TOTO®

Aurora™ One-Piece Toilet

CST686CUFGAT40#** – 1.0 GPF
MS686(124/234)CUF(R)(G)#**
CST686CEFGAT40#** – 1.28 GPF
MS686(124/234)CEF(R)(G)#**

The Aurora introduces a new era of bathroom design, uniting sculptural beauty with a new generation of performance engineering. Its flared, fully skirted silhouette blends soft curves with a refined, contemporary presence. Using a dual-tank, dual-valve architecture, it sequences rim wash and siphon jet for controlled, efficient results at just 1.0 or 1.28 GPF. CEFIONTECT®, PREMIST®, and EWATER+® technologies work together to keep the system cleaner with less effort.

Performance dashboard

Features & functionality

INTEGRAVITY SYSTEM™ optimizes cleaning power through advanced water flow, ensuring an improved flush performance and enhanced bowl wash with our ultra high-efficiency TORNADO FLUSH® bowl design

CEFIONTECT® ceramic glaze prevents debris and mold from sticking to ceramic surfaces

Specially designed to accommodate WASHLET®+

Completely skirted design for a sleek and understated look that's easier to clean

UNIVERSAL HEIGHT

Elongated front bowl with SoftClose® seat

12" Rough-in

Visit TOTO for more product information:
Aurora™ One-Piece Toilet - 1.0 and 1.28 GPF

MasterFormat® 22 41 13.13
Product Specifications:
MS686124CUF(R)(G)
MS686124CEF(R)(G)

Environment & materials

Improved by:

Lower water use via INTEGRAVITY SYSTEM™

Kiln exhaust heat reused to power product dryers

Upcycling of post industrial porcelain waste into ceramic floor tile

Certification & rating systems:

IAPMO(cUPC®) certified: CST686CUFGAT40, CST686CEFGAT40

WaterSense® certified: CST686CUFGAT40, CST686CEFGAT40

CALGreen® compliant

Declare Label

See LCA, interpretation & rating systems

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
	Transparency Report (EPD)
3rd-party verified	✓

Validity: 03/10/2026 – 03/10/2029
SM-TOTO – 20260310 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✓

This environmental product declaration (EPD) was externally verified by Jack Geibig (Ecoform) on behalf of NSF according to ISO 14044; ISO 21930:2017; SM Part A: LCA calculation rules and report requirements, 2023; SM Part B: Residential Toilets; and ISO 14025:2006.

Ecoform, LLC
11903 Black Road
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(865) 850-1883
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NSF International
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Ann Arbor, MI 48105, USA
www.nsf.org
734 769 8010

Certified Environmental Product Declaration
www.nsf.org

SUMMARY

Reference PCR
SM Part B: Residential toilets, v1.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit
One single flush toilet in an average residential environment

LCIA methodology; LCA software; LCI database
TRACI 2.2; SimaPro Developer 10.3; ecoinvent v3.11, US-EI 2.2, and Industry data 2.0

In accordance with ISO 14044 and the referenced PCR, the life cycle assessment was conducted by Sustainable Minds and critically reviewed by Jack Geibig (Ecoform) on behalf of NSF.

Public LCA
Life cycle assessment (LCA) of TOTO Aurora toilets

TOTO USA
1155 Southern Road
Morrow, GA 30260
www.totousa.com

Contact us

LCA results & interpretation

Aurora™ One-Piece Toilet

Aurora™ 1.28gpf | Aurora™ 1.0gpf | EPD additional content

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✓ **Cradle to grave**

Functional unit

One single flush toilet in an average residential environment without an electronic bidet seat. The expected service life (ESL) of a building is 75 years, and all use stage activity and impacts are accounted for in that full ESL period. The reference service life (RSL) of the toilet is 20 years, which is an industry-accepted average lifespan based on the economic lifespan of the product. The Aurora™ 1.28gpf toilet is a single flush toilet with a flush capacity of 1.28 gallons per flush.

Maintenance

Regular cleaning is assumed to use 1.69 fl oz (50mL) of a 1% sodium lauryl sulfate (SLS) solution twice per month over a 75 years. The use of 50mL over 24days/year for 75 years gives a total of 90L of solution. Therefore, 0.9kg of SLS plus 89.1kg of water were included in the model.

Repair and replacement

The trip lever handle, flapper seal, and fill valve seal are assumed to be replaced once during each 20-year RSL period as part of regular repairs, with replacement waste sent to landfill. At the end of its RSL, the residential toilet is assumed to be replaced. Therefore, an additional 2.75 products are included as replacements, with all life cycle modules considered, over the building's ESL of 75 years.

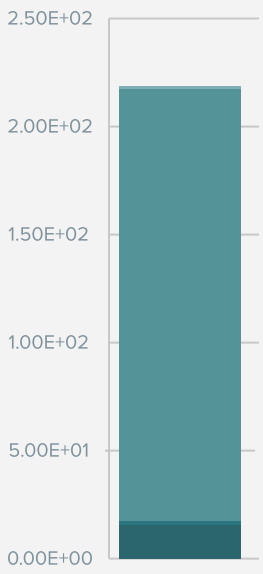
Manufacturing data

Reporting period: January 2025 – December 2025
Location: TOTO Vietnam manufacturing facility (TVN) in Hanoi, Vietnam

Material composition greater than 1% by weight

MATERIAL	%WT.
Ceramic	74.04%
Cardboard packaging	11.38%
Polyphenylene sulfide (PPS)	6.32%
Polyphenylene (PP)	2.66%
Corrugated Board	1.51%
Acrylonitrile butadiene styrene (ABS)	1.26%
Others	2.84%

Total impacts by life cycle stage [mPts/func unit]



LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Production	1.55E+01
Construction	1.94E+00
Use	2.00E+02
End of life	8.21E-02

Total impacts =2.18E+02 mPts
per 75 years installed

What's causing the greatest impacts

All life cycle stages

The use stage dominates the results for all impact categories. The replacements module (B4) is highly dominant in all categories because of the necessity to consider an additional 2.75 products as replacements and operational water use. The production stage itself is slightly significant but does not dominate in any impact category. Additionally, the processes associated with dismantling the product and final waste treatment during the end-of-life stage do not have a significant impact.

