

# ENVIRONMENTAL PRODUCT DECLARATION



ENVIRONMENTAL PRODUCT DECLARATIONS



In accordance with ISO14025 and EN15804 for  
**VITREOUS CHINA(VC) & FINE FIRE CLAY (FFC) CERAMIC SANITARYWARE**  
from

**Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.**

|                           |                                                                        |                                                                                    |
|---------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Programme :               | The International EPD® System                                          | EPD Turkey, fully aligned regional programme                                       |
| Programme Operator :      | EPD Turkey<br><a href="http://www.epdturkey.org">www.epdturkey.org</a> | EPD International AB<br><a href="http://www.environdec.com">www.environdec.com</a> |
| EPD Registration Number:  | S-P-00875                                                              |                                                                                    |
| ECO Platform Reg. Number: | ECO-00000717                                                           |                                                                                    |
| Publication Date:         | 28.05.2018                                                             |                                                                                    |
| Validity Date :           | 14.05.2023                                                             |                                                                                    |
| Geographical Scope:       | Global                                                                 |                                                                                    |

 **Kale**



# INFORMATION

The LCA for this EPD is conducted according to the guidelines of ISO 14040/44 and the requirements given in the Product Category Rules (PCR) document for Construction Products and Construction Services (2012:01, Version 2.2) with reference to EN 15804 and the general program guidelines by The International EPD System in accordance with ISO 14025 standards.

The inventory for the LCA study is based on the 2016 production figures for VC and FFC Ceramic Sanitaryware manufactured by Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş. in their Çan production plant located in Çanakkale, Turkey.

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

|                                                                       |                                                                                                                                                                                 |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EPD Programme</b>                                                  | The International EPD® System<br><a href="http://www.environdec.com">www.environdec.com</a>                                                                                     |
| <b>EPD Programme Operator</b>                                         | EPD Turkey, Istanbul - Turkey<br><a href="http://www.epdturkey.org">www.epdturkey.org</a>                                                                                       |
| <b>EPD Owner</b>                                                      | Kaleseramik Çanakkale Kalebodur Seramik Sanayi A.Ş.<br><a href="http://www.kale.com.tr">www.kale.com.tr</a>                                                                     |
| <b>Declared Unit</b>                                                  | 1 tonne VC and FFC Ceramic Sanitaryware                                                                                                                                         |
| <b>CPC Code</b>                                                       | 3721                                                                                                                                                                            |
| <b>EPD Based on Product Category Rules (PCR)</b>                      | The CEN standard EN 15804 serves as the core PCR<br>The International EPD® System's PCR 2012:01 Construction products and Construction services, Version 2.2, 2017-05-30        |
| <b>PCR Review Conducted by</b>                                        | Technical Committee of the International EPD® System<br><a href="http://www.environdec.com">www.environdec.com</a> <a href="mailto:info@environdec.com">info@environdec.com</a> |
| <b>Independent Verification and data, according to ISO 14025:2006</b> | <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External <input type="checkbox"/> EPD® Process Certification                                              |
| <b>System Boundaries</b>                                              | <input type="checkbox"/> Cradle to Gate <input checked="" type="checkbox"/> Cradle to Gate with Option <input type="checkbox"/> Cradle to Grave                                 |
| <b>Approved and Verified by</b>                                       | Vladimír Kočí, PhD                                                                                                                                                              |
| <b>LCA Report and EPD Prepared by</b>                                 | Metsims Sustainability Consulting<br><a href="http://www.metsims.com">www.metsims.com</a>                                                                                       |

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

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

For more information about this Environmental Product Declaration or its contents, please contact [kaleseramik@kale.com.tr](mailto:kaleseramik@kale.com.tr)

# ABOUT KALE

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

Kaleseramik's sanitaryware products take place in market under Çanakkale Seramik, Kalebodur and Kale brand names.

