ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	DURAVIT AG
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DUR-20210288-IBC1-EN
Issue date	24.01.2022
Valid to	23.01.2027

Sanitary ceramic
DURAVIT AG

www.ibu-epd.com | https://epd-online.com

1. General Information

DURAVIT AG

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-DUR-20210288-IBC1-EN

This declaration is based on the product category rules:
Sanitary ceramics, 11.2017
(PCR checked and approved by the SVR)

Issue date
24.01.2022

Valid to
23.01.2027

Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

Sanitary ceramic

Owner of the declaration
DURAVIT AG
Werderstrasse 36
78132 Hornberg
Germany

Declared product / declared unit
1 ton of sanitary ceramic of an average product including washbasins, toilets, urinals, cisterns and kitchen sinks.

Scope:
This study is aimed to provide the life cycle impact assessment of Duravit sanitary ceramic products, including packaging, produced by Duravit at the Hornberg plant in Germany and worldwide distributed. The basis for the data collection is the year 2019. Due to the identical production method, the object of the study is the average ceramic production of the whole plant consisting of washbasins, toilets, urinals, cisterns and kitchen sinks, considering the total mass produced for the respective ceramic products for the reference year 2019. The system boundaries include the module A1-A3, C1-C4 and D, according to the requirements of the reference *standard EN 15804+A2:2019*, with an approach "from cradle to gate with modules C1–C4 and module D".

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard *EN 15804* serves as the core PCR
Independent verification of the declaration and data according to *ISO 14025:2010*
☐ internally ☒ externally

Angela Schindler
(Independent verifier)

2. Product

2.1 Product description/Product definition

The considered product group of sanitary ceramic mainly consists of materials such as clay, kaolin, feldspar, quartz and fireclay. The sanitary ceramic group includes washbasins, toilets, urinals, cisterns used in bathrooms and sinks used in kitchens. Particularly, the assessment focuses on the average ceramic product resulting from the total mass, produced for the ceramic products of the considered group in the reference year 2019. After preparation of the slurry, sanitary ceramic is cast or pressed, dried, glazed and then fired.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011 (CPR)* applies. The sanitary ceramics needs a declaration of performance taking into consideration EN 997, EN 13407, EN 14528, EN 14688, EN 13310 and the CE-marking. For the application and use the respective national provisions apply.

2.2 Application

The sanitary ceramic group includes washbasins, toilets, urinals, cisterns used in bathrooms and sinks used in kitchens. Washbasins, toilets, urinals and cisterns represent bathroom furnishings and are used for personal hygiene in particular. On account of the comparable manufacturing process, kitchen sinks can also be allocated to this group and represent also furnishing products.

2.3 Technical Data

Sanitary ceramic is subject to the following technical data.

Constructional data

Name	Value	Unit
Washbasins L x W x H	800 x 450 x 170	mm
Toilets L x W x H	600 x 360 x 400	mm
Urinals L x W x H	600 x 300 x 350	mm
Water cisterns L x W x H	390 x 165 x 330	mm
Kitchen sinks L x W x H	1000 x 510 x 225	mm
Maximum water absorption	0.5 - 12	Vol.-%
Water absorption test	< 0.5	Vol.-%
Impact resistance	35 - 60	N/cm
Resistance to chemicals and staining	PASS	-
Resistance to temperature change	PASS	-

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to*:*

- *EN 997: 2012 / AC: 2012* Toilet bowls and toilet facilities with molded sifon trap
- *EN 13407: 2006* Wall-hung urinals
- *EN 14528: 2007* Sit-in sinks
- *EN 14688: 2006* Sanitary appliances - Wash basins
- *EN 13310: 2003* Kitchen sinks
- *AS 1976*
- *AS 1172.1*
- *AS 1172.2*
- *AS / NZS 3982*
- *ASME A112.19.2 / CSA B45.1*
- *ASME A112.19.14*

2.4 Delivery status

Average product weight on delivery, excluding packaging:

- Washbasins - 16 kg
- Toilets - 24.9 kg
- Urinals -16.9 kg
- Water cisterns -18.6 kg
- Kitchen sink - 12.8 kg

2.5 Base materials/Ancillary materials

The list below provides an overview of the average composition (% by mass) of sanitary ceramic:

- Clay: 24.7 % - 26.2 %
- Kaolin:19.3 % - 34.6 %
- Feldspar: 0.0 % - 31.4 %
- Quartz: 7.3 % - 22.8 %
- Fireclay: 2.0 % - 28.6 %
- Other components: 0.0 % - 9.8 %

Other components refer to lime, dolomite, wollastonite, zirconium silicate, frit, and other additives in a negligible content (about 1 % all together).