Production stage [A1-A3]

Product manufacturing (A3) follows the impacts from raw material acquisition (A1), with insignificant impacts from raw material transportation (A2). Most of the impacts within A3 come from energy usage in the ceramic manufacturing operations.

Distribution and installation [A4-A5]

Distribution (A4) and installation (A5) are minor contributors to the total results. Transporting the finished product contributes to smog formation, with the majority of impacts arising from sea transport from Vietnam to the United States and subsequent road transport to end users.

Use [B1-B7]

Environmental impacts are driven by product replacement (B4) and operational water use (B7). The impacts of those 2.75 replacements account for 30%-65% of the total impacts. Operational water use is the leading contributor to three impact categories across the product life cycle: ozone depletion, carcinogenics, and global warming. It is also the second-largest contributor in the remaining impact categories. More than 98% of each of those comes from municipal sewage treatment of wastewater generated.

End-of-life stage [C1-C4]

The transportation to landfill and the disposal process dominate impacts in the end-of-life stage. Impacts associated with the end-of-life stage are minimal, accounting for less than 1% of total life cycle impacts.

Operational water use

The incoming municipal tap water does not require additional filtration. The amount of water used by the toilet depends on its flush rate. The 1.28gpf toilet consumes 1.28 gallons per flush and is assumed to be used 13 times per day over 75 years. This equates to 4,745 flushes per year and 355,875 flushes over the 75-year ESL, resulting in 455,520 gallons of water over its lifetime. An electricity factor of 0.00364 kWh per gallon (0.000961 kWh per liter) of water is used to represent energy for upstream municipal water collection, treatment, supply, and downstream management.

How we're making it greener

TOTO PeoplePlanetWater™ programs improving environmental performance

- Dual-Max®, E-Max®, Tornado Flush™, 1G®, and EcoPower® reduce water consumption in the use phase
- INTEGRAVITY SYSTEM™ optimizes cleaning power with less water
- Energy efficiency programs optimize the firing process
- Modular packing methods increase the fill rate of a trailer, cutting down on the number of trips needed
- 100% of post-industrial ceramic waste is recycled

See how we make it greener

LCA results

LIFE CYCLE STAGE	PRODUCTION	CONSTRUCTION	USE	END OF LIFE
Information modules: **Included (X)** | Excluded (MND)* *Module D is not declared.	(X) A1 Raw materials	(X) A4 Transportation/ Delivery	(X) B1 Use	(X) C1 Deconstruction/ Demolition
	(X) A2 Transportation	(X) A5 Construction/ Installation	(X) B2 Maintenance	(X) C2 Transportation
	(X) A3 Manufacturing		(X) B3 Repair	(X) C3 Waste processing
			(X) B4 Replacement	(X) C4 Disposal
			(X) B5 Refurbishment	
			(X) B6 Operational energy use	
			(X) B7 Operational water use	
				

SM Single Score

Learn about SM Single Score results

Impacts per functional unit	1.55E+01 mPts	1.94E+00 mPts	2.00E+02 mPts	8.21E-02 mPts
Materials or processes contributing >20% to total impacts of each life cycle stage	Ceramic parts production and energy used during manufacturing.	Transportation of the product to installation site or consumer and disposal of packaging.	Volume of water used during operation and the number of product replacements needed over the building's service life.	Transport to waste processing and disposal of material flows transported to a landfill.

Aurora™ 1.28gpf - TRACI v2.2 results per functional unit

LIFE CYCLE STAGE		PRODUCTION	CONSTRUCTION	USE	END OF LIFE
Ecological damage					
Impact category	Unit				
Global warming	kg CO_2 eq	1.89E+02	1.37E+01	2.33E+03	1.15E+00
Ozone depletion	kg CFC-11 eq	3.51E-06	1.11E-07	4.94E-05	1.53E-09
Acidification	kg SO_2 eq	9.31E-01	4.23E-01	1.13E+01	5.83E-03
Marine eutrophication	kg N eq	1.67E-01	1.19E-01	1.67E+00	1.41E-03
Freshwater eutrophication	kg P eq	4.16E-03	4.61E-05	5.19E-02	5.92E-06
Human health damage					
Impact category	Unit				
Smog	kg O_3 eq	1.95E+01	1.42E+01	1.95E+02	1.67E-01
Respiratory effects	kg $PM_{2.5}$ eq	5.89E-02	5.31E-03	7.20E-01	3.07E-04
Additional environmental information					
Impact category	Unit				
Carcinogenics	CTU_h	3.06E-06	1.57E-07	4.72E-05	1.21E-08
Non-carcinogenics	CTU_h	3.36E-05	1.47E-06	3.24E-04	9.86E-08
Ecotoxicity	CTU_e	1.64E+02	2.78E+01	1.50E+03	1.88E+00