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

# PRODUCT INFORMATION

Sanitaryware is the generic term used to describe items which traditionally were made from pottery. i.e. WC's, Washbasins and Bidets installed within a bathroom or washroom. Vitreous China (VC) is a common material used for bathroom sanitaryware, such as console sinks and toilets. Vitreous China sanitaryware products are primarily made of clay, kaolin, feldspar and quartz but they may also include small quantities of other raw materials. Its high gloss, stain resistant surface is ideal for use in both bath-rooms and kitchens. The casting slip is made of the above raw materials are prepared and cast into plaster moulds to form a green body. The green body then undergoes a natural drying process and were given a smooth finish. Glazing is applied before firing at 1200°C to obtain Vitreous China sanitaryware with almost no water absorption.

In fine fireclay, (FFC) the pre-fired or calcined clay is the single most important component and can account for over 40% of the body. Other constituents include clay, kaolin and other minor raw materials. Their production starts with preparation of casting slip from the above constituents. The slip is cast into plaster moulds to form green body. The green body then undergoes a natural drying process and were given a smooth finish before tuner dryers. Glazing is applied before firing at 1220°C to obtain fire clay sanitaryware with water absorption less than 0.5% of the dry weight.

| Technical Specification                     | Kaleseramik VC Sanitaryware | Kaleseramik FFC Sanitaryware | Related Standards      |
|---------------------------------------------|-----------------------------|------------------------------|------------------------|
| Harkord-Cracking                            | Compliant                   | Compliant                    | no referenced standard |
| Autoclave                                   | Compliant                   | -                            | TS 605                 |
| Water Absorption                            | Compliant                   | -                            | EN 997                 |
| Resistance To Chemicals And Staining Agents | Compliant                   | Compliant                    | NFD 14-508-NFD 14-506  |
| Surface Hardness                            | Compliant                   | Compliant                    | TS 605                 |
| Resistance To Acids                         | Compliant                   | Compliant                    | NFD 14-508             |
| Resistance To Hot Alkaline Solutions        | Compliant                   | Compliant                    | NFD 14-507             |

## Areas of Use

A standard product classification in sanitaryware is as follows:

- \* Main pieces: WC, basin, lavatory;
- \* Larger bathroom pieces: shower tray, bathtub;
- \* Other pieces: bidet, pedestals, washbasins
- \* WCs for communities and for disabled people, et

## Application

Sanitaryware can be applied in newly constructed buildings and in renovation and maintenance projects in both residential and non-residential buildings. Residential buildings can be rental or privately-owned houses; non-residential buildings are other buildings such as commercial offices, but also hospitals and hotels. The material employed for the realization of the sanitary products in ceramics (vitreous china, fire clay, fine fire clay) determines the characteristics and the final destination of the product.

Vitreous china ceramic sanitaryware is extremely robust and naturally resistant. Fine fireclay ceramics sanitaryware possess very high thermal shock resistance characteristics and can be used for both cold and hot water applications. The fire clay ceramic sanitaryware products are used as shower trays, countertops, lavatories for the kitchen and public washhouses for communities, etc.

# SYSTEM BOUNDARY

This LCA is cradle to gate with options. The system boundary involves raw materials (A1), transport (A2), manufacturing (A3) and disposal (C4).