This product contains substances listed in *the candidate list* (substances of very high concern SVCH) exceeding 0.1 percentage by mass: no.
This product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on *the candidate list*, exceeding 0.1 percentage by mass: no.
Biocide products were added to this construction product: yes.
Formaldehyde and Preventol are used as fungicides but they evaporate fully and they are not present anymore in the product after the burning process.

2.6 Manufacture

The raw materials delivered to the production plant are first dried (if necessary) and then stored in silos. Components that are not so relevant in terms of quantity are delivered in bags. Some of the raw materials must first be treated mechanically, in the form of grinding. The slip is then prepared by mixing the raw materials with water and sieving them. The raw material mix is stirred with the addition of water, then sieved and only then ground. The addition of glue takes place shortly before processing. The casting moulds required for production are either made of plaster or porous plastic. For small series, a manual casting process and exclusively plaster moulds are used. Another production method is the battery casting process, also with plaster moulds. The porous plastic moulds are used only for big quantities with high-pressure casting. After casting, the ceramic products are fed to different drying processes, depending on their complexity. The glaze is applied to the dried blank either manually or fully automatically with robots. In both processes, the overspray is collected, returned and reused. In order to achieve the highest possible stocking density, the glazed blanks are manually positioned on the kiln carriage. The firing takes place in a tunnel kiln at over 1250 °C and for approximately 17-20 hours. After firing, each product is subjected to an extensive individual test. The Duravit brand logo is applied to flawless parts with a laser. This is followed by the following processes:

- At the customer's request, the surface can be refined (Wondergliss coating);
- Depending on the installation (e.g. integration in bathroom furniture or on glass plates, etc.) some products must be sanded;
- Packaging, storage and shipping.

Products that do not meet the quality requirements can often be repaired and re-fired in a shuttle kiln or recycled as waste. Product scraps are instead sent to landfill.
In order to ensure consistently high quality, extensive controls are carried out, starting with the delivery of raw materials and in all process sections. For many products, shrink plates are required in the firing process. Most of these are made from filter cake that accumulates in the internal wastewater treatment

plant. In general, care is taken to achieve a high recycling rate for the waste and to increase it continuously.
According to the company indications, sanitary ceramic products at the end of life are disposed in inert landfills.
The production site in Hornberg is certified according to *ISO 9001*.

2.7 Environment and health during manufacturing

Legal conformity in relation to occupational safety, health and environmental protection is maintained throughout the entire manufacturing process for sanitary ceramic.
The production site in Hornberg is certified according to *ISO 14001* and *ISO 50001*.

2.8 Product processing/Installation

There are no particular requirements on machines to be used or dust extraction during installation. The tools required or the use of additional ancillary materials is listed in the assembly instructions supplied with each product.

2.9 Packaging

Sanitary ceramic is packaged in cardboard boxes fixed to the pallets with plastic stetch film.

2.10 Condition of use

No particular features arise in the material composition of the product during use.

2.11 Environment and health during use

As sanitary ceramic is fired at very high temperatures, it is solid and chemically stable. No negative interactions can be anticipated between the product, environment and health during the service life.

2.12 Reference service life

According to the scope of this study, the reference service life is not declared.

2.13 Extraordinary effects

Fire

Sanitary ceramic is classified as construction product class A1, non-combustible without percentages of combustible construction products, in accordance with *EN-13501-1*, and therefore approved for a variety of indoor and outdoor applications.

Fire protection

Name	Value
Building material class	A1
Burning droplets	-
Smoke gas development	-

Water

In the event of unforeseen impact by water (e.g. flooding) on sanitary ceramic, no negative impacts are to be anticipated in terms of product function or the environment.