References

LCA Background Report
Life cycle assessment (LCA) of TOTO Aurora toilets, 2026; TRACI v2.2, CML, and Cumulative Energy Demand (LHV) impact assessment methodologies; SimaPro Developer 10.3; ecoinvent v3.11, US-EI 2.2, and Industry data 2.0.
ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services"
ISO 21930:2017, "Sustainability in Building Construction — Environmental Declaration of Building Products" serves as the core PCR along with Sustainable Minds Part A.
SM Part A: LCA calculation rules and report requirements, version 2023
August, 2023. PCR review conducted by the Sustainable Minds TAB, tab@sustainableminds.com.
SM Part B: Residential toilets, v1.0
May, 2022. PCR review conducted by Jack Geibig, Chair (Ecoform) Jgeibig@ecoform.com; Hugues Imbeault-Tétreault, ing., M.Sc.A. (Groupe AGÉCO); Rebe Feraldi, LCACP, CLAR (Pacific Northwest National Laboratory).
Download PDF SM Transparency Report [EPD]™

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. Environmental declarations of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore cannot be used as comparative assertions unless the conditions as defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied. In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines, use the same sub-category PCR where applicable, include all relevant information modules, be limited to EPDs applying a functional unit, and be based on equivalent scenarios with respect to the context of construction works. Some LCA impact categories and inventory items are still under development and can have high levels of uncertainty. To promote uniform guidance on the data collection, calculation, and reporting of results, the ACLCA methodology (ACLCA 2019) was used.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization
Environmental product declarations

○ Industry-wide (generic) EPD	1 product
✓ Product-specific Type III EPD	1.5 products

LEED BD+C: New Construction | v.5 - LEED v5
MR Credit 4: Building Materials Resources Credit (BPSP)

✓ Product-specific Type III EPD	Multi-attribute score: 1

Green Globes for New Construction and Sustainable Interiors
Materials and resources

✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
✓ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products
Environmental Product Declarations (EPD)

○ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
✓ Product-specific EPD	1 point

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
	Transparency Report (EPD)
3rd-party verified	✓

Validity: 03/10/2026 – 03/10/2029
SM-TOTO – 20260310 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✓

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North America; Cradle-to-grave

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One single flush toilet in an average residential environment

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LCA results & interpretation

Aurora™ One-Piece Toilet

Aurora™ 1.28gpf | Aurora™ 1.0gpf | EPD additional content

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✓ Cradle to grave

Functional unit

One single flush toilet in an average residential environment without an electronic bidet seat. The expected service life (ESL) of a building is 75 years, and all use stage activity and impacts are accounted for in that full ESL period. The reference service life (RSL) of the toilet is 20 years, which is an industry-accepted average lifespan based on the economic lifespan of the product. The Aurora™ 1G toilet is a single flush toilet with a flush capacity of 1.0 gallons per flush.

Maintenance

Regular cleaning is assumed to use 1.69 fl oz (50mL) of a 1% sodium lauryl sulfate (SLS) solution twice per month over a 75 years. The use of 50mL over 24days/year for 75 years gives a total of 90L of solution. Therefore, 0.9kg of SLS plus 89.1kg of water were included in the model.

Repair and replacement

The trip lever handle, flapper seal, and fill valve seal are assumed to be replaced once during each 20-year RSL period as part of regular repairs, with replacement waste sent to landfill. At the end of its RSL, the residential toilet is assumed to be replaced. Therefore, an additional 2.75 products are included as replacements, with all life cycle modules considered, over the building's ESL of 75 years.

Manufacturing data

Reporting period: January 2025 – December 2025
Location: TOTO Vietnam manufacturing facility (TVN) in Hanoi, Vietnam

Material composition greater than 1% by weight

MATERIAL	%WT.
Ceramic	74.04%
Cardboard packaging	11.38%
Polyphenylene sulfide (PPS)	6.32%
Polyphenylene (PP)	2.66%
Corrugated Board	1.51%
Acrylonitrile butadiene styrene (ABS)	1.26%
Others	2.84%

Total impacts by life cycle stage [mPts/func. unit]

LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Production	1.55E+01
Construction	1.94E+00
Use	1.76E+02
End of life	8.21E-02

Total impacts =1.94E+02 mPts
per 75 years installed

What's causing the greatest impacts

All life cycle stages

The use stage dominates the results for all impact categories. The replacements module (B4) is highly dominant in all categories because of the necessity to consider an additional 2.75 products as replacements and operational water use. The production stage itself is slightly significant but does not dominate in any impact category. Additionally, the processes associated with dismantling the product and final waste treatment during the end-of-life stage do not have a significant impact.

Production stage [A1-A3]

Product manufacturing (A3) follows the impacts from raw material acquisition (A1), with insignificant impacts from raw material transportation (A2). Most of the impacts within A3 come from energy usage in the ceramic manufacturing operations.

Distribution and installation [A4-A5]

Distribution (A4) and installation (A5) are minor contributors to the total results. Transporting the finished product contributes to smog formation, with the majority of impacts arising from sea transport from Vietnam to the United States and subsequent road transport to end users.

Use [B1-B7]

Environmental impacts are driven by product replacement (B4) and operational water use (B7). The impacts of those 2.75 replacements account for 30%-65% of the total impacts. Operational water use is the leading contributor to three impact categories across the product life cycle: ozone depletion, carcinogenics, and global warming. It is also the second-largest contributor in the remaining impact categories. More than 98% of each of those comes from municipal sewage treatment of wastewater generated.

End-of-life stage [C1-C4]

The transportation to landfill and the disposal process dominate impacts in the end-of-life stage. Impacts associated with the end-of-life stage are minimal, accounting for less than 1% of total life cycle impacts.

