck) and <0.01 l/m ² fuel oil (freighter) |
| Distance | 23% in Spain (300 km). 48% to the rest of Europe (1390 km) and 29% to the rest of the world (6250 km) |
| Capacity utilisation (including empty returns) | 85% in trucks 100% freighter |
| Bulk density of the transported products | 415.4 kg/m ³ |
| Volume capacity utilisation factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products) | 0.20 |

Module A5: Installation into the building

Table 8. TECHNICAL INFORMATION. Construction process stage. Installation into the building

| Parameter | Result |
|--|---|
| Ancillary materials for installation: | |
| Material 1: Cementitious adhesive | 3.5 kg/m ² |
| Use of fresh water | 0.88l/m ² |
| Use of other resources | Not applicable |
| Quantitative description of energy type (regional mix) and consumption during the installation process | Not applicable |
| Wastage of materials on the construction site before waste processing, generated by the product's installation (specified by type) | Packaging waste: Cardboard: 0.23 kg Plastics: 0.02 kg Wood: 0.15 kg |
| Output materials (specified by type) as a result of waste processing at the construction site | Incineration of cardboard: 19 g Recycled cardboard: 161 g Landfill disposal of cardboard: 55 g Incineration of plastics: 2 g Recycled plastics: 11 g Landfill disposal of plastics: 6 g Incineration of wood: 13 g Recycled wood: 101 g Landfill disposal of wood: 36 g |
| Direct emissions to ambient air, soil, and water | Not applicable |

Module: B1-B7: Use stage

Use stage related to the building fabric

Table 9. TECHNICAL INFORMATION. Use stage related to the building

| Parameter | Result |
|---|---|
| B2 MAINTENANCE | |
| Maintenance process | Washing once a week with water and washing with water and detergent every 2 weeks (residential use) |
| Maintenance cycle | Not applicable |
| Ancillary materials for maintenance (e.g. cleaning agent) (specify materials) | Detergent: 1.34E-04 kg/washing |
| Wastage material during maintenance (specify materials) | Not applicable |
| Net fresh water consumption | 0.1 l/washing |
| Energy input during maintenance (e.g. vacuum cleaning), energy carrier type (e.g. electricity), and amount, if applicable and relevant | Not applicable |
| B3 REPAIR | |
| Repair process | Not applicable |
| Inspection process | Not applicable |
| Repair cycle | Not applicable |
| Ancillary materials (e.g. lubricant, specify materials) | Not applicable |
| Wastage material during repair (specify materials) | Not applicable |
| Net fresh water consumption | Not applicable |
| Energy input during repair (e.g. crane activity), energy carrier type (e.g. electricity), and amount | Not applicable |
| B4 REPLACEMENT | |
| Replacement cycle | Not applicable |
| Energy input during replacement (e.g. crane activity), energy carrier type (e.g. electricity), and amount, if applicable and relevant | Not applicable |
| Exchange of worn parts during the product's life cycle (e.g. zinc-galvanised steel sheet), specify materials | Not applicable |
| B5 REFURBISHMENT | |
| Refurbishment process | Not applicable |
| Refurbishment cycle | Not applicable |
| Energy input during refurbishment (e.g. crane activity), energy carrier type (e.g. electricity), and amount, if applicable and relevant | Not applicable |
| Material for refurbishment (e.g. bricks), including ancillary materials for the refurbishment process (e.g. lubricant, specify materials) | Not applicable |
| Wastage material during refurbishment (specify materials) | Not applicable |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants) | Not applicable |