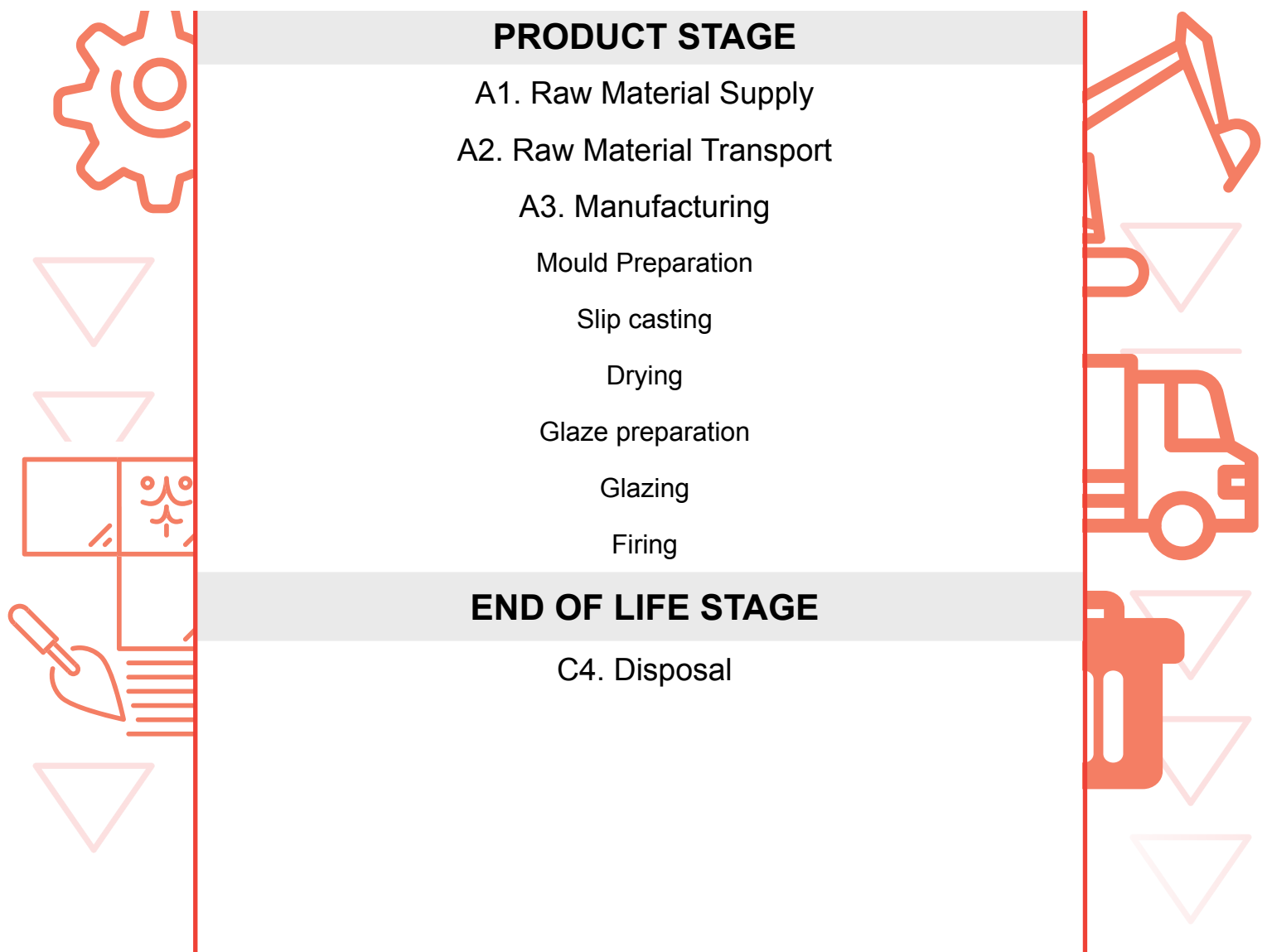
**A1. Raw materials** supply includes pre-treatment before production such as casting slip, plaster mould and glaze preparations.

**A2. Transport** is only relevant for delivery of raw materials to the plant and forklift usage within the factory.

**A3. Manufacturing** stages start with slip casting (forming), drying, glazing, firing, quality control and packaging.

**C4. Disposal** Sanitaryware production waste is inert waste, which is stored on site then disposed of in landfills according to current legislation. Packaging is assumed to end up at packaging recycling streams and plaster mould and product discards ends up at C&D related waste. Product waste scenario is created separately depending on the geographic location of the use phase.

The flow of the process is depicted on the below.



# ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Functional Unit/<br/>Declared Unit</b> | The declared unit is the production of 1 tonne VC and FFC Ceramic Sanitaryware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Goal and Scope</b>                     | Evaluation of environmental impacts for 1 tonne VC and FFC Ceramic Sanitaryware from cradle to grave.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>System Boundary</b>                    | The system boundary covers A1 - A3 product stages referred as 'Raw material supply', 'Transport' and ' Manufacturing' and C4 'End of life' stages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Cut-Off Rules</b>                      | For this LCA study, no cut-off criteria was applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Background Data</b>                    | For local data specific for Turkey, TLCID (V1.01) developed by SÜRATAM was used. For any other background data the Ecoinvent database (V3.2) was used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Data Quality</b>                       | Raw materials, energy and water consumption, waste and material and product transport data is collected from Kaleseramik.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Period Under Review</b>                | All primary data collected from Kaleseramik is for the period year of 2016.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Allocations</b>                        | There are no co-products in the production of ceramic sanitaryware manufactured by Kaleseramik. Hence, there was no need for co-product allocation. Kaleseramik sources raw materials from different locations across Turkey and other parts of the world and by different means of transport (truck and ship). For this reason, transport was allocated according to tonnages for almost all raw materials bought by Kaleseramik. Kaleseramik manufactures various ceramic sanitaryware within the Company's Çanakkale plant in Turkey. Electricity and combined heat power (CHP) powered by natural gas are used. Raw materials, transport, packaging, waste, and energy consumption data were allocated for each product using related production tonnages from Kaleseramik's Çanakkale plant for the average product. The study reflects the average VC and FFC ceramic sanitaryware product manufactured by Kaleseramik is sold on the market under Kaleseramik Bathroom brand name. |

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

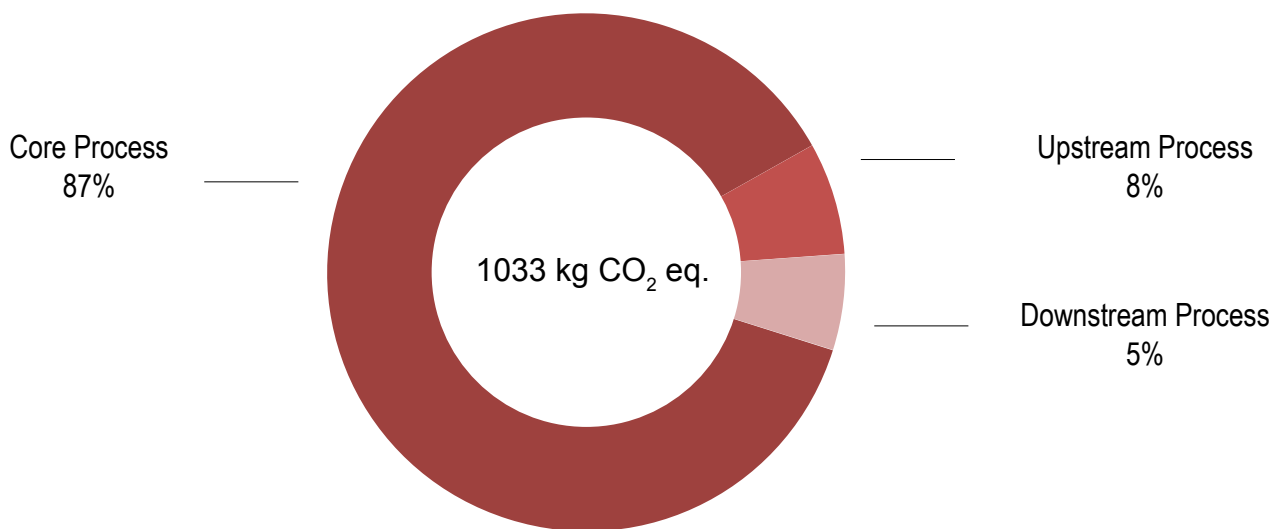
Description of the system boundary (X = Included in LCA, MNA= Module Not Declared, NR=Not Relevant)