Operational water use

The incoming municipal tap water does not require additional filtration. The amount of water used by the toilet depends on its flush rate. The 1.0gpf toilet consumes 1.0 gallons per flush and is assumed to be used 13 times per day over 75 years. This equates to 4,745 flushes per year and 355,875 flushes over the 75-year ESL, resulting in 355,875 gallons of water over its lifetime. An electricity factor of 0.00364 kWh per gallon (0.000961 kWh per liter) of water is used to represent energy for upstream municipal water collection, treatment, supply, and downstream management.

How we're making it greener

TOTO PeoplePlanetWater™ programs improving environmental performance

- Dual-Max®, E-Max®, Tornado Flush™, 1G®, and EcoPower® reduce water consumption in the use phase
- INTEGRAVITY SYSTEM™ optimizes cleaning power with less water
- Energy efficiency programs optimize the firing process
- Modular packing methods increase the fill rate of a trailer, cutting down on the number of trips needed
- 100% of post-industrial ceramic waste is recycled

See how we make it greener

LCA results

LIFE CYCLE STAGE	PRODUCTION	CONSTRUCTION	USE	END OF LIFE
Information modules: Included (X) | Excluded (MND)*	(X) A1 Raw materials	(X) A4 Transportation/ Delivery	(X) B1 Use	(X) C1 Deconstruction/ Demolition
	(X) A2 Transportation	(X) A5 Construction/ Installation	(X) B2 Maintenance	(X) C2 Transportation
	(X) A3 Manufacturing		(X) B3 Repair	(X) C3 Waste processing
			(X) B4 Replacement	(X) C4 Disposal
			(X) B5 Refurbishment	
			(X) B6 Operational energy use	
			(X) B7 Operational water use	
*Module D is not declared.				

SM Single Score

Learn about SM Single Score results

Impacts per functional unit	1.55E+01 mPts	1.94E+00 mPts	1.76E+02 mPts	8.21E-02 mPts
Materials or processes contributing >20% to total impacts of each life cycle stage	Ceramic parts production and energy used during manufacturing.	Transportation of the product to installation site or consumer and disposal of packaging.	Volume of water used during operation and the number of product replacements needed over the building's service life.	Transport to waste processing and disposal of material flows transported to a landfill.

Aurora™ 1.0gpf - TRACI v2.2 results per functional unit

LIFE CYCLE STAGE	PRODUCTION	CONSTRUCTION	USE	END OF LIFE
Ecological damage				
Impact category / Unit				
Global warming kg CO_2 eq	1.89E+02	1.37E+01	2.06E+03	1.15E+00
Ozone depletion kg CFC-11 eq	3.51E-06	1.11E-07	4.30E-05	1.53E-09
Acidification kg SO_2 eq	9.31E-01	4.23E-01	1.02E+01	5.83E-03
Marine eutrophication kg N eq	1.67E-01	1.19E-01	1.58E+00	1.41E-03
Freshwater eutrophication kg P eq	4.16E-03	4.61E-05	4.59E-02	5.92E-06
Human health damage				
Impact category / Unit				
Smog kg O_3 eq	1.95E+01	1.42E+01	1.84E+02	1.67E-01
Respiratory effects kg $PM_{2.5}$ eq	5.89E-02	5.31E-03	6.35E-01	3.07E-04
Additional environmental information				
Impact category / Unit				
Carcinogenics CTU_h	3.06E-06	1.57E-07	4.06E-05	1.21E-08
Non-carcinogenics CTU_h	3.36E-05	1.47E-06	3.01E-04	9.86E-08
Ecotoxicity CTU_e	1.64E+02	2.78E+01	1.40E+03	1.88E+00

References

LCA Background Report
Life cycle assessment (LCA) of TOTO Aurora toilets, 2026; TRACI v2.2, CML, and Cumulative Energy Demand (LHV) impact assessment methodologies; SimaPro Developer 10.3; ecoinvent v3.11, US-EI 2.2, and Industry data 2.0.
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SM Part A: LCA calculation rules and report requirements, version 2023
August, 2023. PCR review conducted by the Sustainable Minds TAB, tab@sustainableminds.com.
SM Part B: Residential toilets, v1.0
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Rating systems

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LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization
Environmental product declarations

○ Industry-wide (generic) EPD	1 product
✓ Product-specific Type III EPD	1.5 products

LEED BD+C: New Construction | v.5 - LEED v5
MR Credit 4: Building Materials Resources Credit (BPSP)

✓ Product-specific Type III EPD	Multi-attribute score: 1

Green Globes for New Construction and Sustainable Interiors
Materials and resources

✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell	
✓ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs	

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products
Environmental Product Declarations (EPD)

○ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
✓ Product-specific EPD	1 point

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VERIFICATION	LCA
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Validity: 03/10/2026 – 03/10/2029
SM-TOTO – 20260310 – 001

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Self-declared	✓

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Certified Environmental Product Declaration www.nsf.org

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North America; Cradle-to-grave

Functional unit
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EPD additional content

Aurora™ One-Piece Toilet

Aurora™ 1.28gpf | Aurora™ 1.0gpf | EPD additional content

Data

Background This product-specific plant-specific declaration was created by collecting production data from the facility in TOTO's Vietnam (TVN) plant in Hanoi, Vietnam. All unit processes were modeled using primary data. Secondary data sources include those available in the ecoinvent v3.11, US-EI 2.2, and Industry data 2.0 databases.