Reference service life

Table 10. TECHNICAL INFORMATION. Reference service life

| Parameter | Result |
|--|--|
| Reference service life | At least 50 years |
| Declared product properties (at the gate) and finishes, etc. | Values of the relevant characteristics according to standard EN 14411, Annex G Information included in the manufacturer's technical data sheet, according to the model. |
| Design application parameters (manufacturer's instructions), including the references to appropriate practices | APAVISA PORCELANICO has instructions for installation, cleaning, and maintenance of ceramic tiles |
| An assumed quality of work, when installed in accordance with the manufacturer's instructions | APAVISA PORCELANICO has instructions for installation, cleaning, and maintenance of ceramic tiles |
| Outdoor environment (for outdoor applications), e.g. weathering, pollutants, UV radiation and wind exposure, building orientation, shading, temperature | Values of the relevant characteristics according to standard EN 14411, Annex G Information included in the manufacturer's technical data sheet, according to the model. |
| Indoor environment (indoor applications), e.g. temperature, moisture, chemical exposure | Values of the relevant characteristics according to standard EN 14411, Annex G Information included in the manufacturer's technical data sheet, according to the model. |
| Usage conditions, e.g. frequency of use, mechanical exposure | Information included in the manufacturer's technical data sheet according to the model. |
| Maintenance, e.g. required frequency, type and quality and replacement of replaceable components | APAVISA PORCELANICO has instructions for installation, cleaning, and maintenance of ceramic tiles |

B6 Energy use and B7 Water use

Table 11. TECHNICAL INFORMATION. Energy use and water use

| Parameter | Result |
|---|----------------|
| Ancillary materials, specified by materials | Not applicable |
| Net fresh water consumption | Not applicable |
| Energy carrier type, e.g. electricity, natural gas, urban heating | Not applicable |
| Equipment output power | Not applicable |
| Characteristic performances (e.g. energy efficiency, emissions, variation in output with capacity utilisation) | Not applicable |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants) | Not applicable |

Module C1-C4: End-of-life stage

Table 12. TECHNICAL INFORMATION. End-of-life stage

| Parameter | Result |
|--|--|
| Collection process specified by type | 24.4 kg/m ² collected with mixed construction and demolition waste |
| Recovery system specified by type | 18.53 kg/m ² for recycling |
| Disposal specified by type | 2.4 kg/m ² to a controlled landfill |
| Assumptions for scenario development (e.g. transportation) | The product waste is transported in a large-tonnage truck (24 t) that meets Euro III standard. A distance of 50 km is assumed both to the final disposal site and to the recycling plant. A truck return trip (100% empty returns) is also included in accordance with the typical scenarios in the Spanish PCR for ceramic coverings. |

ANNEX I. Results of the LCA for the size with minimum environmental impact

Environmental impact indicators

The following table sets out the data of the assessed impact indicators with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO and included in this EPD with the lowest environmental impact: 30x60cm with 5.1mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view according.

Table 13. Parameters describing the environmental impacts of 1 m² of porcelain stoneware tiles (Bla), size 30x60 cm [values of the size with the lowest environmental impact]