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

All energy calculations were obtained using Cumulative Energy Demand V1.09 methodology, while environmental impacts are calculated with the CML-IA baseline V4.2 within SimaPro LCA Software. The net fresh water use reflect the water consumption during manufacturing processes and water scarcity index is calculated by AWARE method version 1.01

# LCA RESULTS

| ENVIRONMENTAL IMPACTS FOR 1 tonne VC Ceramic Sanitaryware |                           |                                                                                                                                                                                                                                                                                                                                        |                       |                       |                       |
|-----------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|
| Parameter                                                 |                           | Unit                                                                                                                                                                                                                                                                                                                                   | A1-A3                 | C4                    | TOTAL                 |
| GWP                                                       | Fossil                    | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 962                   | 8.52                  | 970                   |
|                                                           | Biogenic                  | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 2.92                  | 45.8                  | 48.8                  |
|                                                           | Land Use & Transformation | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 2.50                  | 0.006                 | 2.51                  |
|                                                           | <b>Total</b>              | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 978                   | 54.5                  | 1033                  |
| ODP                                                       |                           | [kg CFC11 eq.]                                                                                                                                                                                                                                                                                                                         | 91.2x10 <sup>-6</sup> | 1.32x10 <sup>-6</sup> | 92.5x10 <sup>-6</sup> |
| POCP                                                      |                           | [kg C <sub>2</sub> H <sub>4</sub> eq.]                                                                                                                                                                                                                                                                                                 | 0.408                 | 0.015                 | 0.423                 |
| AP                                                        |                           | [kg SO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 4.33                  | 0.060                 | 4.39                  |
| EP                                                        |                           | [kg PO <sub>4</sub> <sup>3-</sup> eq.]                                                                                                                                                                                                                                                                                                 | 21.7                  | 0.172                 | 21.9                  |
| ADPE                                                      |                           | [kg Sb eq.]                                                                                                                                                                                                                                                                                                                            | 625x10 <sup>-6</sup>  | 1.20x10 <sup>-6</sup> | 626x 10 <sup>-6</sup> |
| ADPF                                                      |                           | [MJ]                                                                                                                                                                                                                                                                                                                                   | 16.6x10 <sup>+3</sup> | 124                   | 16.7x10 <sup>+3</sup> |
| Legend                                                    |                           | GWP: Global Warming Potential, ODP: Ozone Depletion Potential, POCP: Formation Potential of Tropospheric Ozone Photochemical Oxidants, AP: Acidification Potential, EP: Eutrophication Potential, ADPE: Abiotic Depletion Potential for Non-fossil Resources, ADPF: Abiotic Depletion Potential for Fossil Resources, NR: Not Relevant |                       |                       |                       |