Allocation Allocations of multi-input and multi-output processes follow a mass-based approach in the collected data, which is the most appropriate for the unit processes modeled. Allocation approaches in the background data follow the ecoinvent methodology. No co-product allocations were made in the model.

Cut-off criteria for the inclusion of mass and energy flows are 1% of renewable primary resource (energy) usage, 1% nonrenewable primary resource (energy) usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exceptions to these criteria are substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. However, neither toilet contains hazardous substances according to the standards or regulations of the Resource Conservation and Recovery Act (RCRA), Subtitle C. Barring insignificant quantities of wastewater treatment chemicals and reused resin molds, no known flows are deliberately excluded; therefore, these criteria have been met. The completeness of the bill of materials defined in this report satisfies the above-defined cut-off criteria.

Data quality assessment

Precision: As the relevant foreground data is primary data or modeled based on primary information sources of the owner of the technology, precision is considered to be high. Background data are from the ecoinvent v3.11 and US-EI 2.2 databases with documented precision to the extent available.

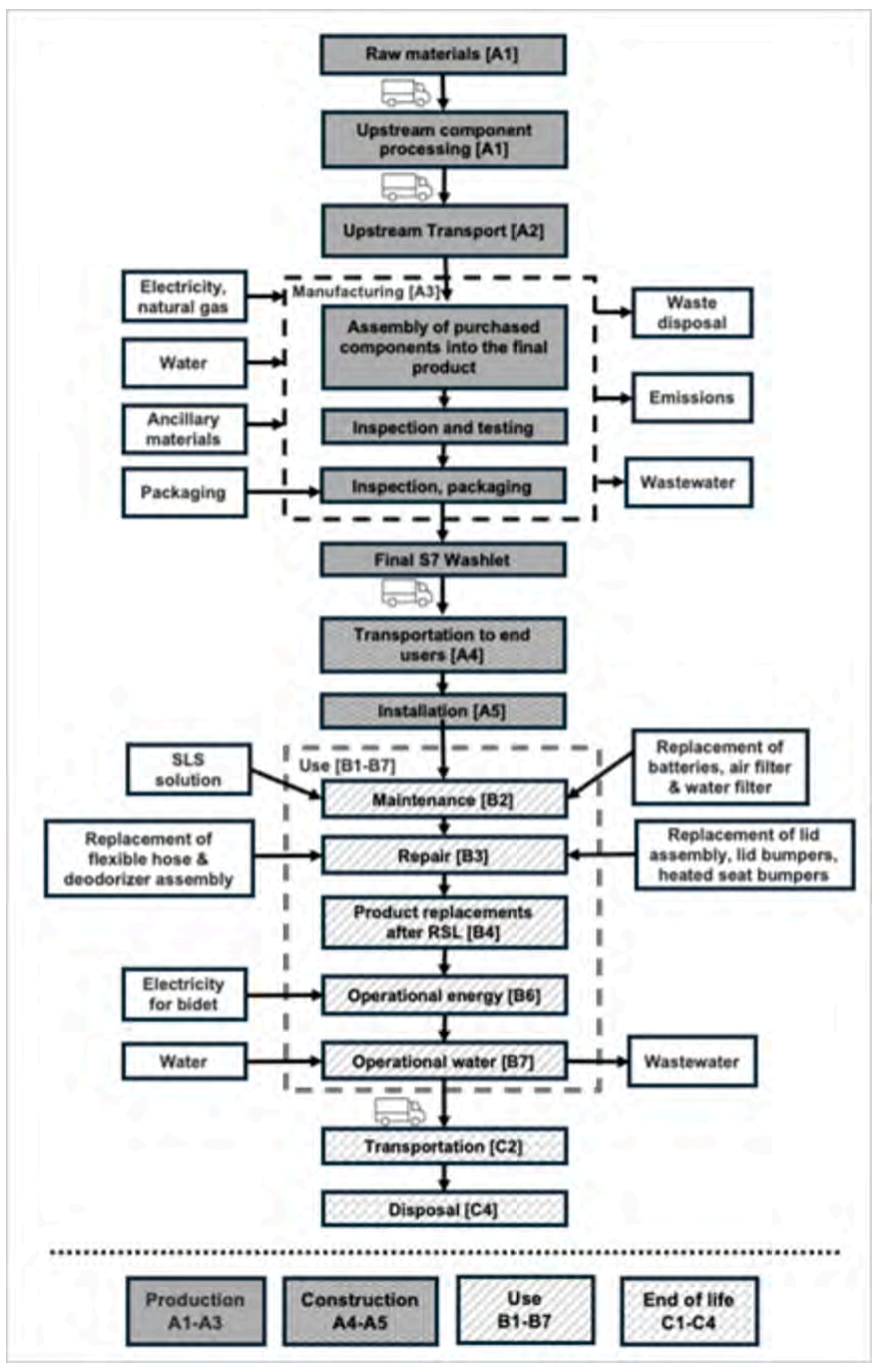
Completeness: TOTO worked with its manufacturing partners to obtain a comprehensive set of primary data associated with the manufacturing processes. The product system was checked for mass balance and completeness of the inventory. The data set was considered complete based on our understanding of the manufacturing site and a review with key stakeholders on the TOTO team, and cut-off criteria were observed consistent with those prescribed in the PCR. Besides capital equipment, no data was knowingly omitted.

Consistency: Primary data were collected with a similar level of detail, while background data were sourced primarily from the ecoinvent database. Other databases were used if data were not available in ecoinvent, or the data set was judged to be more representative. Other methodological choices were made consistently throughout the model.

