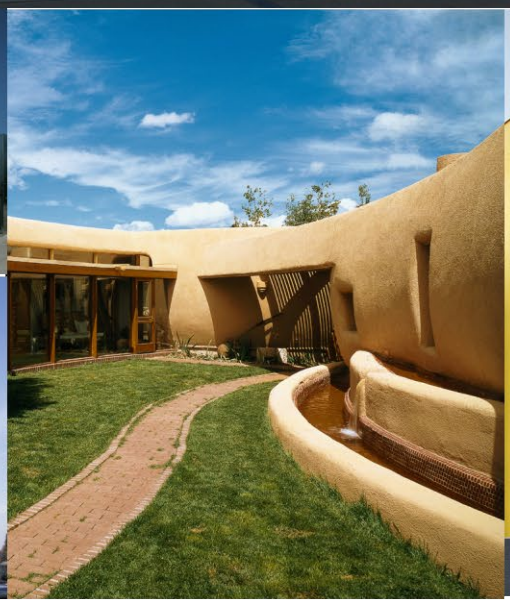
Building with conscience.

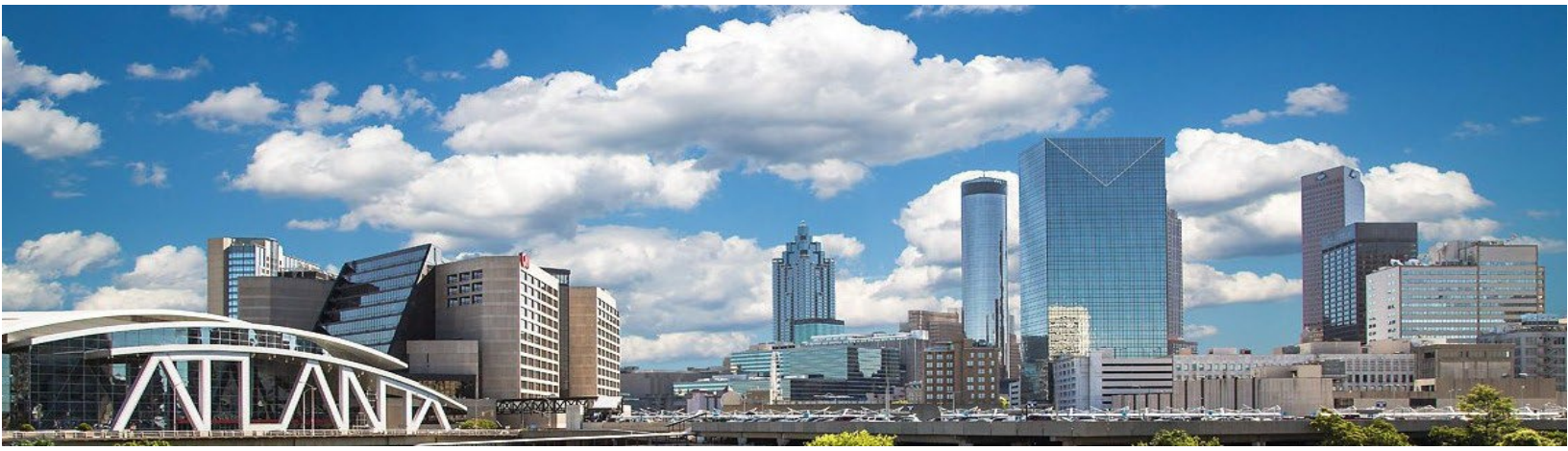
EPD for Sto BTS® Plus

Sto BTS® Plus is a one-component, polymer-modified, cement based, dry powder material used as an adhesive, skim coat and base coat in Sto Wall Claddings, including StoTherm ci Classic and StoTherm ci Lotusan Systems. While the product has multiple functions, in this study the product's primary function is considered to be a cement-based adhesive mortar for Sto Wall Claddings.