Mechanical destruction

In the event of minor, unforeseen mechanical damage, no impacts are to be anticipated in terms of sanitary ceramic product function.

2.14 Re-use phase

Even if material recycling of sanitary ceramic products is theoretically possible, it is however very complex.

2.15 Disposal

According to the company indications, sanitary ceramic products at the end of life are disposed in inert landfills.

2.16 Further information

Additional information available online at www.duravit.de

3. LCA: Calculation rules

3.1 Declared Unit

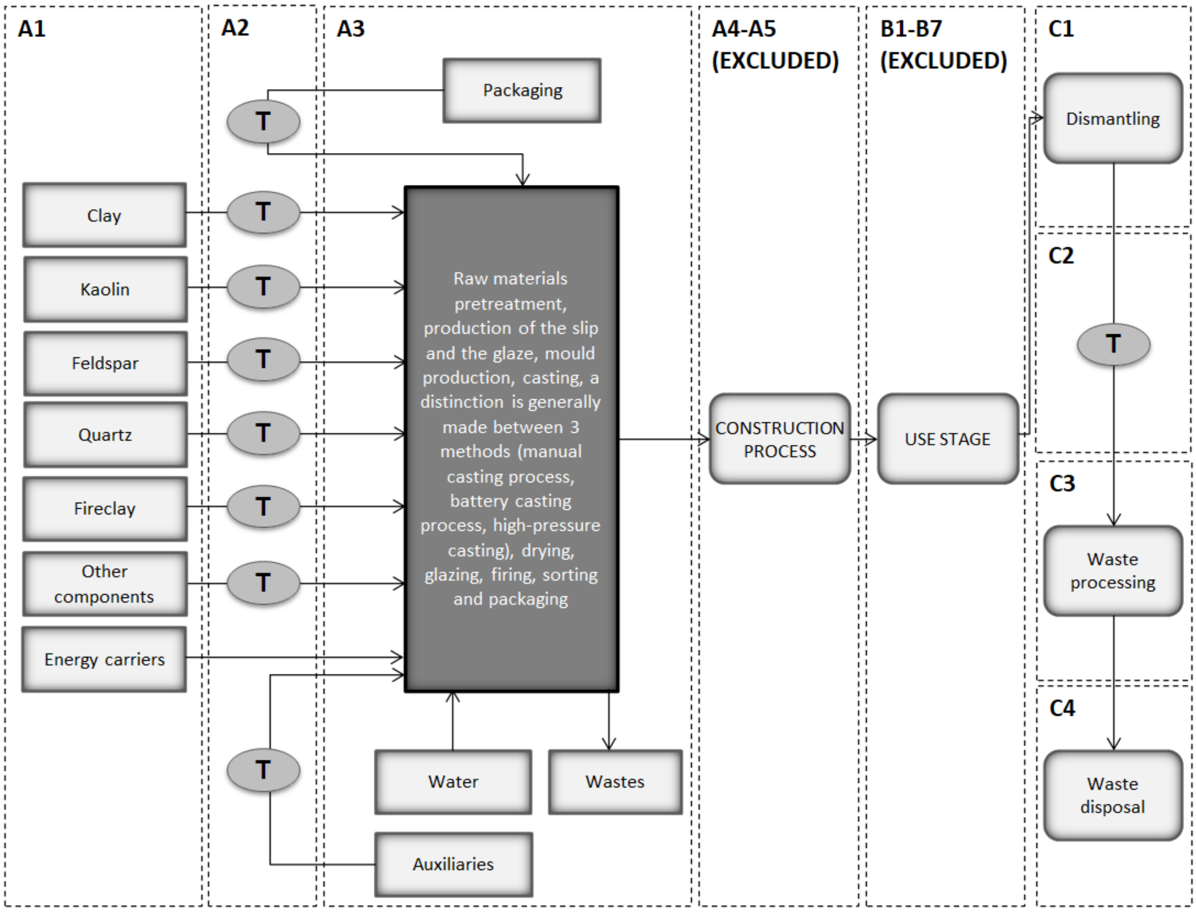
A declared unit of 1 ton of sanitary ceramic of an average product including washbasins, toilets, urinals, cisterns and kitchen sinks, is used as the basis for calculating the life cycle assessment. All environmental impacts of the product are related to 1 ton of sanitary ceramic. Because of the identical manufacturing method, an average ceramic product made of washbasins, toilets, urinals, cisterns and kitchen sinks has been considered according to the total mass produced for the respective ceramic products for the reference year 2019. Product accessories are not considered, as the analysis of electronic parts and nozzles for the involved sanitary ceramic products would be beyond the scope of this study. The average product, without packaging, has a total weight of 1000 kg in relation to the declared unit. The packaging has a weight of 97.32 kg per declared unit.