Data sets contributing 5% or more to any environmental impact category

Data set name	Database name and version	Geography	Allocation method
Sewage treatment	US-EI 2.2	United States	By mass
Electricity mix 2021	US-EI 2.2	United States	By mass

Flow diagram



Scenarios and additional technical information

Distribution [A4]

Resource category	Flow	Value	Unit
Manufacturing facility (Vietnam) to GA, US	Road transport in Vietnam	54.84	km
	Sea transport	17,818.50	km
	Rail transport from port to GA, US	3,509.68	km
Transport to final users	Road transport (83% share)	1,421.05	km
	Rail transport (17% share)	2,042.26	km

The Aurora toilets manufactured in Vietnam are first shipped to TOTO's distribution center in Georgia, US and then transported to end users and building sites. Shipment to end users can occur via trucks or rail with trucks contributing to 83% of the shipments in 2025.

Installation [A5]
Installation of the product is manual with no additional resources being consumed. The inputs in this module include the disposal of packaging waste (plastic bags and corrugated board) with a waste transportation distance of 100 km.

Packaging waste	Flow
Plastic bags	Recycled - 80.88%
	Landfilled - 15.37%
	Incinerated - 3.75%
Corrugated board	Recycled - 13.63%
	Landfilled - 69.44%

End-of-life stage [C1-C4]
This module represents the final waste disposal including the physical treatment and management of the disposal site. Per the PCR, 100% of the discarded product is sent to sanitary landfills.

Name	Value	Unit
Transport from building site to landfill	100	km
Mixed construction waste	59.7	kg
Landfilling total	59.7	kg

Product information

Product family	Product models	Certifications
Aurora 1.28gpf Toilets	CST686CEFGAT40#**	Meets and exceeds: ASME A112.19.2/CSA B45.1 Certifications: IAPMO(cUPC) Code compliance with UPC, IPC, NSPC, NPC Canada, and others
	MS686124CEFG#**	
	MS686124CEF#**	
	MS686124CEFRG#**	
	MS686234CEFG#**	
Aurora 1.0gpf (1G) Toilets	CST686CUFGAT40#**	Meets and exceeds: ASME A112.19.2/CSA B45.1 Certifications: IAPMO(cUPC) Code compliance with UPC, IPC, NSPC, NPC Canada, and others
	MS686124CUFG#**	
	MS686124CUF#**	
	MS686124CUFRG#**	
	MS686234CUFG#**	

Major system boundary exclusions

- Construction of major capital equipment
- Maintenance and operation of support equipment
- Human labor and employee transport
- Manufacture and transport of packaging materials not associated with final product
- Energy consumption in warehouses, distribution centers, and retail facilities during the course of transport to the final customer
- Disposal of packaging materials not associated with final product
- Building operational energy and water use

Major assumptions and limitations

- Available ecoinvent data sets were manually updated to represent the upstream component production in the supplier country. However, actual manufacturing operations and resources consumed for each component might vary.
- Generic data sets used for material inputs, transportation, and waste processing are considered good quality, but actual impacts from material suppliers, transport carriers, and local waste processing may vary.
- The impacts of resin molds, expected to be minimal, in ceramic production is excluded from the study.
- Some chemicals used in wastewater treatment in ceramic production plant with minimal share (annual facility consumption <= 1 kg) has been excluded.
- For materials with unknown suppliers and transport distances, a generic value of 2,000 km was used as suggested by PCR. However, actual transport distances might vary.

The reported values for all indicators in the below tables for B1, B5, and C1 are zero.