epstengroup Environmental Product Declaration

epstengroup Solutions for a Sustainable World



EPD program operator	Epsten Group, a Salas O'Brien Company 101 Marietta St NW Suite 2600 Atlanta, GA 30303 www.epstengroup.com
General program instructions & version	
Manufacturer's name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120 Atlanta, GA 30331 www.stocorp.com | (800) 221-2397
Site(s) in which the results of the LCA are representative	STO manufacturing site in Atlanta, GA and Glendale, AZ
Declaration Number	01-011
Declared Product & Functional Unit	Sto BTS® Plus One square meter (m^2) of 450mm x 450mm tile with a 3mm joint width with an assumed reference service life (RSL) of 75 years
PCR Identification	UL Part A: Life cycle Assessment Calculation Rules and Reporting Requirements v4.0 UL Part B: Cement-based Grout, Adhesive Mortar and Self-Leveling Underlayment v1, UL 10010-39, v1.0
Product's intented application and use	For protection of facades and interior walls/ceilings
Porduct RSL	75 years
Markets of applicability	North America
Date of certification	October 8th, 2024
Period of validity	5 years from date of certification
EPD type	Product-specific
EPD scope	Cradle to grave
Year of reported primary data	Calendar year 2021
LCA software and version Number	LCA for Experts (formerly GaBi) 10.7
LCI database and version Number	MLC (formerly GaBi) Database Version 2023.2
LCIA methodology and version number	IPCC AR5, TRACI 2.1 and CML-2016
The sub-category PCR review was conducted by	Jim Mellentine Jack Geibig Thomas Gloria, Ph.D.
This declaration was independently verified in accordance with ISO 21930:2017, ISO 14025: 2006 and the reference PCR: PCR for Architectural Coatings: NAICS 325510 ☐ Internal ☒ External	Megan Blizzard Megan.Blizzard@salasobrien.com
This life cycle assessment was independently verified in accordance with ISO 21930:2017, ISO 14044 and the reference PCR by:	Angela Fisher, Aspire Sustainability angela@aspiresustainability.com

Limitations

Environmental product declarations from different EPD programs (ISO 14025) may not be comparable.
Comparison of the environmental performance of Cladding Product Systems using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase.

Company

We believe in '**Building with conscience**'.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you're always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That's exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it's new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That's why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through Sto Studio or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

Manufacturing Sites Covered in this EPD

Atlanta, GA Plant

Glendale, AZ Plant

Product Identification

The product declared in this EPD is Sto BTS® Plus (product number 80727).

Product Average

Results in this EPD are declared as an arithmetic average across all manufacturing sites.

Application

While this product has versatile applications in commercial building settings, this product is intended to be used as a component in Sto's fully customizable exterior and insulation finish systems (EIFS) for building envelope solutions.

Product Description

Sto BTS® is a one-component, polymer-modified, cement based, dry powder material used as an adhesive, skim coat and base coat in Sto Wall Claddings, including StoTherm ci Classic and StoTherm ci Lotusan Systems. While the product has multiple functions, in this study the product's primary function is considered to be a cement-based adhesive mortar for Sto Wall Claddings.

This product falls under CSI division 07 24 00 and the following production code: ASTM E2568.

Performance Features

One-component	Polymer-modified	High polymer/cement ratio	Creamy & smooth consistency
Vapor Permeable	High Build	Factory blended Portland cement	Low cement ratio

Technical Details

Table 1: Technical Data for Product

Performance*	Test Method	Result	Unit
Wet Density (when installed)	n/a	1,660	kg/m^3
Tensile Strength	ASTM C-297	> 0.21 Gypsum Sheathing* > 0.10 EPS Board* > 0.69 Concrete Block > 0.28 Dens-Glass® Gold** > 0.69 Concrete	MPa @ 28 days
Impact Strength	EIMA 101.86	Pass	
Shear Strength	ANSI A118.4 and A118.15	Not Tested	kg/m^2
Pot Life	n/a	Dries within 24 hours under normal drying conditions [70ºF (21ºC), 50% RH]	minutes
Mixture Proportion	n/a	0.256	liters liquid/kg powder
Microorganism Resistance	n/a	Not tested	

* Failure of substrate

** Dens-Glass Gold is a registered trademark of the G-P Gypsum Corp.

Because this product can serve several functions and is an individual component intended for use in Sto's wall systems, not all technical properties specified by the PCR for individual components apply. The technical properties and product performance criteria depend on the combination of products in the wall system. As such, the following table declares the product performance when used in Sto wall systems.