# LCA RESULTS

## OUTPUT FLOWS AND WASTE CATEGORIES FOR 1 tonne VC Ceramic Sanitaryware

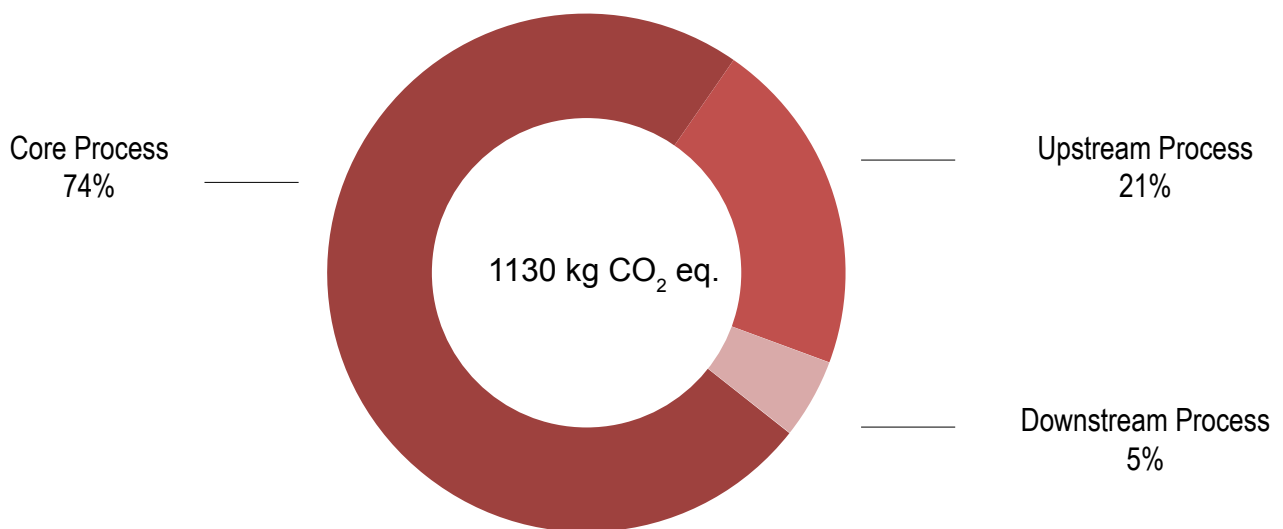
|                 |                                                                                                                                                                                                                                       |       |      |       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|-------|
| <b>HWD</b>      | [kg]                                                                                                                                                                                                                                  | 0.489 | -    | 0.489 |
| <b>NHWD</b>     | [kg]                                                                                                                                                                                                                                  | 550   | 1058 | 1609  |
| <b>RWD</b>      | [kg]                                                                                                                                                                                                                                  | -     | -    | -     |
| <b>CRU</b>      | [kg]                                                                                                                                                                                                                                  | -     | 59.6 | 59.6  |
| <b>MFR</b>      | [kg]                                                                                                                                                                                                                                  | -     | 35.3 | 35.3  |
| <b>MER</b>      | [kg]                                                                                                                                                                                                                                  | -     | -    | -     |
| <b>EE [Typ]</b> | [MJ]                                                                                                                                                                                                                                  | -     | -    | -     |
| Legend          | HWD: Hazardous Waste Disposed, NHWD: Non-Hazardous Waste Disposed, RWD: Radioactive Waste Disposed, CRU: Components for Reuse, MFR: Material for Recycling, MER: Materials for Energy Recovery, EE: Exported Energy, NR: Not Relevant |       |      |       |

## RESOURCE USE FOR 1 tonne VC Ceramic Sanitaryware

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |       |                       |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------|-----------------------|
| <b>PERE</b>  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 34.6x10 <sup>-3</sup> | 3.22  | 34.6x10 <sup>-3</sup> |
| <b>PERM</b>  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 0.000 | 0.000                 |
| <b>PERT</b>  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 34.6x10 <sup>-3</sup> | 3.22  | 34.6x10 <sup>-3</sup> |
| <b>PENRE</b> | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 16.6x10 <sup>-3</sup> | 124   | 16.7x10 <sup>-3</sup> |
| <b>PENRM</b> | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| <b>PENRT</b> | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 16.6x10 <sup>-3</sup> | 124   | 16.7x10 <sup>-3</sup> |
| <b>SM</b>    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 0.000 | 0.000                 |
| <b>RSF</b>   | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 0.000 | 0.000                 |
| <b>NRSF</b>  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 0.000 | 0.000                 |
| <b>FW</b>    | [m <sup>3</sup> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.565                 | -     | 0.565                 |
| <b>WSI</b>   | [m <sup>3</sup> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 828                   | 1.93  | 830                   |
| Legend       | PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources, PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water, WSI: Water Scarcity Index, NR: Not Relevant |                       |       |                       |