| | GWP [kg CO ₂ eq.] | ODP [kg CFC11 eq.] | AP [kg SO ₂ eq.] | EP [kg Phosphate eq.] | POCP [kg Ethene eq.] | ADP-Element [kg Sb-Equiv.] | ADP-fossil [MJ] |
|--------------------------------------|---------------------------------|--|--------------------------------|--|-------------------------|--|--------------------|
| A1 | 1.6 | 3.9E-08 | 8.5E-03 | 1.7E-03 | 6.4E-04 | 4.1E-06 | 25.0 |
| A2 | 1.7E-01 | 1.8E-11 | 3.1E-03 | 3.1E-04 | 1.7E-04 | 7.7E-09 | 2.3 |
| A3 | 9.1 | -1.6E-10 | 1.6E-02 | 1.3E-03 | 1.2E-03 | 8.5E-07 | 148.0 |
| A4 | 6.2E-01 | 1.0E-16 | 5.2E-04 | 1.1E-04 | 7.3E-05 | 4.8E-08 | 8.4 |
| A5 | 7.9E-01 | 1.2E-13 | 1.2E-03 | 2.6E-04 | 1.1E-04 | 1.1E-06 | 3.7 |
| B2 | 2.5E-01 | 1.2E-07 | 1.3E-03 | 3.3E-04 | 4.2E-04 | 3.4E-07 | 1.3 |
| C2 | 1.1E-01 | 1.8E-17 | 8.2E-05 | 1.8E-05 | 1.2E-05 | 8.2E-09 | 1.4 |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 6.4E-02 | 6.5E-14 | 3.8E-04 | 5.1E-05 | 3.0E-05 | 2.3E-08 | 8.2E-01 |
| D | -3.4E-01 | -4.8E-09 | -1.4E-03 | -1.4E-04 | -1.4E-04 | -9.1E-08 | -8.2 |
| A1. Raw materials | | B1. Use | | C1. Deconstruction | | D. Benefits and loads beyond the system boundary | |
| A2. Transport | | B2. Maintenance | | C2. Transport | | | |
| A3. Manufacturing | | B3. Repair | | C3. Waste processing | | | |
| A4. Transport | | B4. Replacement | | C4. Disposal | | | |
| A5. Installation | | B5. Refurbishment | | | | | |
| | | B6. Operational energy use | | | | | |
| | | B7. Operational water use | | | | | |
| GWP: Global Warming Potential | | AP: Acidification Potential | | ADPE: Abiotic Depletion Potential for non-fossil resources | | | |
| ODP: Ozone Layer Depletion Potential | | EP: Eutrophication Potential | | ADPF: Abiotic Depletion Potential for fossil resources | | | |
| | | POCP: Photochemical Ozone Creation Potential | | | | | |

Indicators describing the resource use

The following table sets out the data of the parameters describing resource use with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO and included in this EPD with the lowest environmental impact: 30x60cm with 5.1mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 14. Parameters describing the resource use of 1 m² of porcelain stoneware tiles (B1a), size 30x60 cm [values of the size with the lowest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|---|--------------------------|------|---------|-------|---------|---------|---------|---------|----|---------|----------|
| Use of renewable primary energy excluding renewable primary energy resources used as raw material | MJ (net calorific value) | 12.7 | 5.4E-02 | 17.3 | 4.9E-01 | 0.9 | 4.6 | 8.3E-02 | 0 | 1.0E-01 | -2.1 |
| Use of renewable primary energy resources used as raw material | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total use of renewable primary energy resources | MJ (net calorific value) | 12.7 | 5.4E-02 | 17.3 | 4.9E-01 | 0.9 | 4.6 | 8.3E-02 | 0 | 1.0E-01 | -2.1 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material | MJ (net calorific value) | 30.2 | 2.29 | 159.0 | 8.4 | 4.2 | 1.4 | 1.4 | 0 | 8.5E-01 | -8.9 |
| Use of non-renewable primary energy resources used as raw materials | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total use of non-renewable primary energy resources | MJ (net calorific value) | 30.2 | 2.3 | 159.0 | 8.4 | 4.2 | 1.4 | 1.4 | 0 | 8.5E-01 | -8.9 |
| Use of secondary material | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Use of renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Use of non-renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net use of fresh water | m ³ | 2.4 | 6.9E-03 | 1.0 | 3.5E-02 | 2.9E-01 | 1.9E-01 | 6.0E-03 | 0 | 4.8E-02 | -4.1E-01 |
| <p>B1. Use A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary</p> | | | | | | | | | | | |

Indicators describing the waste categories and output flows

The following tables set out the data of the parameters describing waste production and output flows with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO with the lowest environmental impact: 30x60cm with 5.1mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 15. Parameters describing the waste categories of 1 m² of porcelain stoneware tiles (B1a), size 30x60 cm [values of the size with the lowest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|--|------|---------|---------|---------|---------|---------|---------|---------|----|---------|----------|
| Hazardous waste | kg | 2.4E-03 | 0 | 2.3E-02 | 0 | 0 | 0 | 0 | 0 | 0 | 7.0E-04 |
| Non-hazardous waste | kg | 5.6 | 5.9E-03 | 212.0 | 2.8E-02 | 1.2 | 1.4E-01 | 4.8E-03 | 0 | 8.1 | -5.8 |
| Radioactive waste | kg | 1.7E-03 | 2.9E-06 | 4.2E-03 | 1.1E-05 | 1.8E-04 | 1.6E-05 | 2.0E-06 | 0 | 1.2E-05 | -3.9E-05 |
| B1. Use A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary | | | | | | | | | | | |

Table 16. Parameters describing other outputs flows of 1 m² of porcelain stoneware tiles (B1a), size Slim 30x60 cm [values of the size with the lowest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|--|------|----|----|----|----|---------|----|----|------|----|----------|
| Components for reuse | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 3.3E-01 | 0 | 0 | 14.0 | 0 | -1.3E-02 |
| Materials for energy valorisation (energy recovery) | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Export energy | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B1. Use A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary | | | | | | | | | | | |

ANNEX II. Results of the LCA for the size with maximum environmental impact

Environmental impact indicators

The following table sets out the data of the assessed impact indicators with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO and included in this EPD with the highest environmental impact: 50x100 cm and 20 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 17. Parameters describing the environmental impacts of 1 m² of porcelain stoneware tiles (Bla), size 50x100 cm [values of the size with the greatest environmental impact]

| | GWP [kg CO ₂ eq.] | ODP [kg CFC11 eq.] | AP [kg SO ₂ eq.] | EP [kg Phosphate eq.] | POCP [kg Ethene eq.] | ADP-Element [kg Sb-Equiv.] | ADP-fossil [MJ] |
|--------------------------------------|---------------------------------|--|--------------------------------|--|-------------------------|--|--------------------|
| A1 | 3.8 | 1.0E-07 | 1.4E-02 | 2.5E-03 | 1.3E-03 | 8.8E-06 | 62.7 |
| A2 | 5.5E-01 | 2.3E-11 | 1.1E-02 | 1.0E-03 | 5.8E-04 | 2.6E-08 | 7.6 |
| A3 | 21.6 | -5.2E-10 | 2.4E-02 | 2.7E-03 | 2.4E-03 | 1.2E-06 | 358.0 |
| A4 | 1.2 | 2.0E-16 | 1.1E-03 | 2.3E-04 | 1.5E-04 | 9.2E-08 | 16.2 |
| A5 | 2.9 | 4.2E-13 | 4.1E-03 | 1.0E-03 | 4.1E-04 | 3.6E-06 | 12.8 |
| B2 | 8.4E-01 | 4.0E-07 | 4.4E-03 | 1.1E-03 | 1.4E-03 | 1.1E-06 | 4.3 |
| C2 | 3.6E-01 | 6.0E-17 | 2.8E-04 | 6.3E-05 | 4.1E-05 | 2.8E-08 | 4.9 |
| C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C4 | 2.6E-01 | 2.6E-13 | 1.5E-03 | 2.1E-04 | 1.2E-04 | 9.2E-08 | 3.3 |
| D | -7.7E-01 | -1.6E-08 | -2.5E-03 | -3.6E-04 | -2.5E-04 | -2.7E-07 | -15.0 |
| A1. Raw materials | | B1. Use | | C1. Deconstruction | | D. Benefits and loads beyond the system boundary | |
| A2. Transport | | B2. Maintenance | | C2. Transport | | | |
| A3. Manufacturing | | B3. Repair | | C3. Waste processing | | | |
| A4. Transport | | B4. Replacement | | C4. Disposal | | | |
| A5. Installation | | B5. Refurbishment | | | | | |
| | | B6. Operational energy use | | | | | |
| | | B7. Operational water use | | | | | |
| GWP: Global Warming Potential | | AP: Acidification Potential | | ADPE: Abiotic Depletion Potential for non-fossil resources | | | |
| ODP: Ozone Layer Depletion Potential | | EP: Eutrophication Potential | | ADPF: Abiotic Depletion Potential for fossil resources | | | |
| | | POCP: Photochemical Ozone Creation Potential | | | | | |