Table 2: Technical Data for Product as a Component of Sto Wall Systems

Meets Requirements of	ASTM Classification	Evaluation Criteria:	Evaluation Report Reference
2021 IBC,IRC and IECC	ASTM E2568	AC 235	ESR 1748 / ESR 4500 / ESR 1720 CAN/ULC S101 / CAN ULC-S134 / CCMC 12416-R

Material Composition

The material compositions of Sto BTS® Plus are listed below:

Table 3: Material composition for Sto BTS® Plus

Ingredient*	Masss %
Ethylene Vinyl Acetate Copolymer	3%
Silica	55%
Surfactant	<1%

Portland cement	42%
Silicate	<1%
Additives	<1%

* The product does not contain hazardous substances per the EPA's Resource Conservation and Recovery Act.

Components related to Life Cycle Assessment

The functional unit for the LCA study was covering and protecting 1 square meter (m^2) of installed 450mm x 450mm tile with a 3mm joint width with an assumed reference service life (RSL) of 75 years. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in the PCR. The reference flow required for one functional unit is provided in Table 4 for each lifetime.

Table 4: Reference flow for one functional unit

	Functional Unit	Reference Flow [kg]
Sto BTS® Plus	1m^2 for 75 years	Product: 2.13E+00 Water: 5.40E-01

Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in the PCR.

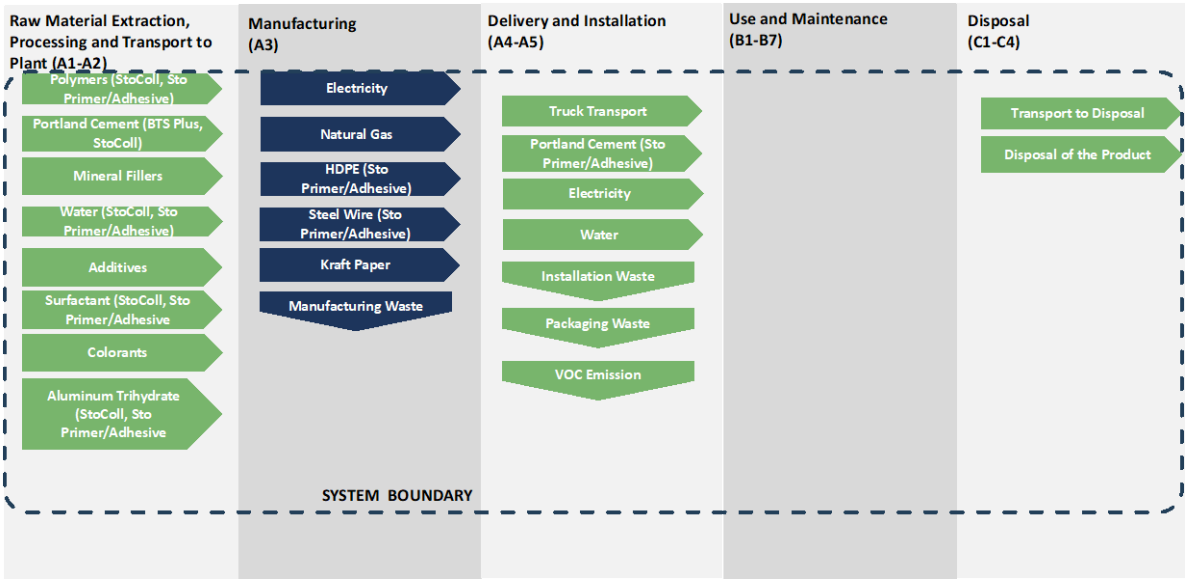


Figure 1: Life stages for the cradle-to-grave LCA

Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

Data Quality

The overall data quality level was determined to be good. Primary data was collected from Sto's facilities in Atlanta, GA, and Glendale, AZ for the 2021 reference year. When primary data did not exist, secondary data were obtained from the MLC Database Service. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions were made in accordance with the PCR and include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

Product Stage (A1-A3)

Sto BTS® PLUS is produced at Sto's Atlanta, GA, and Glendale, AZ facilities. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by Sto. Sto BTS® PLUS is supplied in 21-kg paper bags.