Declared unit

Name	Value	Unit
Declared unit	1	t
Mass per peace (average)	16.71	kg

3.2 System boundary

The system boundaries include the module A1-A3, C1-C4 and D, according to the requirements of the reference standard *EN 15804*, with an approach “from cradle to gate with modules C1–C4 and module D”. Construction, maintenance and decommissioning of infrastructures (in terms of buildings) and the occupation of industrial land are not part of the present EPD since their contribution to the overall environmental impact of the product assessed may be considered negligible. Moreover, the construction process stage (modules A4-A5) and use phase (modules B1-B7) are not included in the assessment. Particularly, because of the type of product assessed, C1 results are equal to zero.



3.3 Estimates and assumptions

Some assumptions have been made according to as follow:

- Frit (raw material) was modelled considering flat glass dataset as proxy for fritted glass (finely porous glass);
- Quartz (raw material) was modelled consideringas silica sand;
- Wollastonite (raw material) was modelled considering a mix of CaO (48.5 % of calcium oxide) and SiO_2 (51.75 % of silicon dioxide);
- Stretch film (packaging) was modelled considering packaging film in low linear density polyethylene;
- Tap water was modelled starting from the existing databases which have been properly modified considering as much as possible Germany as the reference country for default input and output inventory flows;
- Glue, barium hydroxide, barium carbonate, cordierite and wood packaging transport was assumed with a travel distance by lorry of 500 km;
- EoL waste processing was modelled with a shredding treatment assuming an electricity consumption of 0.02852 kWh/kg derived from existent *Ecoinvent v.3.6* dataset for plastic flake consumer electronics recycling by grinding/shredding;
- EoL waste disposal was modelled considering 100 % inert landfilling.

Furthermore, the following assumptions were made regarding the geographical reference and generic data from the databases: when no datasets were available for the Germany context, European and global datasets were adopted.

3.4 Cut-off criteria

In this study, the consumption of dye, condenser, cordierite (as auxiliary), hydrogen peroxide and the respective transport to the German plant have been neglected. Their total incidence by mass, in fact, is about 0.2 %. Moreover, residual lime waste, kiln waste, wood waste, paper waste, plastic waste, municipal waste, raw mixes waste, hazardous waste and metal waste coming from the production plant have been neglected according to their low incidence.

3.5 Background data

Primary data, covering the reference period January 2019 – December 2019, have been collected through a specific data sheet in Excel format prepared and shared with the German plant and filled by the different data owners. They include particularly:

- Inbound transport of raw materials, packaging and auxiliaries to the production plant at Hornberg.
- Waste produced during the production of the assessed product (type and quantity).
- Bill of materials for the whole yearly ceramic production (type and quantity).
- Co-products related to the main product (type and quantity).
- Production processes involved in ceramic

production, including energy mix (electricity and heat) and water consumed at the plant.

When primary data were missing, databases and sources from the international literature have been adopted, particularly according to as follow:

- Combustion processes of vehicles: emissions, maintenance, use of the road network and fuel consumption (*Ecoinvent v.3.6*).
- Electricity: energy mix, distribution network, emissions and losses (*Ecoinvent v.3.6*).
- Production of all the materials used (*Ecoinvent v.3.6*).
- Waste processing: specific parameters such as energy efficiency of incineration plant, waste treatment scenarios and quality of recovered material (scientific articles and sectorial literature).