# LCA RESULTS

| ENVIRONMENTAL IMPACTS FOR 1 tonne FFC Ceramic Sanitaryware |                           |                                                                                                                                                                                                                                                                                                                                        |                        |                       |                        |
|------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|------------------------|
| Parameter                                                  |                           | Unit                                                                                                                                                                                                                                                                                                                                   | A1-A3                  | C4                    | TOTAL                  |
| GWP                                                        | Fossil                    | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 1123                   | 8.53                  | 1131                   |
|                                                            | Biogenic                  | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 3.00                   | 46.0                  | 49.0                   |
|                                                            | Land Use & Transformation | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 2.51                   | 0.006                 | 2.52                   |
|                                                            | <b>Total</b>              | [kg CO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 1075                   | 54.7                  | 1130                   |
| ODP                                                        |                           | [kg CFC11 eq.]                                                                                                                                                                                                                                                                                                                         | 0.107x10 <sup>-3</sup> | 1.32x10 <sup>-6</sup> | 0.108x10 <sup>-3</sup> |
| POCP                                                       |                           | [kg C <sub>2</sub> H <sub>4</sub> eq.]                                                                                                                                                                                                                                                                                                 | 0.439                  | 0.015                 | 0.454                  |
| AP                                                         |                           | [kg SO <sub>2</sub> eq.]                                                                                                                                                                                                                                                                                                               | 4.95                   | 0.060                 | 5.01                   |
| EP                                                         |                           | [kg PO <sub>4</sub> <sup>3-</sup> eq.]                                                                                                                                                                                                                                                                                                 | 22.0                   | 0.173                 | 22.13                  |
| ADPE                                                       |                           | [kg Sb eq.]                                                                                                                                                                                                                                                                                                                            | 0.656x10 <sup>-3</sup> | 1.20x10 <sup>-6</sup> | 0.657x10 <sup>-3</sup> |
| ADPF                                                       |                           | [MJ]                                                                                                                                                                                                                                                                                                                                   | 19.2x10 <sup>+3</sup>  | 123.6                 | 19.3x10 <sup>+3</sup>  |
| Legend                                                     |                           | GWP: Global Warming Potential, ODP: Ozone Depletion Potential, POCP: Formation Potential of Tropospheric Ozone Photochemical Oxidants, AP: Acidification Potential, EP: Eutrophication Potential, ADPE: Abiotic Depletion Potential for Non-fossil Resources, ADPF: Abiotic Depletion Potential for Fossil Resources, NR: Not Relevant |                        |                       |                        |








# LCA RESULTS

| OUTPUT FLOWS AND WASTE CATEGORIES FOR 1 tonne FFC Ceramic Sanitaryware |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |       |                       |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------|-----------------------|
| HWD                                                                    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.489                 | -     | 0.489                 |
| NHWD                                                                   | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 550                   | 1058  | 1609                  |
| RWD                                                                    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | -     | -                     |
| CRU                                                                    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 59.6  | 59.6                  |
| MFR                                                                    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | 37.7  | 37.7                  |
| MER                                                                    | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | -     | -                     |
| EE [Typ]                                                               | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                     | -     | -                     |
| Legend                                                                 | HWD: Hazardous Waste Disposed, NHWD: Non-Hazardous Waste Disposed, RWD: Radioactive Waste Disposed, RWD: Radioactive Waste Disposed, CRU: Components for Reuse, MFR: Material for Recycling, MER: Materials for Energy Recovery, EE: Exported Energy, NR: Not Relevant                                                                                                                                                                                                                                                                                                                                                                 |                       |       |                       |
| RESOURCE USE FOR 1 tonne FFC Ceramic Sanitaryware                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |       |                       |
| PERE                                                                   | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 34.9x10 <sup>+3</sup> | 3.23  | 34.9x10 <sup>+3</sup> |
| PERM                                                                   | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| PERT                                                                   | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 34.9x10 <sup>+3</sup> | 3.23  | 34.9x10 <sup>+3</sup> |
| PENRE                                                                  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 19.2x10 <sup>+3</sup> | 124   | 19.3x10 <sup>+3</sup> |
| PENRM                                                                  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| PENRT                                                                  | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 19.2x10 <sup>+3</sup> | 124   | 19.3x10 <sup>+3</sup> |
| SM                                                                     | [kg]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| RSF                                                                    | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| NRSF                                                                   | [MJ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.000                 | 0.000 | 0.000                 |
| FW                                                                     | [m <sup>3</sup> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.565                 | -     | 0.565                 |
| WSI                                                                    | [m <sup>3</sup> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1769                  | 1.93  | 1771                  |
| Legend                                                                 | PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy resources, PENRE: Use of non-renewable primary energy excluding resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water, WSI: Water Scarcity Index, NR: Not Relevant |                       |       |                       |