Aurora 1.28gpf - LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Impact categories	Unit	A1-A3	A4	A5	B2	B3	B4	B7	C2	C4
Ozone depletion	kg CFC-11 eq	3.51E-06	8.09E-09	1.03E-07	1.12E-07	4.33E-07	1.95E-05	2.94E-05	5.78E-10	9.47E-10
Global warming	kg CO2 eq	1.89E+02	1.06E+01	3.09E+00	3.51E+00	5.49E+00	1.07E+03	1.25E+03	6.16E-01	5.30E-01
Smog	kg O3 eq	1.95E+01	4.07E+00	1.01E+01	1.70E-01	4.58E-01	1.45E+02	4.93E+01	9.82E-02	6.83E-02
Acidification	kg SO2 eq	9.31E-01	1.38E-01	2.85E-01	1.95E-02	6.16E-02	6.20E+00	5.02E+00	3.41E-03	2.42E-03
Respiratory effects	kg PM2.5 eq	5.89E-02	2.26E-03	3.05E-03	1.68E-03	7.67E-03	3.26E-01	3.85E-01	5.32E-05	2.54E-04
Freshwater eutrophication	kg P eq	4.16E-03	2.33E-05	2.28E-05	6.63E-05	2.65E-03	2.16E-02	2.76E-02	1.38E-06	4.54E-06
Marine eutrophication	kg N eq	1.67E-01	3.39E-02	8.47E-02	1.63E-03	4.94E-03	1.23E+00	4.36E-01	8.21E-04	5.89E-04
Additional impact categories										
Carcinogenics	CTUh	3.06E-06	1.46E-07	1.06E-08	7.15E-08	2.49E-07	1.68E-05	3.01E-05	8.52E-09	3.58E-09
Non carcinogenics	CTUh	3.36E-05	1.37E-06	1.01E-07	7.01E-07	3.16E-05	1.86E-04	1.06E-04	7.95E-08	1.91E-08
Ecotoxicity	CTUe	1.64E+02	2.62E+01	1.64E+00	1.72E+00	3.85E+01	9.74E+02	4.88E+02	1.52E+00	3.63E-01
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ, NCV	5.79E+02	2.56E-01	3.35E-01	6.02E+00	2.05E+00	6.72E+03	2.09E+03	1.73E-02	6.09E-02
Renewable primary resources with energy content used as material	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary resources with energy content	MJ, NCV	5.79E+02	2.56E-01	3.35E-01	6.02E+00	2.05E+00	6.72E+03	2.09E+03	1.73E-02	6.09E-02
Non-renewable primary resources used as an energy carrier (fuel)	MJ, NCV	3.01E+03	1.30E+02	8.53E+00	8.15E+01	2.78E+01	6.77E+04	2.06E+04	3.96E+00	4.45E+00
Non-renewable primary resources with energy content used as material	MJ, NCV	1.99E+01	3.86E+00	3.86E+00	3.86E+00	0.00E+00	5.88E+01	0.00E+00	3.86E+00	3.86E+00
Total use of non-renewable primary resources with energy content	MJ, NCV	3.03E+03	1.34E+02	1.24E+01	8.53E+01	2.78E+01	6.78E+04	2.06E+04	7.82E+00	8.31E+00
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	9.14E-04	1.70E-03	1.61E-03	1.02E-03	0.00E+00	3.05E-04	8.20E-04	7.30E-04	7.80E-04
Abiotic depletion potential (fossil)	MJ, LHV	2.72E+03	1.32E+02	1.15E+01	7.87E+01	9.01E+01	1.52E+04	1.46E+04	7.71E+00	8.11E+00
Output flows and waste category indicators										
Hazardous waste disposed	kg	6.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	2.99E+01	1.20E+00	1.43E+00	2.93E+01	1.11E+00	1.32E+02	0.00E+00	5.40E-01	2.59E+01
High-level radioactive waste, conditioned, to final repository	kg	7.81E-03	5.93E-04	3.89E-05	3.44E-04	0.00E+00	1.47E+01	1.51E+01	1.61E-06	4.81E-06
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	4.07E-05	3.38E-07	1.25E-07	7.76E-07	4.14E-07	8.05E-05	5.58E-05	1.54E-08	2.46E-08
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	2.93E+01	0.00E+00	4.45E+01	0.00E+00	2.20E-01	2.20E-01
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions and removals										
Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Removal from Packaging	kg CO_2	7.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E+01	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Packaging	kg CO_2	0.00E+00	0.00E+00	7.00E+00	0.00E+00	0.00E+00	1.05E+01	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbonation Carbon Removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon Emissions from Combustion of Waste from Renewable and Non-Renewable Sources used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Aurora 1.0gpf - LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Impact categories	Unit	A1-A3	A4	A5	B2	B3	B4	B7	C2	C4
Ozone depletion	kg CFC-11 eq	3.51E-06	8.09E-09	1.03E-07	1.12E-07	4.33E-07	1.95E-05	2.30E-05	5.78E-10	9.47E-10
Global warming	kg CO2 eq	1.89E+02	1.06E+01	3.09E+00	3.51E+00	5.49E+00	1.07E+03	9.79E+02	6.16E-01	5.30E-01
Smog	kg O3 eq	1.95E+01	4.07E+00	1.01E+01	1.70E-01	4.58E-01	1.45E+02	3.85E+01	9.82E-02	6.83E-02
Acidification	kg SO2 eq	9.31E-01	1.38E-01	2.85E-01	1.95E-02	6.16E-02	6.20E+00	3.93E+00	3.41E-03	2.42E-03
Respiratory effects	kg PM2.5 eq	5.89E-02	2.26E-03	3.05E-03	1.68E-03	7.67E-03	3.26E-01	3.00E-01	5.32E-05	2.54E-04
Freshwater eutrophication	kg P eq	4.16E-03	2.33E-05	2.28E-05	6.63E-05	2.65E-03	2.16E-02	2.16E-02	1.38E-06	4.54E-06
Marine eutrophication	kg N eq	1.67E-01	3.39E-02	8.47E-02	1.63E-03	4.94E-03	1.23E+00	3.40E-01	8.21E-04	5.89E-04
Additional impact categories										
Carcinogenics	CTUh	3.06E-06	1.46E-07	1.06E-08	7.15E-08	2.49E-07	1.68E-05	2.35E-05	8.52E-09	3.58E-09
Non carcinogenics	CTUh	3.36E-05	1.37E-06	1.01E-07	7.01E-07	3.16E-05	1.86E-04	8.31E-05	7.95E-08	1.91E-08
Ecotoxicity	CTUe	1.64E+02	2.62E+01	1.64E+00	1.72E+00	3.85E+01	9.74E+02	3.82E+02	1.52E+00	3.63E-01
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ, NCV	5.79E+02	2.56E-01	3.35E-01	6.02E+00	2.05E+00	5.47E+03	1.63E+03	1.73E-02	6.09E-02
Renewable primary resources with energy content used as material	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary resources with energy content	MJ, NCV	5.79E+02	2.56E-01	3.35E-01	6.02E+00	2.05E+00	5.47E+03	1.63E+03	1.73E-02	6.09E-02
Non-renewable primary resources used as an energy carrier (fuel)	MJ, NCV	3.01E+03	1.30E+02	8.53E+00	8.15E+01	2.78E+01	5.53E+04	1.61E+04	3.96E+00	4.45E+00
Non-renewable primary resources with energy content used as material	MJ, NCV	1.99E+01	3.86E+00	3.86E+00	3.86E+00	0.00E+00	5.88E+01	0.00E+00	3.86E+00	3.86E+00
Total use of non-renewable primary resources with energy content	MJ, NCV	3.03E+03	1.34E+02	1.24E+01	8.53E+01	2.78E+01	5.54E+04	1.61E+04	7.82E+00	8.31E+00
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	1.20E-03	1.70E-03	1.61E-03	1.02E-03	0.00E+00	2.91E-04	6.40E-04	7.23E-04	7.80E-04
Abiotic depletion potential (fossil)	MJ, LHV	2.72E+03	1.32E+02	1.15E+01	7.87E+01	9.01E+01	1.52E+04	1.13E+04	7.71E+00	8.11E+00
Output flows and waste category indicators										
Hazardous waste disposed	kg	6.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	2.99E+01	1.20E+00	1.43E+00	2.93E+01	1.11E+00	1.32E+02	0.00E+00	5.40E-01	2.59E+01
High-level radioactive waste, conditioned, to final repository	kg	7.81E-03	5.93E-04	3.89E-05	3.44E-04	0.00E+00	1.47E+01	6.94E-02	1.61E-06	4.81E-06
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	4.07E-05	3.38E-07	1.25E-07	7.76E-07	4.14E-07	8.05E-05	6.37E-04	1.54E-08	2.46E-08
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	2.93E+01	0.00E+00	4.45E+01	0.00E+00	2.20E-01	2.20E-01
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions and removals										

Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Removal from Packaging	kg CO_2	7.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E+01	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Packaging	kg CO_2	0.00E+00	0.00E+00	7.00E+00	0.00E+00	0.00E+00	1.05E+01	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbonation Carbon Removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon Emissions from Combustion of Waste from Renewable and Non-Renewable Sources used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

SM Transparency Report (EPD)™

VERIFICATION LCA

3rd-party reviewed ✓

Transparency Report (EPD)

3rd-party verified ✓

Validity: 03/10/2026 – 03/10/2029
SM-TOTO – 20260310 – 001

MATERIAL HEALTH Material evaluation

Self-declared ✓

This environmental product declaration (EPD) was externally verified by Jack Geibig (Ecoform) on behalf of NSF according to ISO 14044; ISO 21930:2017; SM Part A: LCA calculation rules and report requirements, 2023; SM Part B: Residential Toilets; and ISO 14025:2006.

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www.nsf.org
734 769 8010

Certified Environmental Product Declaration
www.nsf.org

SUMMARY

Reference PCR
SM Part B: Residential toilets, v1.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit
One single flush toilet in an average residential environment

LCIA methodology; LCA software; LCI database
TRACI 2.2; SimaPro Developer 10.3; ecoinvent v3.11, US-EI 2.2, and Industry data 2.0

In accordance with ISO 14044 and the referenced PCR, the life cycle assessment was conducted by Sustainable Minds and critically reviewed by Jack Geibig (Ecoform) on behalf of NSF.

Public LCA
Life cycle assessment (LCA) of TOTO Aurora toilets

TOTO USA
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www.totousa.com

Contact us

How we make it greener

Aurora™ One-Piece Toilet

Collapse all

RAW MATERIALS ACQUISITION

TOTO focuses on regional manufacturing and local sourcing to minimize environmental impact and reduce transit-related pollution. In the US, TOTO sources significant amounts of raw china and ball clays from Georgia and Tennessee for its manufacturing facilities. This strategy reduces carbon emissions, improves supply chain agility, and supports local economies.

TRANSPORATION

TOTO packaging incorporates 100% recycled post-consumer paper products and is designed to maximize shipping efficiency, reducing transportation emissions.

MANUFACTURING

TOTO implements a comprehensive sustainability strategy focused on circular economy principles, achieving "zero waste" in ceramic manufacturing activities by recycling 100% of its porcelain scrap into new products. TOTO recycles diverse materials (plastics, metals, pallets) and utilizes eco-friendly packaging. TOTO facilities use recycled graywater in operations and utilizes waste heat from kilns for drying, reducing natural gas consumption.

OTHER (USE, END OF LIFE)

TOTO integrates advanced technologies — like PREMIST, CEFIONTECT, and EWATER+ — to keep surfaces cleaner while reducing harsh chemical use, conserving water, and supporting a more sustainable bathroom.

With high-efficiency toilets, faucets, and shower systems, TOTO products conserve water and reduce environmental impact — without compromising performance. TOTO's automated cleaning technologies and eco-active surfaces reduce the need for scrubbing and harsh chemicals — supporting a cleaner home and a healthier planet.

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
Transparency Report (EPD)	
3rd-party verified	✓

Validity: 03/10/2026 – 03/10/2029
SM-TOTO – 20260310 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✓

This environmental product declaration (EPD) was externally verified by Jack Geibig (Ecoform) on behalf of NSF according to ISO 14044; ISO 21930:2017; SM Part A: LCA calculation rules and report requirements, 2023; SM Part B: Residential Toilets; and ISO 14025:2006.

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NSF Certified Environmental Product Declaration www.nsf.org

SUMMARY

Reference PCR
SM Part B: Residential toilets, v1.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit
One single flush toilet in an average residential environment

LCIA methodology; LCA software; LCI database
TRACI 2.2; SimaPro Developer 10.3; ecoinvent v3.11, US-EI 2.2, and Industry data 2.0

In accordance with ISO 14044 and the referenced PCR, the life cycle assessment was conducted by Sustainable Minds and critically reviewed by Jack Geibig (Ecoform) on behalf of NSF.

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