3.6 Data quality

The data adopted in this study have been collected according to the following requirements:

- Time coverage: primary data cover a period of 12 months (January 2019 - December 2019). General data and databases are not older than 10 years.
- Geographical coverage: data refer as much as possible to the specific geography context, e.g. for electricity consumption at the Hornberg plant has been considered the specific supplier mix. The European context has been considered as proxy for waste disposal at the EoL since sanitary products are mainly distributed in Europe.
- Technological coverage: data collected refer to the state of the art of the technologies used for the production of materials.
- Accuracy: data collected refer to specific consumption and measurements of reference year 2019.
- Completeness: the percentage of mass flow included in the study is more than 99 %.
- Representativeness: information were collected specifically on site for the product under study.
- Consistency: the adopted methodology has been extended uniformly to each life cycle stages.
- Reproducibility: all data were collected through an Excel file form allowing a third party to reproduce the results reported in the study report.
- Data sources: data derive from primary sources and, where it was not possible, from secondary sources like internationally recognized databases.
- Uncertainty: uncertainty of data and assumptions was assessed through a Monte Carlo analysis.

Scoring from 1 to 5 (very good, good, fair, poor, very poor) has been adopted for the data quality levels according to the *EN 15804* at Annexe E (table E.2). The Data Quality Rating (DQR), instead, will correspond to a data quality level defined as follows:

- Overall data quality rating (DQR) from 1.6: excellent quality
- Overall data quality rating (DQR) from 1.6 to 2.0: very good quality
- Overall data quality rating (DQR) from 2.0 to 3.0: good quality
- Overall data quality rating (DQR) from 3 to 4.0: fair quality
- Overall data quality rating (DQR) > 4: poor quality

The value obtained for DQR (Data Quality Rating) is equal to 2.30 (good quality).

3.7 Period under review

Data collection was performed considering the reference period January 2019 - December 2019.

3.8 Allocation

For the production of sanitary ceramic, the assignment of the production data has been carried out on site by Duravit allocating all the inventory data to the investigated process according to the fact that the production plant is owned by Duravit (thus production refers totally only to Duravit).
Considering the co-products resulting from the main process, declared by the company in smooth (rejected ceramic) and shrinkage plate, an economic allocation has been applied according to the primary data provided by Duravit. However, because of the very low incidence of the co-products on the final impact results due to their low mass and economic value, it has been assumed that all the environmental burdens are allocated to the ceramic product.
Finally, according to the “polluter pays principle” required by the *EN 15804*, in this study the *Ecoinvent* “Cut-off” datasets have been adopted for all the selected items.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

For background data *Ecoinvent database* (Version 3.6) was used.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
The biogenic carbon content of wood-based products has been calculated according to *EN 16449*, Wood and wood-based products — Calculation of the biogenic carbon content of wood and conversion to carbon dioxide.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in product	0	kg C
Biogenic Carbon Content in accompanying packaging	49.06	kg C

Additional technical scenario information for module A5 (not declared in this study) are provided. Particularly, product packaging is represented by cardboard boxes fixed to the pallets with plastic stretch film (low-linear density polyethylene LLDPE) characterized at their EoL according to the national scenario of each country where the product will be finally installed.

End of life (C1-C4)
Considering the EoL of ceramic product, it is basically disposed to inert landfill (allocated to module C4) without any kind of energy recovery after the product has been previously shredded, this last allocated to module C3.

Name	Value	Unit
Landfilling Inert	1000	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information
According to the system product investigated, potential loads and credits are null since waste flows coming from the production plant (A3) are not significant thus they can be neglected, and no potential loads and benefits arise from EoL module since the product is finally disposed in an inert landfill.

5. LCA: Results

The following results for the 2019 Duravit sanitary average ceramic product from the plant at Hornberg (Germany) are given, unless otherwise indicated, per 1 ton of ceramic average product.

Disclaimer:

EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 ton Sanitary caramic

Core Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	1.82E+3	1.56E+2	6.77E+2	0.00E+0	1.28E+2	1.86E-1	5.28E+0	0.00E+0
GWP-fossil	[kg CO_2-Eq.]	1.79E+3	1.55E+2	6.67E+2	0.00E+0	1.28E+2	1.85E-1	5.27E+0	0.00E+0
GWP-biogenic	[kg CO_2-Eq.]	1.96E+1	8.76E-2	7.33E+0	0.00E+0	3.49E-2	8.06E-4	1.04E-2	0.00E+0
GWP-luluc	[kg CO_2-Eq.]	9.72E+0	5.88E-2	2.90E+0	0.00E+0	1.19E-2	3.35E-4	1.47E-3	0.00E+0
ODP	[kg CFC11-Eq.]	2.73E-4	3.55E-5	6.41E-5	0.00E+0	2.79E-5	7.66E-9	2.17E-6	0.00E+0
AP	[mol H^+-Eq.]	3.39E+0	1.16E+0	5.43E+0	0.00E+0	8.10E-1	9.24E-4	5.00E-2	0.00E+0
EP-freshwater	[kg PO_4-Eq.]	3.58E-1	1.17E-2	2.28E-1	0.00E+0	2.68E-3	9.16E-5	5.41E-4	0.00E+0
EP-marine	[kg N-Eq.]	8.91E-1	3.80E-1	5.41E-1	0.00E+0	3.25E-1	1.75E-4	1.73E-2	0.00E+0
EP-terrestrial	[mol N-Eq.]	9.66E+0	4.17E+0	5.19E+0	0.00E+0	3.57E+0	1.76E-3	1.90E-1	0.00E+0
POCP	[kg NMVOC-Eq.]	2.88E+0	1.17E+0	1.94E+0	0.00E+0	1.26E+0	4.70E-4	5.51E-2	0.00E+0
ADPE	[kg Sb-Eq.]	4.25E-3	3.83E-3	3.64E-3	0.00E+0	7.56E-4	3.17E-7	4.82E-5	0.00E+0
ADPF	[MJ]	2.70E+4	2.36E+3	4.51E+3	0.00E+0	1.74E+3	2.39E+0	1.47E+2	0.00E+0
WDP	[m^3 world-Eq deprived]	1.33E+2	7.08E+0	7.79E+1	0.00E+0	1.39E+0	2.88E-2	6.60E+0	0.00E+0

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 ton Sanitary caramic

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	2.67E+3	3.35E+1	1.02E+3	0.00E+0	6.55E+0	2.64E-1	1.19E+0	0.00E+0
PERM	[MJ]	0.00E+0	0.00E+0	5.98E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.67E+3	3.35E+1	1.62E+3	0.00E+0	6.55E+0	2.64E-1	1.19E+0	0.00E+0
PENRE	[MJ]	2.70E+4	2.36E+3	4.38E+3	0.00E+0	1.74E+3	2.39E+0	1.47E+2	0.00E+0
PENRM	[MJ]	0.00E+0	0.00E+0	1.33E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	2.70E+4	2.36E+3	4.51E+3	0.00E+0	1.74E+3	2.39E+0	1.47E+2	0.00E+0
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	7.19E+0	2.62E-1	5.58E+0	0.00E+0	6.14E-2	1.32E-3	1.57E-1	0.00E+0

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 ton Sanitary caramic

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	3.61E-2	5.82E-3	4.36E-2	0.00E+0	4.68E-3	8.14E-7	2.20E-4	0.00E+0
NHWD	[kg]	6.99E+1	1.38E+2	2.56E+2	0.00E+0	8.26E+0	1.22E-2	1.00E+3	0.00E+0
RWD	[kg]	2.85E-2	1.61E-2	1.50E-2	0.00E+0	1.24E-2	7.49E-6	9.67E-4	0.00E+0
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported

	thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 ton Sanitary caramic

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PM	[Disease Incidence]	3.09E-5	1.35E-5	2.89E-5	0.00E+0	1.73E-5	6.72E-9	9.71E-7	0.00E+0
IRP	[kBq U235-Eq.]	6.37E+1	1.22E+1	2.71E+1	0.00E+0	7.85E+0	2.70E-2	6.58E-1	0.00E+0
ETP-fw	[CTUe]	6.13E+4	1.90E+3	2.66E+4	0.00E+0	9.92E+2	3.29E+0	9.55E+1	0.00E+0
HTP-c	[CTUh]	4.37E-7	7.05E-8	4.62E-7	0.00E+0	1.60E-8	3.93E-11	2.21E-9	0.00E+0
HTP-nc	[CTUh]	1.08E-5	2.23E-6	1.52E-5	0.00E+0	6.93E-7	1.60E-9	6.79E-8	0.00E+0
SQP	[-]	1.92E+3	1.92E+3	5.03E+3	0.00E+0	3.03E+2	3.73E-1	3.09E+2	0.00E+0