Delivery and Installation Stage (A4-A5)

The design and construction process stage starts with the packaged product leaving the production site and ends with being delivered to the application site.

During this stage, the finished product is moved from a shipping dock for distribution. The end gate is the application site after the purchaser acquires the finished product and transports it to the application site.

The installation stage begins when the user prepares the product before applying it to a substrate and ends with any leftover coating and discarded packaging entering the end-of-life stage. Detailed application instructions are provided online. The application procedure includes mixing and applying. As recommended, an electric drill/mixer and a spray pump are assumed to be used for mixing and application. The equipment is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible, but electricity to power application tools has been included.

As prescribed in the PCR, 4.5% of the wet mass of Sto BTS® Plus is assumed to be unused and properly disposed of.

Table 5: Transport to Building Site (A4)

Property	Value
Vehicle Type	Heavy Heavy-duty Diesel Truck / 53,333 lb payload - 8b
Fuel Efficiency [L/100km]	42
Fuel Type	Diesel

Distance [km]	9.93E+02
Capacity Utilization [%]	67%
Weight of Products Transported [kg]	2.14E+00
Product Density [kg/m^3]	1.89E+03
Capacity utilization volume factor	=1

Table 6: Installation Scenario Details (A5)

Property	Value
Net Freshwater Consumption [m^3]	5.40-E04
VOC emission [kg]	0.00E+00
Electricity Usage [kWh]	2.12E-02
Product wastage [%]	4.5%
Waste materials at the construction site before waste processing, generated by product installation [kg]	1.26E-01
Packaging Waste to Landfill [kg]	2.76E-03
Packaging Waste to Incineration [kg]	6.69E-04
Packaging Waste to Recycling [kg]	7.36E-03
Distance to disposal facility [km]	3.22E+01

Use Stage (B1-B7)

This stage contains all of the energy, water, and materials related to the use of the product, including cleaning, maintenance, and replacements. Sto BTS® Plus does not require any energy or material for providing its functions. The reference service life of the product is 75 years. This service life scenario is valid only when the product is used as intended in Sto's proprietary engineerd wall system assemblies. The details are in Table 7.

Table 7: Replacement Scenario Details

Product	Value
ESL [years]	75
RSL [years]	75
Replacement (System-based Life)	0

End-of-Life Stage (C1-C4)

In this stage, the disposal of installation waste, packaging waste and product waste at its end of life is included. The disposal pathway of each waste stream is modeled based on the recommendation of PCR and US EPA's 2018 waste management fact sheet.

Table 8: End-of-life scenario details details

Waste Flow	Value
Collected as Mixed Construction Waste [kg]	2.56E+00
Waste to Landfill [kg]	2.56E+00
Distance to Landfill [kg]	3.22E+01

Life Cycle Assessment Results

As prescribed by the PCR, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 9 provides the acronym key of the impact indicators declared in this EPD.