Indicators describing the resource use

The following table sets out the data with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO with the highest environmental impact: 50x100 cm and 20 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 18. Parameters describing the resource use of 1 m² of porcelain stoneware tiles (B1a), size 50x100 cm [values of the size with the greatest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|---|--|------|---------|-------|---------|---------|---------|---------|----|---------|-------|
| Use of renewable primary energy excluding renewable primary energy resources used as raw material | MJ (net calorific value) | 29.4 | 1.9E-01 | 22.1 | 9.4E-01 | 3.1 | 15.7 | 2.8E-01 | 0 | 4.0E-01 | -6.4 |
| Use of renewable primary energy resources used as raw material | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total use of renewable primary energy resources | MJ (net calorific value) | 29.4 | 1.9E-01 | 22.1 | 9.4E-01 | 3.1 | 15.7 | 2.8E-01 | 0 | 4.0E-01 | -6.4 |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material | MJ (net calorific value) | 72.9 | 7.6 | 372.0 | 16.2 | 14.3 | 4.9 | 4.9 | 0 | 3.4E+00 | -16.4 |
| Use of non-renewable primary energy resources used as raw materials | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total use of non-renewable primary energy resources | MJ (net calorific value) | 72.9 | 7.6 | 372.0 | 16.2 | 14.3 | 4.9 | 4.9 | 0 | 3.4E+00 | -16.4 |
| Use of secondary material | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Use of renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Use of non-renewable secondary fuels | MJ (net calorific value) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net use of fresh water | m ³ | 5.4 | 2.4E-02 | 1.7 | 6.7E-02 | 9.9E-01 | 6.5E-01 | 2.0E-02 | 0 | 1.9E-01 | -1.3 |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal D. Benefits and loads beyond the system boundary | | | | | | | | | | |

Indicators describing waste categories and output flows

The following tables set out the data of the parameters describing waste production and output flows with regard to the commercial size of porcelain stoneware tiles marketed by APAVISA PORCELÁNICO with the highest environmental impact: 50x100 cm and 20 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 19. Parameters describing the waste categories of 1 m² of porcelain stoneware tiles (Bla), size 50x100 cm [values of the size with the greatest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|--|---|---|---------|---------|---------|---------|--|---------|----|---------|----------|
| Hazardous waste | kg | 6.0E-03 | 0 | 1.2E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 2.1E-03 |
| Non-hazardous waste | kg | 17.3 | 2.0E-02 | 544.0 | 5.4E-02 | 4.4 | 4.7E-01 | 1.7E-02 | 0 | 32.3 | -18.9 |
| Radioactive waste | kg | 3.5E-03 | 9.5E-06 | 5.4E-03 | 2.2E-05 | 6.1E-04 | 5.4E-05 | 6.6E-06 | 0 | 4.7E-05 | -3.5E-05 |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use | C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal | | | | | D. Benefits and loads beyond the system boundary | | | | |

Table 20. Parameters describing other outputs flows of 1 m² of porcelain stoneware tiles (Bla), size 50x100 cm [values of the size with the greatest environmental impact]

| Parameter | Unit | A1 | A2 | A3 | A4 | A5 | B2 | C2 | C3 | C4 | D |
|--|---|---|----|----|----|---------|--|----|------|----|----------|
| Components for reuse | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 8.5E-01 | 0 | 0 | 45.2 | 0 | -5.0E-02 |
| Materials for energy valorisation (energy recovery) | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Export energy | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| A1. Raw materials A2. Transport A3. Manufacturing A4. Transport A5. Installation | B1. Use B2. Maintenance B3. Repair B4. Replacement B5. Refurbishment B6. Operational energy use B7. Operational water use | C1. Deconstruction C2. Transport C3. Waste processing C4. Disposal | | | | | D. Benefits and loads beyond the system boundary | | | | |