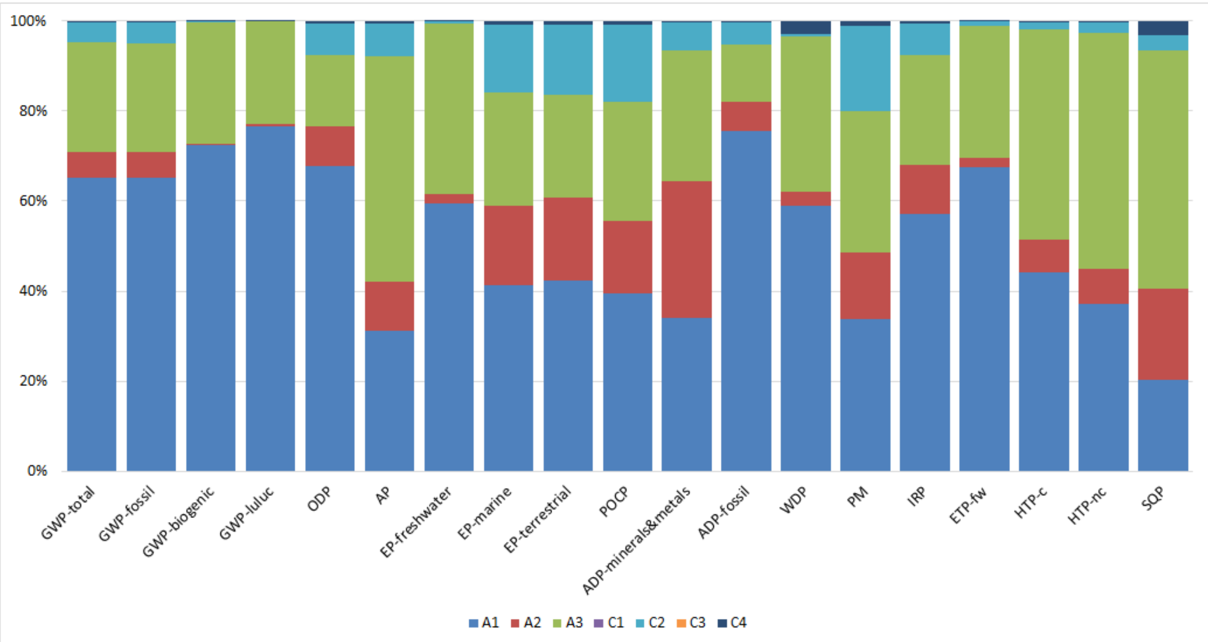
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

6. LCA: Interpretation

Results are discussed below providing also their graphical representation:



The above results indicates that most of the environmental impacts is because of module A1 (extraction and provision of the raw materials) with an average incidence of 52 % (values varying between 20 % and 77 %). The second larger contributor is module A3 (manufacturing) with an average incidence of 31 % (values varying between 13 % and 53 %). The next largest contribution to the total impacts comes from module A2, with an average incidence of 10 % (values varying between 0 % and 31 %). Modules C1-C4 together have an average incidence of 7 %, with module C2 (EoL transport) characterized by an average impact of 6 % (values varying between 0 % and 19 %).
The main hotspot of product stages is energy plant mix with an average incidence of 25 % among all the impact categories, with the highest incidence on GWP-total (46 %), ODP (52 %) and ADP-fossil (57 %) mainly due to the natural gas consumption needed to produce thermal energy.

The second largest contributor to the product stages is waste (plant), with an average incidence of 18 % (up to 43 % for both EP-freshwater and HTP-nc) mainly because of the final disposal of filter cake and gypsum. Fireclay is the next hotspot with an average incidence of 10 % (up to 19 % on PM impact category), together with other materials (plant) characterized by and an average incidence of 9 % among all the impact categories mainly because of Aluminium oxide, Barium hydroxide, Detergent, Glue, Lime and Zirconium silicate.
Considering transport (module A2), its average contribution to the final results is 10 %, affecting particularly the impact categories of EP-marine (17 %), EP-terrestrial (18 %), POCP (16 %), ADP-minerals&metals (30 %), SQP (20 %).