Table 9: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
	IPCC AR5	
GWP	Global warming potential (100 years, includes biogenic CO2)	kg CO_2 eq
	TRACI 2.1	
AP	Acidification potential of soil and water	kg SO_2 eq
EP	Eutrophication potential	kg N eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
SFP	Smog formation potential	kg O_3 eq
	CML 2001-Jan 2016	
ADPF	Abiotic depletion potential for fossil resources	MJ, net calorific value
	Carbon Emissions and Uptake	
BCRP	Biogenic Carbon Removal from Product	[kg CO_2]
BCEP	Biogenic Carbon Emission from Product	[kg CO_2]
BCRK	Biogenic Carbon Removal from Packaging	[kg CO_2]
BCEK	Biogenic Carbon Emission from Packaging	[kg CO_2]
BCEW	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	[kg CO_2]
CCE	Calcination Carbon Emissions	[kg CO_2]
CCR	Carbonation Carbon Removals	[kg CO_2]
CWNR	Carbon Emissions from Combustion of Waste from Non- Renewable Sources used in Production Processes	[kg CO_2]
	Resource Use Parameters	
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV)
RPR_M	Use of renewable primary energy resources used as raw materials	MJ, net calorific value
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value
$NRPR_M$	Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value
SM	Use of secondary materials	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
RE	Recovered energy	MJ, net calorific value
FW	Net use of fresh water	m^3
	Waste Parameters	
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste, conditioned, to final repository	kg
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
CRU	Components for reuse	kg
MR	Materials for recycling	kg
MER	Materials for energy recovery	kg
EEE	Exported electrical energy	MJ
EET	Exported thermal energy	MJ

Sto BTS® Plus

The LCIA results presented below are for 1 m^2 of Sto BTS® Plus for 75 years.

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
IPCC AR5														
GWP [kg CO_2 eq]	1.50E+00	1.55E-01	9.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.98E-03	0.00E+00	4.39E-02
TRACI LCIA Impacts (North America)														
AP [kg SO_2 eq]	3.07E-03	7.60E-04	2.04E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-05	0.00E+00	2.26E-04
EP [kg N eq]	2.23E-04	6.60E-05	1.58E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-06	0.00E+00	9.92E-06
ODP [kg CFC 11 eq]	3.85E-14	3.96E-16	2.90E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-17	0.00E+00	2.10E-15
SFP [kg O_3 eq]	6.43E-02	1.76E-02	4.11E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E-04	0.00E+00	4.13E-03
CML 2001-Jan 2016														
ADPF [MJ]	1.56E+01	2.14E+00	9.59E-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	6.90E-02	0.00E+00	6.61E-01
Carbon Emissions and Uptake														
BCRP [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK [kg CO_2]	1.63E-02	0.00E+00	7.33E-04	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	0.00E+00	0.00E+00
BCEK [kg CO_2]	0.00E+00	0.00E+00	1.70E-02	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	0.00E+00	0.00E+00
BCEW [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO_2]	7.36E-01	0.00E+00	3.31E-02	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	0.00E+00	0.00E+00
CCR [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

The LCI results presented below are for 1 m^2 of Sto BTS® Plus for 75 years.

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Resource Use Indicators														
RPR_E [MJ]	2.13E+00	8.60E-02	1.45E-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	2.77E-03	0.00E+00	8.00E-02
RPR_M [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$ [MJ]	1.45E+01	2.16E+00	9.56E-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	6.96E-02	0.00E+00	6.83E-01
$NRPR_M$ [MJ]	1.45E+00	0.00E+00	6.51E-02	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	0.00E+00	0.00E+00
SM [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	4.93E-03	2.95E-04	8.56E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.51E-06	0.00E+00	8.46E-05
Output Flows and Waste Categories														
HWD [kg]	3.17E-09	6.20E-12	1.42E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-13	0.00E+00	1.70E-11
NHWD [kg]	1.30E-01	1.88E-04	1.00E-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	6.06E-06	0.00E+00	2.04E+00
HLRW [kg]	7.28E-07	7.34E-09	5.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-10	0.00E+00	8.44E-09
ILLRW [kg]	6.13E-04	6.18E-06	4.51E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-07	0.00E+00	7.55E-06
CRU [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	0.00E+00	0.00E+00	7.36E-03	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	0.00E+00	0.00E+00
MER [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Interpretation

For all the products in study, the majority of the environmental impacts come from the Product Stage, which includes raw material sourcing, transportation and manufacturing. Distribution to customer (A4) also contributes significantly (10% or more) to AP, EP, and SFP impacts. All other life cycle stages contribute 5% or less each to the cradle-to-grave impacts in all impact categories.

Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, July 2024
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