# REFERENCES

- /ISO 9001:2015/** Quality Management System
- /ISO 10002:2006/** Customer Satisfaction Management System
- /ISO 14001:2015/** Environmental Management System
- /ISO 50001/** Energy Management System
- /ISO 27001/** Information Security Management System
- /OHSAS 18001:2014/** Occupational Health and Safety Management System
- /ISO 14020:2000/** Environmental labels and declarations - General principles
- /EN 14411/** Ceramic tiles. Definitions, classification, characteristics, evaluation of conformity and marking
- /ISO 10545-2/** Ceramic tiles - Part 3: Determination of dimensions and surface quality
- /ISO 10545-3/** Ceramic tiles - Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density
- /ISO 10545-4/** Ceramic tiles - Part 4: Determination of modulus of rupture and breaking strength
- /ISO 10545-5/** Ceramic tiles - Part 5: Determination of impact resistance by measurement of coefficient of restitution
- /ISO 10545-6/** Ceramic tiles -- Part 6: Determination of resistance to deep abrasion for unglazed tiles
- /ISO 10545-7/** Ceramic tiles - Part 7: Determination of resistance to surface abrasion for glazed tiles
- /ISO 10545-8/** Ceramic tiles - Part 8: Determination of linear thermal expansion
- /ISO 10545-9/** Ceramic tiles - Part 9: Determination of resistance to thermal shock
- /ISO 10545-10/** Ceramic tiles - Part 10: Determination of moisture expansion
- /ISO 10545-11/** Ceramic tiles - Part 11: Determination of crazing resistance for glazed tiles
- /ISO 10545-12/** Ceramic tiles - Part 12: Determination of frost resistance
- /ISO 10545-13/** Ceramic tiles - Part 13: Determination of chemical resistance
- /ISO 10545-14/** Ceramic tiles - Part 14: Determination of resistance to stains
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- /The International EPD® System/** The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025.[www.environdec.com](http://www.environdec.com)
- /Ecoinvent /** Ecoinvent Centre, [www.Eco-invent.org](http://www.Eco-invent.org)
- /TLCID/** Turkish Life Cycle Inventory Database, Turkish Centre for Sustainable Production Research and Design - SÜRATAM , [www.suratam.org](http://www.suratam.org)
- /SimaPro/** SimaPro LCA Package, Pré Consultants, the Netherlands, [www.pre-sustainability.com](http://www.pre-sustainability.com)





# VERIFICATION & REGISTRATION

|                                  |                                                                                                                                                                                                                                                                                   |                                                                                                                                                  |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Programme</b>                 | <b>The International EPD System</b><br><a href="http://www.environdec.com">www.environdec.com</a><br><br>EPD registered through the fully aligned regional programme:<br>EPD Turkey<br><a href="http://www.epdturkey.org">www.epdturkey.org</a>                                   |                                                               |
| <b>Programme Operator</b>        | EPD International AB<br>Box 210 60<br>SE- 100 31 Stockholm, Sweden<br><br>EPD Turkey:<br>SÜRATAM-Turkish Centre for Sustainable Production Research & Design<br>Nef 09 B Blok No:7/15, 34415 Kağıthane / İstanbul, Turkey<br><a href="http://www.suratam.org">www.suratam.org</a> |                                                               |
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