Finally, it is possible to highlight that packaging is characterized by an incidence on final total results significant only for the impact categories of WDP (17 %) and SQP (42 %) due to the corrugated board box. Considering that this study is focused on an average product, an additional assessment aimed to evaluate the variance of the final impacts according to different raw materials contents in the final product has been performed. Particularly, two different bills of materials were considered: one characterized by the lower average impacts and one characterized by the higher average impacts. This was done according to the % variability of fireclay (min-max) which is the main hotspot among all materials.
Results from the assessment highlight a potential variability for the GWP-total impact indicator ranging from -12,3 % up to +1,3 %.

7. Requisite evidence

Not relevant.

8. References

IBU 2021
Institut Bauen und Umwelt e.V.: Allgemeine Anleitung für das EPD-Programm des Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021.
www.ibu-epd.coM

ISO 9001
ISO 9001:2015 Quality management systems — Requirements.

ISO 14001
ISO 14001:2015/ Environmental Management Systems – Requirements with Guidance for Use.

ISO 14025
ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

ISO 14040
ISO 14040:2006/Amd 1:2020 Environmental management - Life cycle assessment - Principles and framework.

ISO 14044
ISO 14044:2006/Amd 2:2017 Environmental management - Life cycle assessment – Requirements and guidelines.

ISO 50001
ISO 50001:2018 - Energy management systems - Requirements with guidance for use.

EN 997
EN 997:2012 - WC pans and WC suites with integral trap.

EN 13310
EN 13310:2003 - Kitchen sinks - Functional requirements and test methods.

EN 13407
EN 13407:2006 - Wall-hung urinals - Functional requirements and test methods.

EN 13501-1
EN 13501-1:2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

EN 14528
EN 14528:2007 - Bidets - Functional requirements and test methods.

EN 14688
EN 14688:2006 - Sanitary appliances - Wash basins - Functional requirements and test methods.

EN 15804
EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction works.

EN 16449
EN 16449:2014 Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide.

AS 1172.1
AS 1172.1:2014 - Sanitary plumbing products.

AS 1172.2
AS 1172.1:2014 - Sanitary plumbing products.

AS 1976
AS 1976:1992 - Vitreous china used in sanitary appliances.

AS / NZS 3982
AS / NZS:1996 - Urinals.

ASME A112.19.1
ASME A112.19.1:2018 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures.

ASME A112.19.2/CSA B45.1
ASME A112.19.2/CSA B45.1:2018 - Ceramic Plumbing Fixtures.

Reg. (UE) 305/2011
Regulation of the European Parliament and of the Council (EU) No 305/2011 of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106 / EEC, Official Journal EU No L 88, 4.4.2011.

SVCH list
Candidate List of Substances of Very High Concern for Authorisation. Helsinki, ECHA.

PCR Part A
PCR for Building-Related Products and ServicesPart A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report/ Prepared by Institute Construction and Environment e.V. (IBU), Institut Bauen und Umwelt e.V. (IBU), Rheinufer 108, 53639 Königswinter, V 2.0.1 – 04-2021.

PCR Part B
PCR for Building-Related Products and ServicesPart B: Requirements on the EPD for Sanitary ceramics/ Prepared by Institute Construction and Environment e.V. (IBU), Institut Bauen und Umwelt e.V. (IBU), Panoramastr 1, 10178 Berlin, 2012:07, DATE 11-2017.

Pré Consultants, 2020. Software SimaPro version 9.1.1.1.

Ecoinvent v.3.6. Swiss Centre for Life Cycle Assessment provider of dataset.

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
SGS-TÜV Saar GmbH
Rheinpromenade 12
67061 Ludwigshafen
Germany

Tel +49 (0)6897 506 60
Fax +49 (0)6897 506 102
Mail info@sgs-tuev.de
Web **https://www.sgs-tuev-saar.com**

Owner of the Declaration
DURAVIT AG
Werderstraße 36
78132 Hornberg
Germany

Tel 07833/ 70-0
Fax 07833/ 70-289
Mail info@duravit.de
Web **www.duravit.de**